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Metaphor studies: theories, methods, approaches, and future perspectives

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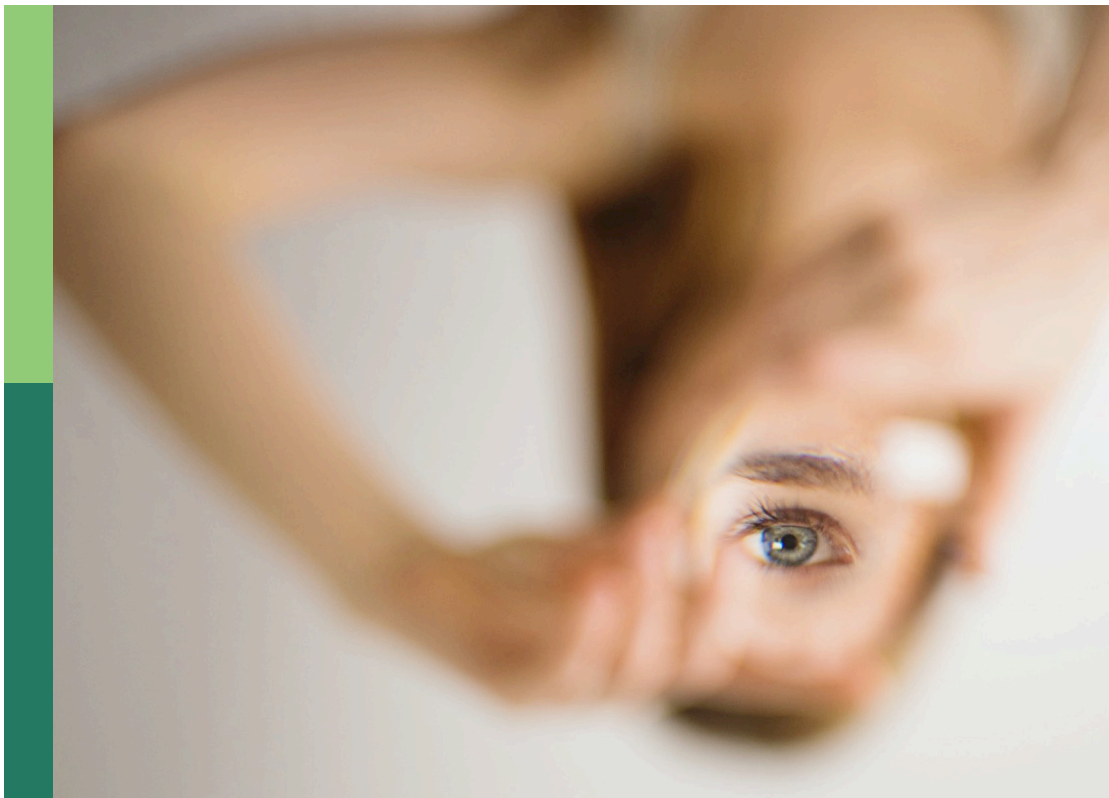

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Metaphor studies: theories, methods, approaches, and future perspectives

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Editorial: Metaphor studies: theories, methods, approaches, and future perspectives

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metaphor, figurative language, metaphorical thought, abstract conceptualization, embodied metaphors, metaphor in discourse, metaphor variation

Editorial on the Research Topic
Metaphor studies: theories, methods, approaches, and future perspectives

1 Introduction: aims and scope

This Research Topic seeks to provide an open and inclusive space for the discussion of Metaphor Studies as a plural, diverse research area encompassing a wide range of disciplines as well as a number of theories, approaches, and methods. It aims to enrich and expand on the platform provided by Lakoff and Johnson's Conceptual Metaphor Theory (Lakoff and Johnson, 1980) and by the responses and further developments that the CMT has elicited in the field over the past few decades, including the Dynamic Systems Approach (Gibbs, 2008), Deliberate Metaphor Theory (Steen, 2008, 2023), Kövecses' studies on embodiment and context (Kövecses, 2000, 2015), and the theory of conflictual concepts (Prandi, 2012, 2017), to mention but a few of the works that have elaborated on the cognitive theoretical paradigm and proposed further ways of conceptualizing, interpreting, and researching metaphors. Based on these premises, this Research Topic attempts to bring the discussion forward by promoting interdisciplinarity, diversity, and depth. In this connection, this Research Topic showcases a number of different conceptual and methodological approaches to Metaphor Studies, pursued through a variety of theoretical and analytical tools, and applied to a wide array of social, cultural and linguistic domains, with the aim of favoring cross-fertilization among the many research areas involved, thus offering a comprehensive account of existing research scenarios and their possible future developments.

The next section provides a brief overview of the contributions to the Research Topic. In order to highlight the main points of contact among the articles, five major thematic areas have been identified, including the conceptualizing potential of metaphors, metaphor comprehension in learning and teaching processes, semantics and metaphor processing, metaphor and multimodality, and new contributions to metaphor theory. The articles have been assigned to one thematic category for the sake of simplicity and tidiness, but this classification is not meant to be exhaustive of the possible similarities, analogies, and interconnections that may emerge from a full reading of each contribution.

2 Contributions to the Research Topic *Metaphor studies: theories, methods, approaches, and future perspectives*

A total of 22 articles contributed to this Research Topic, bringing together different strands in a common search for methods and approaches that might pave the way for positive developments in the research field of Metaphor Studies. A solid starting point in this direction is Zhao et al.'s bibliometric analysis of conceptual metaphor research, which shows the steady increase in such studies over the past 20 years and points to the many ramifications and re-elaborations of Conceptual Metaphor Theory.

The potential of metaphor for conceptualizing abstract, intangible and/or complex entities is well-represented in this Research Topic, which covers topical fields of inquiry such as health and social discourse in addition to areas of vast consequence in linguistics and psychology such as the notion of time and its relationship with space. Shi and Khoo, for example, analyzed how depression sufferers conceptualize their experience metaphorically in Chinese in a self-constructed corpus of texts produced by online health communities. Xu examined COVID-19 metaphors used on Twitter and Weibo and compared the different outcomes emerging in English and Chinese utterances. Negrea-Busuioc looked at the criticism raised by the use of a specific COVID-19-related metaphor on Facebook due to the different connotations and projections it may activate. Liu and Chen investigated the role of metaphors in shaping people's attitudes toward the risk of telecom fraud through an experiment confronting them with different framings. Zhang and Yang conducted a corpus-based analysis of economic texts to find out that the landslide concept prevails in terms of impact over other disaster notions in communicating economic crises. Feist and Duffy explored two widely studied metaphors for time, MOVING TIME and MOVING EGO, to point out the limitations of CMT unifying theory and to put an emphasis on variation, individuality and context in metaphor use. Park et al.'s experiment, in which Arabic-English bilingual participants were required to arrange cards so as to tell a story in chronological order proves that the writing direction of the language being used affects the representation of time in terms of space.

Metaphor as a conceptualizing tool also features prominently in the study of comprehension and learning and teaching processes. In this connection, Giuliani looked at the metaphors used by teachers and educators to elicit positive, resilient responses to the pandemic in primary and secondary schools in Italy. Cheng et al. investigated the metaphorical comprehension of Chinese children aged 5–8 years by analyzing response times and accuracy rates in processing metaphorical and literal sentences and found that metaphorical ability improves with age. Yu et al. used event-related potentials to compare brain responses in the comprehension of both novel and conventional metaphors and novel and conventional similes and interestingly found no significant difference between novel and conventional similes. Tay subverted the static TARGET IS SOURCE formula and invoked a dynamic approach to metaphor use, for which he devised a pilot study among statistics students consisting of transforming target domains into source domains in unconventional, creative metaphors. Gebbia considered the translation strategies spontaneously adopted by 73 translation students to render creative metaphors and their textual patterning and the related output. The findings suggest that isolated, non-conflictual metaphors do not pose any problems, whereas the diverse patterns of conflictual ones result in problematic outcomes, lacking connotative elements, figurative diversity, and cohesion.

Questions of meaning-making through figurative language are also prominent in the articles dealing with semantics and metaphor processing. Al-Azary and Katz studied the role of two semantic richness variables in metaphor production: semantic neighborhood density (SND), which measures the proximity of a word and its associations in semantic space, and body-object interaction (BOI), which reflects the ease with which a human body can motorically interact with a word's referent. They found that participants in their experiment appeared to try to reduce the overall semantic richness of the metaphors they created. De Backer et al. discussed the possible issues deriving from a quantitative analysis of the semantic field of metaphor-related words through MIP/VU and proposed three methods to extend its protocols to identify metaphorical strings in a more consistent manner. Zhang et al. applied Event Related Potential (ERP) technology to look at Chinese action verbs in their metaphorical sense and literal and abstract verbs. The comparison between the evidence from different sets of verbs suggests that the comprehension of the metaphorical action verbs is based on the semantics of concrete action, which cannot be said for literal and abstract verbs.

The abstract and concrete spheres simultaneously come into play when the object of analysis is a multimodal metaphor. Zhong et al. conducted a bibliometric analysis of the field of multimodal metaphor over the years 1977–2022, with a focus on 397 relevant publications retrieved from the Web of Science Core Collection through the visualization tool VOSviewer and identified topical moments and themes in this area. Guerrieri et al. sought to provide a definition of artistic metaphor and outlined the multimodal properties of metaphor in artistic environments. They tested their definition through a corpus of artworks by prominent Sardinian artists to show that the visual, tactile, and auditory components of the pictures can boost effective comprehension of figurative meaning. Borgogni reassessed Renaissance emblematics through the lens of recent metaphor theory to cast light on the complex and refined multimodal patterns offered by the interplay of visual and verbal text with figuration. His analysis subverts the traditional view of emblems as marginal by-products in Renaissance texts, revealing that metaphorical concepts in emblems predominantly rely on conflict rather than similarity.

More traditional views are questioned in the final section, where major theoretical tenets on the nature and behavior of metaphors are addressed and explored. Garello and Carapezza challenged what they call the "Natural Kind Assumption," that is, the widespread notion that despite their differences, metaphors share many properties and that a theory of metaphor should capture such essential properties. In their article they subverted this assumption and discussed the main consequences of this view shift on the philosophical plane. Colston discussed the conceptualization of metaphor as an entity relying on the dual structure of source and target and traced the success of such a conceptualization back to the human need for shared interpretative patterns for complex meanings. Thus, simpler dual frameworks tend to prevail,

despite the many advantages that multiple structures can provide in the analysis of complex phenomena. Finally, Steen's article looked at the most recent developments in Deliberate Metaphor Theory, based on the identification of metaphors that are subject to both a non-deliberate and a deliberate reading, so that they can produce different outcomes in communication, also depending on participant-related circumstances. Participants' responses are also relevant to the other finding this article exposes: different types of metaphors elicit different types of thinking, particularly fast and slow thinking, the former being associated with less processing effort and with non-deliberate, conventional metaphors, the latter with more processing effort and deliberate, unconventional metaphors, or very complex instances of metaphors that require considerable interpretive commitment to be processed.

Among the declared goals of the latter article is the search for principles that can serve as a unifying function in metaphor theory and research. Similarly, this Research Topic attempts to bring together different theories, methods and approaches in one place for discussion and dialogue, which may act as a starting point for future developments.

Author contributions

IR: Writing – original draft, Writing – review & editing.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Communicating telecom fraud risk in anti-telefraud messages: The effects of metaphorical frames on attitudes

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Introduction: With the frequent occurrences of telecom fraud crimes in China, it is very necessary and urgent to carry out effective anti-telefraud risk communication. In the present study, we investigated the role of metaphorical framing in shaping people's attitudes toward telecom fraud in anti-telefraud messages through two experiments.

Methods: Participants (N=547, Experiment 1; N=604, Experiment 2) were randomly assigned to war-framing, disease-framing, or issue-framing conditions. They were asked to read anti-telefraud messages where metaphorical frames were realized through multiple metaphorical expressions in Experiment 1 and relatively shorter messages where metaphorical frames were only instantiated through one metaphorical word in Experiment 2.

Results: The results showed that participants without prior experience with telecom fraud perceived severity as significantly higher in the war-framing condition than in the issue-framing condition. Besides, the framing effects were only detected in Experiment 2 where the short anti-telefraud message with limited metaphorical information was provided.

Discussion: The study reveals that even one metaphorical word is sufficient to build a framework for thinking about complex concepts, like telecom fraud, and prior experience with a certain risk can serve as a moderator of metaphorical framing on people's risk perceptions. It is also found that the effectiveness of metaphors may be more salient in the genres of a short length such as anti-telefraud banners. The study can shed light on public legal educators whose job is to use effective ways to communicate telecom fraud risk to citizens.

KEYWORDS

telecom fraud, metaphorical framing, war metaphor, disease metaphor, risk communication, anti-telefraud messages

1. Introduction

Metaphors pervade natural discourse to discuss a wide variety of subjects. They are not merely the "rhetorical flourish" that enlivens the discourse; instead, according to Conceptual Metaphor Theory, they act as a cognitive mechanism that prompts people to draw on the knowledge of the concrete concept to interpret the target issue (Lakoff and Johnson, 1980, p. 3). As a fundamental cognitive means in our conceptual system, metaphors help us make sense of elusive things, such as electricity (Gentner and Gentner, 1983), economics (Henderson, 1982), medicine (Coulehan, 2003), and politics (Lakoff, 2008).

Importantly, an extensive body of work suggests that metaphor can guide thought and influence our reasoning about social reality, such as cancer (Hendricks et al., 2018), immigration (Brown et al., 2019), crime (Thibodeau and Boroditsky, 2011) and natural disaster (Hauser and Fleming, 2021). When one comprehends an issue that is metaphorically framed, a conceptual metaphor is activated. Metaphors work in part by activating a conceptual schema connected with the source domain, which

prompts people to construct a representation of and subsequently draw inferences about the target domain (for reviews, see Thibodeau et al., 2019). More specifically, metaphor use involves transferring knowledge of a familiar and concrete source in a way that underscores some target features and de-emphasizes others, guiding people to bring their target attitudes consistent with the source knowledge (Lakoff and Johnson, 1980; Thibodeau et al., 2019). For example, metaphorically framing a hurricane as an antagonist increases participants' forecast of the number of homes destroyed, lives lost, and days without power caused by the hurricane, compared to the literal framing condition. In this case, because antagonists are dangerous, antagonist framing of a hurricane confers such qualities to the hurricane, increasing forecasts of its severity (Hauser and Fleming, 2021).

In this article, we examine the role of metaphor in risk communication about telecom fraud. Telecom fraud refers to a crime in that criminals make up false information, set up scams, and carry out remote and non-contact fraud on victims through telephone, network and SMS, and other telecom tools to induce the victims to make payments or transfer money to the criminals (O'Brien, 1998). In China, telecom fraud crimes have increased in recent years due to factors such as the development of telecommunication technology, and people's widespread and daily use of mobile devices (Wu, 2015). The recent frequent occurrences of the crimes represent a severe case that has led to economic concerns on a nationwide scale because of its potentially severe effects, including huge loss of money. People, who are easily targeted by doorstep criminals and vulnerable to exploitation, are those lacking anti-telefraud awareness, i.e., the awareness of acting against telecom fraud (Li and Li, 2019). Underestimating telecom fraud risk, they often assume that telecom fraud is far away from their lives and they will never be defrauded. As such, the promotion of people's anti-telefraud awareness is key to the success of anti-telefraud activities (Yuniarti and Ariandi, 2017).

Developing high-quality and efficient risk communication about telecom fraud is essential for promoting anti-telefraud awareness and preventing economic loss. Understanding the features of persuasive messaging, which promote risk awareness and encourage the adoption of protective behaviors against telecom fraud, is especially important when the telecom fraud interception system is not highly effective, as is the current case for China. Since various online and offline media play a significant role in anti-telefraud publicity, it is useful to study how messaging, including messages framed with colorful metaphors, influences our reasoning about telecom fraud in risk communication. As conceptual metaphors may guide people's thinking, they provide anti-telefraud practitioners with a possible approach to raising people's anti-telefraud awareness and improving the efficiency and persuasiveness of anti-telefraud messages.

To gain a better insight into whether and how metaphorical information works in anti-telefraud messages, we ran two experiments to investigate the effectiveness of metaphors in shaping people's attitudes toward telecom fraud, including risk perceptions, behavioral intentions, and policy support. Specifically, we focused on the metaphors of disease and war, which recent research suggests may enhance risk perceptions toward societal issues (Flusberg et al., 2017; Keefer et al., 2020). In addition, we explored whether the potential metaphorical framing effects in the context of anti-telecom communication would depend on metaphor and information amount in anti-telefraud messages, a key factor we need to consider when public legal educators design anti-telefraud messages.

Furthermore, we considered the potential role of people's prior experience with telecom fraud in the two experiments. Research suggests that the persuasive impact of metaphorically framed messages may only appeal to a specific group of people and the effects depend on people's prior knowledge (Landau et al., 2014). That is, metaphor can affect reasoning only when people feel uncertain about the target issues (Landau et al., 2014). Thus, one potential boundary condition on metaphorical framing effects is people's prior experience with telecom fraud in anti-telefraud risk communication, as their vivid experience may provide them with pre-existing background knowledge and deep-seated beliefs, and moderate the persuasive effects of metaphorical anti-telefraud messages.

2. Metaphorical framing

Our starting point is the Conceptual Metaphor Theory's claim that metaphors are not just linguistic packages of information; they might transfer conceptual content as well (Lakoff and Johnson, 1980, p. 3). This theory posits that metaphors serve as a cognitive tool that people can draw on to understand a concept (target domain) in terms of a superficially unrelated concept (source domain; for overviews, see Lakoff and Johnson, 1980; Gibbs, 1994; Kövecses, 2010). The target domain involves typically novel, abstract or complex concepts such as social-political issues (e.g., immigration) or intangible things (e.g., love, depression). The source domain is relatively more concrete, familiar and easier to understand, referring to embodied experience (e.g., experience of movement, space, feeling cold or hot) or familiar scripts (e.g., what do people experience in a journey or war). Metaphors facilitate comprehension of the target by conceptually mapping its features onto analogous features of the source: in this way, metaphors transfer familiar and concrete source knowledge to support interpretations of the target, which highlights the entailments of the target in line with the source. For example, people commonly understand the elusive process of life metaphorically in terms of a physical journey (e.g., my life is on the right track). The mapping created by the metaphor LIFE IS A JOURNEY transfers a conceptual template that life choices are branching paths, difficulties are obstacles and life progress is forward movement, emphasizing the similarities between life and journey.

Serving as frames or existing cognitive schemas that help interpret information, the more concrete source concepts can highlight similarities between the two domains while downplaying dis-similarities (Lakoff and Johnson, 1980, p. 10), which makes metaphor the framing device and reasoning device *par excellence*. As argued by Burgers et al. (2016), metaphors can achieve one or more of the functions of framing as proposed by Entman (1993, p. 52), "to frame is *to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the described item*" (italics in original). For example, thinking about a wildfire has been found to elevate people's perceived loss and increase people's willingness to evacuate when the wildfire is metaphorically framed as a monster, compared to when the wildfire is literally depicted (Matlock et al., 2017). In this situation, a monster, which refers to wildfire, is a danger (problem definition) that causes serious problems (causal interpretation), is difficult to control (problem evaluation), and requires action to stop it from harming society and citizens (treatment recommendation).

In line with Conceptual Metaphor Theory, a growing body of research has shown evidence that metaphors can affect how people reason on the issue that is addressed, and hence steer recipients' opinions more in line with the metaphorical frame (for reviews, see Thibodeau et al., 2017, 2019; Van Stee, 2018). Because metaphors facilitate comprehension, it should not come as much of a surprise that they are

frequently used to symbolize intangible aspects of societal issues and potential responses to those issues (Keefer and Landau, 2016). Thibodeau and Boroditsky (2011) explored how metaphors CRIME IS A DISEASE and CRIME IS A WILD BEAST influenced the way that people reasoned about complex issues, such as generating different solutions to a city's crime problem and foraging for further information about them. Participants in the crime-as-a-beast condition chose enforcement-oriented solutions more frequently than those in the crime-as-a-virus condition. Contrastingly, participants in the virus condition were more inclined to favor reform-oriented solutions, such as prevention and education reform. They found that even the limited metaphorical information (*via* a single word) could powerfully influence how people attempted to solve social problems like crime and how they gathered information to make "well-informed" decisions. Christmann and Göhring (2016) replicated Thibodeau and Boroditsky's study (2011) in the German language, concluding that metaphors do indeed frame reasoning. Thibodeau and Boroditsky (2013) further found that the CRIME IS A DISEASE and CRIME IS A WILD BEAST metaphors could influence people's reasoning even when they had a set of options available to compare and select among, which suggests metaphors can influence not just what solution comes to mind first, but also which solution people think is best. Interestingly, few participants thought the metaphor was crucial in their decision, which displays that the effects of metaphor framing are predominantly covert.

When it comes to conveying social, health, or environmental risks, metaphors are useful communicative tools in that they enable speakers to describe risk issues in terms of simple and more familiar domains (e.g., Vasquez et al., 2014; Flusberg et al., 2017; Matlock et al., 2017). Specifically, metaphors help people establish common ground between the danger conveyed by the source image and the target risk, and efficiently transfer a range of structured attitudes. Supporting evidence suggests that framing a risk with a metaphor can also influence people to reason about the risk in a metaphor-congruent fashion. To take a few recent examples: (1) when the flood and hurricane were metaphorically framed as an antagonist, people were likely to forecast more damage caused by the natural disaster, compared with literal or vehicle framing conditions (Hauser and Fleming, 2021), (2) animalistic descriptions of criminal acts resulted in significantly higher perceived risk of recidivism related to perpetrators and accordingly, harsher punishment for them (Vasquez et al., 2014), and (3) when the influenza was metaphorically compared to a wild animal attacking one's health, a weed growing inside one's body or an invading army, people were more likely to have intentions to get a flu shot (Scherer et al., 2015). In related studies, metaphors influence attitudes toward risk issues, including cancer (Hendricks et al., 2018), COVID-19 (Panzeri et al., 2021), immigration (Brown et al., 2019), climate change (Flusberg et al., 2017), and wildfire (Matlock et al., 2017).

Especially, the war metaphor (e.g., "war on cancer," "climate change is war") and the disease metaphor (e.g., "plagiarism is a disease," "euro crisis is a disease," "immigration is a disease") are widely adopted in risk communication (Flusberg et al., 2017; Hendricks et al., 2018; Brown et al., 2019; Joris et al., 2019; Keefer et al., 2020), because war and disease are easily-understood concepts with well-defined attributes. The effectiveness mainly depends on the negative scenarios with strong risk conveyed by the two metaphorical frames, by seeing an abstract problem in terms of a concrete threat, i.e., war or disease. For example, for the war frame, Flusberg et al. (2017) found that the war metaphor shaped people's attitudes toward climate change, which improved the perceived urgency and willingness to curb climate change, relative to the race metaphor and the literal version. For the disease frame, the findings of Keefer et al.'s (2020) study showed that framing plagiarism with the disease metaphor led students to perceive plagiarism as a more severe problem and as a result, they were more supportive of anti-plagiarism policies. The results of the experiments provide evidence that war and disease metaphors have far-reaching implications for the perception and evaluation of societal issues in risk communication. It is suggested that war and disease metaphors can activate conceptual schemas that are used to reason about a target domain and elicit cognitive or affective responses that influence reasoning about risks. The two metaphors for societal issues cause people to see the issues as riskier and more pressing.

However, even though metaphors show strong effects in many risk communication and other field studies, some research suggests that metaphorical framing effect can be conditional and individual differences can modify the direction and/or strength of the message's framing effects (e.g., Landau et al., 2014; Thibodeau and Boroditsky, 2015; Brown et al., 2019). Some work shows that people's prior knowledge serves as one key individual difference that matters to the persuasive effects of metaphorical framing (e.g., Landau et al., 2014; Thibodeau and Boroditsky, 2015). More specifically, the research posits that when people feel certain about their knowledge of the target, metaphors become less influential than when people feel uncertain about it. For instance, Landau et al. (2014) found that metaphorically framing corporate bankruptcy as a car crash prompted participants to attribute more blame to the CEO of the company, relative to the non-metaphorical condition. However, the metaphorical framing effects were diluted for participants who felt confident in their prior knowledge of corporate bankruptcies, compared with those who felt less confident. Similarly, another study also showed that metaphors were less persuasive for people who held deep-seated attitudes about how to best deal with a crime problem than those who do not (Thibodeau and Boroditsky, 2015). These studies suggest that people's knowledge of the target domain must be somewhat malleable for a metaphor to influence them and deep-seated beliefs about a target domain can "interfere with a metaphorical mapping" (Thibodeau et al., 2017, p. 4).

3. The current study

Drawing from the insights from metaphorical framing research, the present study investigated whether conceptual metaphors influenced people's reasoning about telecom fraud in anti-telefraud risk communication. Specifically speaking, we focused on the war metaphor and disease metaphor, which are two prevalent frames for communicating risk issues and are commonly used to confer danger to the target topics in risk communication.

War and disease metaphors are pervasive in anti-telefraud discourse to metaphorically describe telecom fraud, as in "阻断电信诈骗入侵校园 (Blocking telecom fraud from invading the campus)" (Sohu, 2021) and "网络诈骗犯罪仍是'社会毒瘤' (Internet fraud is still a 'social cancer')" (Xinhua Net, 2019). The war metaphor characterizes telecom fraud as enemies that lurk around citizens and invade their lives. As such, measures need to be taken to build the defense line and combat the enemies, as in "罗甸公安多举措打防电信诈骗战果明显 (Luodian public security bureau has taken many measures to defend and fight against telecom fraud, with positive results of war)" (Tencent, 2021). The disease metaphor characterizes telecom fraud as diseases or disease-related concepts, such as "stubborn disease," "malignant tumor," and "virus." As such, a remedy for telecom fraud is needed such as the inoculation of the vaccine or preventive injection, as in "廉江公安为群众接种'反诈疫苗',打好防骗预防针 (Lianjiang public security bureau

inoculates the masses with 'anti-fraud vaccine', a good preventive shot against fraud)" (Netease, 2021). Because war and disease metaphors are commonplace in discussions about telecom fraud, it is important to know whether such metaphors can serve as a cognitive tool that can influence people's reasoning about telecom fraud.

To remind people to avoid telecom fraud, the use of war or disease metaphors, which evoke domains that elicit perceived risk, may be a productive strategy. Human beings have evolved to stay away from things they consider to be pathogenic and dangerous to reduce the chance of infection and injury (Kagan, 1996; Murray and Schaller, 2016). Thus, language describing telecom fraud systematically as a disease or an enemy could cause perceivers to transfer the perceived risk to a new domain. We referred to Lu and Schuldt's (2018) research and decomposed the multi-faceted concept of risk perceptions as perceived severity (judgments of seriousness), perceived susceptibility (likelihood of being affected), [negative affect (affect response to risk) Cummings et al., 1978; Janssen et al., 2011)]. The war and disease metaphors both have a strongly negative valence, which conveys danger and severity and potentially elicits fear, disgust, anger, and anxiety in human emotions. Thus, we predicted that, compared with those who read the materials with the non-metaphorical frame, participants in war-framing and disease-framing conditions, would have stronger risk perceptions, specifically speaking, perceived severity, perceived susceptibility, and negative affect toward telecom fraud, relative to the literal version.

Some work suggests that individuals are more willing to act and propose responses that align with the salient concepts offered by metaphors when metaphors prime individuals to perceive a diffuse abstract problem as a concrete threat (e.g., Thibodeau and Boroditsky, 2015; Keefer et al., 2020). Thus, war-fighting and disease-preventing narratives potentially tap into people's expectations of solving problems and willingness to engage in anti-telefraud activities, as Yanow (2008, p. 237), argues that metaphor is both a "model of" a phenomenon and a "model for" actions concerning that phenomenon. Thus, we predicted that participants exposed to metaphorical frames would show a stronger motivation in their behavioral intentions. Besides, we also predicted that participants exposed to metaphorical frames would support more in terms of the anti-telefraud policy proposed by the government and consider it more of a priority.

As illustrated in the previous sections, the metaphorical framing effects can vary with individual-level factors and people's prior knowledge of the target domain must be somewhat malleable for metaphors to influence them (Thibodeau et al., 2017). Therefore, we considered the potential role of people's prior experience with telecom fraud in metaphorical framing effects, as their vivid experience may lead them to form pre-existing knowledge and entrenched mental models about the telefraud topic. As deep-seated beliefs about a topic can make a person less amenable to persuasion by metaphor (Landau et al., 2014), we might find that the metaphorical framing effects are smaller for people who have prior experience with telecom fraud, and are more likely to form unambiguous judgments about the telefraud topic, than for people who do not have such vivid experience. Thus, we predicted that metaphorical framing effects would be greater for participants without prior experience with telecom fraud than for those with such prior experience.

Of note, we operationalized prior experience as having been defrauded, or having at least one family member or close friend who has been defrauded, including both direct and indirect experience. We added indirect experience to the variable of participants' prior experience, given that their vicarious experience from close relationships could also influence people's pre-existing attitudes toward telecom fraud through victim-telling or direct observation.

Besides, in the current study, we also investigated the role of metaphor and information amount in metaphorical framing effects, a key factor we need to consider in designing anti-telefraud messages. Two experiments were conducted to examine the framing effects of metaphor in anti-telefraud discourse when metaphorical frames were realized through various metaphorical expressions and linguistic relations in a relatively longer text (i.e., the greater number of words and the greater amount of information), or just through limited metaphorical information, such as one metaphorical word in a short text, respectively.

We used a common type of telecom fraud, i.e., loan fraud, as an example to organize the experimental materials. Loan fraud was chosen as an example, as loan fraud has become an increasingly prominent issue in recent years. More people in China are considering enjoying petty services, for instance, consumer credit from apps like Alipay, with the acceptance of the popular concept of "buy-now-pay-later" (Huang, 2021, p. 2). Some people also seek relatively large loan services for making up for the shortage of funds, such as in investment or buying houses. The ensuing loan fraud that frequently appears nowadays deserves a high priority in anti-telefraud campaigns.

4. Experiment 1: Can war metaphor and disease metaphor influence people's attitudes toward telecom fraud?

4.1. Method

4.1.1. Design

Experiment 1 aimed to test whether there were differences in people's attitudes about telecom fraud (including risk perceptions, behavioral intentions, and policy support) between the subjects exposed to the war frame, disease frame, and issue frame. The metaphorical frames in the experiments were realized by a variety of metaphorical expressions and linguistic relations.

4.1.2. Participants

Participants were recruited through a post on Wenjuanxing, the Chinese version of Mechanical Turk, and were paid 2 yuan for completing the experiment. Completed questionnaires were obtained from exactly 547 participants. Submissions were excluded from the study as follows: (a) 33 respondents refused to participate in the task, (b) 11 respondents spent <100 s finishing the whole task, (c) 19 respondents failed to correctly answer the attention-checking question, suggesting low attention to the stimulus materials, (d) 2 questionnaires were submitted repeatedly from the same IP address, and (e) 12 respondents who aged below 18 were excluded. The final samples consisted of 470 participants. These individuals spent a mean of 354.90 s (SD = 378.34) finishing the task. The sample was 67.02% female and 32.98% male with a mean age of 37.63 years (SD = 9.11). The median highest level of education attained was a bachelor's degree. People with prior experience with telecom fraud account for 32.98%.

4.1.3. Stimulus materials and procedure

Participants were randomly assigned to one of three experimental conditions, i.e., war frame, disease frame, or issue frame. The experiment was conducted online using Wenjuanxing. After giving informed

TABLE 1 Illustrative language manipulations with translations in Experiment 1 (Differences across conditions are underlined).

Issue frame	War frame	Disease frame
当心贷款诈骗问题 (Beware of the issue of loan fraud)	当心贷款诈骗敌人 (Beware of the enemy of loan fraud)	当心贷款诈骗病毒 (Beware of the virus of loan fraud)
近年来，随着电信网络的发展，贷款诈骗这个问题在我们身边出现。 In recent years, with the development of telecommunication networks, the issue of loan fraud has appeared around us.	近年来，随着电信网络的发展，贷款诈骗这群敌人在我们身边发起了侵袭。 In recent years, with the development of telecommunication networks, the enemy of loan fraud has launched an attack on our side.	近年来，随着电信网络的发展，贷款诈骗这种病毒在我们身边传播开来。 In recent years, with the development of telecommunication network, the virus of loan fraud has spread around us.
贷款诈骗可能存在于很多地方，如手机短信平台、社交媒体、虚拟网站等等。 Loan fraud may exist in many places, such as SMS platforms, social media, virtual websites, and so on	贷款诈骗可能埋伏在很多地方，如手机短信平台、社交媒体、虚拟网站等等。 Loan fraud may be lurking in many places, such as SMS platforms, social media, virtual websites, and so on	贷款诈骗可能扩散到了很多地方，如手机短信平台、社交媒体、虚拟网站等等。 Loan fraud may spread to many places, such as SMS platforms, social media, virtual websites, and so on.
若不小心，则可能会遭到贷款诈骗的困扰。 If we are not careful, we may be troubled by loan fraud.	若不小心，则可能会遭到这群敌人的攻击。 If we are not careful, we may be attacked by the enemy.	若不小心，则可能会遭到这种病毒的伤害。 If we are not careful, we may be affected by the virus.
为了减少诈骗，我们需要找到能有效解决贷款诈骗问题的办法。 To reduce fraud, we need to find an effective solution to loan fraud.	为了重挫敌人，我们需要拿出能有效打击贷款诈骗敌人的武器。 To defeat the enemy, we need to come up with weapons that can effectively combat loan fraud.	为了遏制病毒，我们需要开发能有效免疫贷款诈骗病毒的疫苗。 To contain the virus, we need to develop a vaccines that can effectively immunize against loan fraud.
反诈在行动，电信网络贷款是我们要解决的问题。 Anti-telefraud activities are in action, and loan fraud is the problem we must solve.	反诈在行动，电信网络贷款是我们要击败的敌人。 Anti-telefraud activities are in action. Loan fraud is the enemy we must defeat.	反诈在行动，电信网络贷款是我们要清除的病毒。 Anti-telefraud activities are in action. Loan fraud is the virus we must eliminate.

consent, participants read a fabricated message released on Weibo, a Chinese social media platform similar to Twitter. They then completed a questionnaire on the next page. Time spent on finishing the questionnaire was covertly recorded. The back button was forbidden to prevent participants from returning to the Weibo message while completing the questionnaire.

Participants first read a brief Weibo message about the current situation of loan fraud in China that varied with the experimental conditions. Each message was titled "Beware of the enemy of loan fraud," "Beware of the virus of loan fraud" and "Beware of the issue of loan fraud." Participants in this experiment were randomly allocated to one of these three frames. The frame was presented as the title of the articles and then was extended throughout the description. For example, in the war-framing condition, participants read statements about how the enemy of loan fraud were seeking to attack people and that we needed to use weapons to combat him. In the disease-framing condition, participants read about how the virus of loan fraud was seeking to affect people and that we needed to use vaccines to prevent it. In the issue-framing condition, participants read about how the issue of telecom fraud troubled us and that we needed to solve this social problem. Aside from the metaphorical contents, we kept the linguistic forms used in the Weibo message identical, including the same sentence structures, for example, "Loan fraud is the enemy we must combat.", "Loan fraud is the virus we must clean.", and "Loan fraud is the issue we must solve." The illustrative language manipulations in the three passages were presented in Table 1. No words were emphasized in the original materials. The number of words in three conditions is 205 words, 210 words, and 212 words, respectively.

After reading the Weibo message, participants were asked to make judgments about risk perceptions. Specifically, for perceived severity, participants indicated how severe they believed loan fraud crimes have been on a scale ranging from 1 = Not severe at all to 11 = Extremely severe. For perceived susceptibility, participants indicated their perceived likelihood of becoming encountered with loan fraud personally on a scale ranging from 1 = Not likely at all to 11 = Extremely likely. For negative affect, participants indicated among a battery of negative emotion items how much they felt each of the listed emotions when thinking about loan fraud (1 = None of this feeling to 11 = A lot of this feeling): fear, disgust, anger, and anxiety. These four emotion items were averaged into a composite scale representing negative affect (Cronbach's $\alpha = 0.85$).

Then we investigated participants' attitudes toward anti-telefraud policy support. Participants reported how much they thought the government should prioritize curbing loan fraud crime on a scale ranging from 1 = Should not be a priority at all to 11 = Should be the top priority.

Participants were then asked to read a list of fraud prevention behaviors and indicated their willingness of adopting these behaviors in the following year (1 = Not likely at all to 11 = Extremely likely).

1. Would you be willing to download the app designed for anti-loan fraud activities?
2. Would you be willing to receive SMS or email about anti-loan fraud messages regularly?
3. Would you be willing to read or watch public articles or videos about anti-loan fraud activities?
4. Would you be willing to attend the public lecture on anti-loan fraud activities? These items were averaged to create a composite scale of behavioral intentions (Cronbach's $\alpha = 0.83$).

People were also asked a question about their prior experience with telecom fraud, i.e., whether they themselves, their family members or close friends had been defrauded before or not. The prior experience with telecom fraud was included as a categorical predictor in the following behavioral analysis to test whether the effects of the experimental manipulations were moderated by participants' prior experience with telecom fraud.

Then, one attention check question was included to assess whether participants paid attention to the experimental materials. The question asked participants to summarize at least one keyword about the main idea of the passage. Finally, demographic questions about gender, age, and educational background were asked. The data for the experiments are available in Supplementary material.

4.2. Results

To test whether metaphors influenced risk perceptions, behavioral intentions, and policy support, a series of two-way ANOVAs were conducted that compared the extent to which participants in each condition were affected by each framing.

4.2.1. Perceived severity

There was no statistical significance of the main effect of experimental conditions, $F(2,464) = 1.127$, $p = 0.325$, but the main effect of prior experience on perceived severity displayed a trend, $F(1,464) = 3.164$, $p = 0.076$, $\eta_p^2 = 0.007$, such that participants with prior experience ($M = 9.10$, SD = 1.92) perceived severity higher than those without prior experience ($M = 8.72$, SD = 2.06). There was no significant interaction effect between experimental conditions and prior experience, $F(2,464) = 1.087$, $p = 0.338$, on perceived severity.

4.2.2. Perceived susceptibility

Turning to perceived susceptibility, a trend was displayed on the main effect of the experimental conditions, $F(2,464) = 2.765$, $p = 0.064$, $\eta_p^2 = 0.012$. A *post-hoc* test with Bonferroni-corrections showed there was a trend that the war-framing message ($M = 7.67$, SD = 3.18) resulted in more perceived susceptibility than the literal message ($M = 6.95$, SD = 3.02), $p = 0.098$. There were no main effect of prior experience, $F(1,464) = 2.376$, $p = 0.124$, or significant interaction effects, $F(2,464) = 1.033$, $p = 0.357$.

4.2.3. Negative affect

Concerning negative affect, the main effect of prior experience with telecom fraud was observed, $F(1,464) = 7.040$, $p = 0.008 < 0.05$, $\eta_p^2 = 0.015$. Descriptive statistics showed that the participants with prior experience with telecom fraud ($M = 8.24$, SE = 2.37) had more negative affect than those without prior experience ($M = 7.53$, SE = 2.63). We did not find a main effect of the experimental conditions, $F(2,464) = 0.601$, $p = 0.548$. There was also no interaction effect on participants' negative affect, $F(2,464) = 0.053$, $p = 0.948$.

4.2.4. Behavioral intentions

There were no main effects of framing conditions, $F(2,464) = 1.181$, $p = 0.308$, and prior experience, $F(1,464) = 0.978$, $p = 0.323$, on participants' behavioral intentions. Besides, we did not find any interaction effect on participants' behavioral intentions, $F(2,464) = 0.912$, $p = 0.403$.

4.2.5. Policy support

There were no main effects of framing conditions, $F(2,464) = 1.969$, $p = 0.141$, and prior experience, $F(1,464) = 0.040$, $p = 0.842$, on participants' policy support. Besides, there was also no interaction effect on participants' policy support, $F(2,464) = 0.465$, $p = 0.629$.

5. Experiment 2: Can limited metaphorical information influence people's attitudes toward telecom fraud?

5.1. Method

5.1.1. Design

Experiment 2 aimed to explore how people's attitudes about telecom fraud were affected by limited metaphorical information in a short text. In this experiment, only the first sentence of the experimental stimuli contained one metaphorical term, such as the virus/the enemy of loan fraud has appeared around us. The total words of the stimuli for each framing condition were only about one-third of those in Experiment 1.

5.1.2. Participants

Participants in Experiment 2 were recruited through a post on Wenjuanxing and were paid 2 yuan for completing the experiment. Completed questionnaires were obtained from exactly 604 participants. Submissions were excluded from the study: (a) 44 respondents refused to participate in the task, (b) 40 respondents spent <80 s finishing the whole task, (c) 36 respondents failed to correctly answer the attention-checking question, suggesting low attention to the stimulus materials, and (d) 4 respondents who aged below 18 or did not fill in his/her exact age were excluded. The final samples consisted of 482 participants. These individuals spent a mean of 265.75 s (SD = 238.33) finishing the task. The sample was 63.07% female and 36.93% male with a mean age of 31.79 years (SD = 11.69). The median highest level of education attained was a bachelor's degree. People with prior experience with telecom fraud account for 37.76%.

5.1.3. Stimulus materials and procedure

In Experiment 2, we changed the representation of metaphorical frames and the message length in the stimulus materials to further examine the role of metaphor in reasoning. In this experiment, we just used only one word to instantiate the metaphorical frames. The illustrative language manipulations in the three passages were presented in Table 2. Besides, the information about loan fraud in the stimuli was reduced to two sentences. The number of words in three conditions is all 70 words across three conditions. The experimental procedures were the same as those in Experiment 1.

TABLE 2 Illustrative language manipulations with translations in Experiment 2 (Differences across conditions are underlined).

Issue frame	War frame	Disease frame
近年来，随着电信网络的发展，贷款诈骗这个问题已经出现在了我们的身边。 In recent years, with the development of telecommunication networks, the issue of loan fraud has appeared around us.	近年来，随着电信网络的发展，贷款诈骗这群敌人已经出现在了我们的身边。 In recent years, with the development of telecommunication networks, the enemy of loan fraud has appeared around us.	近年来，随着电信网络的发展，贷款诈骗这种病毒已经出现在了我们的身边。 In recent years, with the development of telecommunication networks, the virus of loan fraud has appeared around us.

5.2. Results

5.2.1. Perceived severity

No main effects were found for framing conditions, $F(2,476) = 1.798$, $p = 0.167$, and previous experience, $F(1,476) = 1.449$, $p = 0.229$, on perceived severity. However, the interaction effect between framing conditions and prior experience displayed a trend, $F(2,476) = 2.661$, $p = 0.071$, $\eta_p^2 = 0.011$. Post-host tests with Bonferroni-corrections showed that for people without prior experience, the war-framing message ($M = 9.10$, SD = 1.85) aroused higher perceived severity than the issue-framing message ($M = 8.41$, SD = 1.75), $p = 0.017$. Besides, in the issue-framing message, people with prior experience ($M = 9.13$, SD = 1.45) perceived loan fraud as significantly more severe than people without prior experience ($M = 8.41$, SD = 1.75), $p = 0.009$.

5.2.2. Perceived susceptibility

There was no main effect of framing conditions, $F(2,476) = 1.225$, $p = 0.295$, and no significant interaction effect, $F(2,476) = 0.976$, $p = 0.378$, on perceived susceptibility, but we found a significant effect of prior experience with perceived susceptibility, $F(1,476) = 6.631$, $p = 0.01$, $\eta_p^2 = 0.014$. People with prior experience with telecom fraud ($M = 8.01$, SD = 2.42) perceived loan fraud as significantly more susceptible than those without prior experience with telecom fraud ($M = 7.37$, SD = 2.75).

5.2.3. Negative affect

Turning to negative affect, no main effect of experimental conditions was found on negative affect, $F(2,476) = 0.325$, $p = 0.723$. However, results revealed a significant main effect of prior experience, $F(1,476) = 4.302$, $p = 0.039$, $\eta_p^2 = 0.009$, such that people with prior experience with telecom fraud ($M = 7.78$, SD = 2.17) perceived more negative affect than people without prior experience with telecom fraud ($M = 7.30$, SD = 2.44). The main effect, however, was qualified by the trend of a two-way interaction, $F(2,476) = 2.387$, $p = 0.093$, $\eta_p^2 = 0.01$. A post-host test with Bonferroni-corrections showed that only in the issue-framing condition, people with prior experience with telecom fraud rated the measure of negative affect significantly higher than people without prior experience with telecom fraud ($p = 0.003$).

5.2.4. Behavioral intentions

With respect to behavioral intentions, no main effects of framing conditions, $F(2,476) = 1.014$, $p = 0.364$, and prior experience, $F(1,476) = 0.119$, $p = 0.731$, were found on people's behavioral intentions. There was also no interaction effect between framing conditions and prior experience with people's behavioral intentions, $F(2,476) = 0.020$, $p = 0.980$.

5.2.5. Policy support

Regarding policy support, no significant effect of framing conditions, $F(2,476) = 0.410$, $p = 0.664$, and no interaction effect between framing conditions and prior experience, $F(2,476) = 0.821$, $p = 0.441$, were found on people's policy support. However, there was a significant effect of prior experience with people's policy support, $F(1,476) = 6.126$, $p = 0.014$. People with prior experience with telecom fraud ($M = 9.54$, SD = 1.37) rated the priority of anti-loan fraud activity as significantly higher than people without prior experience with telecom fraud ($M = 9.18$, SD = 1.67).

6. Discussion

The two experiments presented in this article explored the cognitive consequences of war and disease metaphors on people's attitudes toward telecom fraud in two different metaphorical information contexts. Participants read a passage about loan fraud, either framed as a/an "enemy," "virus" or "issue." They then responded to questions that probed their attitudinal landscape about loan fraud, including risk perceptions (which are composed of perceived severity, perceived susceptibility, and negative affect), behavioral intentions, and policy support. In Experiment 1, an overall significant effect on attitudes toward loan fraud was not found. In Experiment 2, we found that for participants without prior experience, the war-framing message generated more perceived severity of loan fraud than the issue-framing message.

Although the metaphorical framing effect is chiefly limited to the perceived severity of loan fraud in the war-framing condition of Experiment 2, the result implies, consistent with previous research (Thibodeau and Boroditsky, 2011; Matlock et al., 2017), even one metaphorical word can shape people's thoughts about a certain risk. It adds to evidence that one metaphorical word is sufficient to build a framework for thinking about complex concepts, like telecom fraud, and support the metaphorical mapping process which makes similarities in relational structure salient, and imbues the target with some of the source's features (Gentner and Gentner, 1983). This structure mapping process is likely responsible for the higher perceived severity we observed in Experiment 2 when loan fraud was framed as an "enemy," relative to the literal version.

The present study also contributes to the literature in the metaphor and risk communication research fields in that it testifies that prior experience with the target domain (a certain risk) serves as a moderator of metaphorical framing on people's risk perceptions. The role of prior experience with telecom fraud was displayed in metaphorical framing effects, as the effects of war framing, which led to higher perceived severity, are limited to the participants without prior experience with telecom fraud. As previous studies argued, participants who have existing knowledge structures on a target are less likely to be influenced by metaphorical frames (Robins and Mayer, 2000), as the frames can only affect participants whose views on a target are somewhat malleable (Landau et al., 2014; Thibodeau and Boroditsky, 2015). Thus, the metaphorical framing effects may be attenuated if the knowledge structure that is related to the severity of telecom fraud is primed, due to participants' vivid experiences with telecom fraud that helps them to understand the situation (Robins and Mayer, 2000). In contrast, participants without such vivid experiences may be more easily affected and use metaphors to make sense of aspects of risky issues when they are ambiguous about the telefraud topic.

Considering that citizens without first-hand experience with telecom fraud take a large proportion, war-framing messages can be employed to target communities for achieving more effective anti-telefraud publicity by public legal education practitioners. Although no framing effects were detected in the other dimensions of risk perceptions, the observed effects of metaphorical framing on the perceived severity can have significant impacts in anti-telefraud media campaigns where the outcomes are possibly influenced by slim margins (Prentice and Miller, 1993). Especially,

the finding of metaphorical framing effects in the short text indicates that the war metaphor can be especially considered to be used in the anti-telefraud banners, a typical short text. Although it is rather naïve to presume that a single media message will directly keep people away from loan fraud, the results revealed that metaphorical wording can be an effective and cost-efficient way of anti-telefraud publicity.

In the study, we detected significant war framing effects in perceived severity only in Experiment 2, but not in Experiment 1. The findings point to the possibility that metaphorical frames may be ineffective at elevating perceived severity when the messages on a risk issue in question already provide a sufficient amount of information on its severity. Thus, the detailed descriptions of loan fraud in Experiment 1 make its severity salient for participants both with prior experience and without it, regardless of the use of metaphors. On the contrary, in the short texts that lack a detailed description to present loan fraud risk, even one metaphorical word has the capacity to highlight its severity, thus displaying the framing effect. This implies that anti-telefraud messages that vary in length in different channels can influence metaphorical framing effects, such that the effects in the banners for anti-telefraud publicity can be more salient than those in other channels, such as leaflets and posters.

No metaphorical framing effects in risk perceptions were found in the disease-framing condition. People's perception of the metaphors possibly explains why we did not detect disease framing effects but war framing effects in the present study. For example, metaphor novelty can influence the processing fluency of a metaphorical sentence (Pierce and Chiappe, 2008), and perceived aptness has been regarded as a prerequisite for the persuasive effects of metaphorical language (Thibodeau and Durgin, 2011). The use of war metaphor and disease metaphor may vary in the aptness and novelty in anti-telefraud discourse, leading to different framing effect sizes. Nevertheless, we have not been able to establish the extent to which the disease metaphor and the war metaphor used in the anti-telefraud context are perceived as apt and novel. Empirical studies are further needed to test participants' perceived novelty and aptness of the metaphors.

In the two experiments, we find no significant metaphorical framing effects on policy support and behavioral intentions. Probably, since policy support does not require much personal effort (Lu and Schuldt, 2018), the dimensions of policy support across the experimental conditions all show a very high level (Experiment 1: $M_{overall} = 9.87$, $SD_{overall} = 1.75$; Experiment 2: $M_{overall} = 9.32$, $SD_{overall} = 1.57$), with participants' overall relatively high levels of risk perceptions. Besides, the high level of policy support demonstrates the typical collectivism in Chinese political culture, in which citizens tend to think that government should shoulder a high responsibility for social welfare (Yang et al., 2019). The behavioral intentions also demonstrate a relatively high level across three experimental conditions in two experiments (Experiment 1: $M_{overall} = 9.09$, $SD_{overall} = 1.84$; Experiment 2: $M_{overall} = 8.47$, $SD_{overall} = 1.92$). The reason may be that the behaviors listed in the questionnaires do not involve the actual cost of money and are also relatively easy to achieve. In addition, we use the self-reports to measure behavioral intentions, which may not reflect their real behavioral change (Webb and Sheeran, 2006) and thus we do not know whether people will engage in anti-telefraud activities at the high level as reported.

7. Implications, limitations, and future directions

The current study carries implications both practically and theoretically. First, the study can shed light on how anti-telefraud practitioners describe telecom fraud in future anti-telefraud activities. The results demonstrate that metaphors are not merely rhetorical devices that can be added to or removed from anti-telefraud messages without affecting people's perceptions. Designers of anti-telefraud messages can leverage war metaphors to make the severity of telecom fraud salient, and anti-telefraud target group, especially people without prior experience with telecom fraud, can draw on the metaphors to ascertain its severity even through one metaphorical word. Overall, the study suggests that metaphorical information used to discuss telecom fraud deserves consideration in the development of models of effective anti-telefraud risk communication.

Second, the study suggests that anti-telefraud messages that vary in length in different channels can influence the persuasive effects of metaphorical framing, such that the effects in the banners for anti-telefraud publicity can be more salient than those in other channels, such as leaflets and posters. The results further indicate that message characteristics, such as message length and further the amount of risk information, may also affect metaphorical framing effects in risk communication, which needs to be testified in future studies.

Third, the current study contributes to the literature in the metaphor and risk communication research fields in that it testifies that people's prior experience with a certain risk is an important moderator of the persuasive impact of metaphorical framing on risk perception. To get a better sense of how metaphorical framing works in risk communication, future studies should pay attention to the variable of prior experience with a certain risk in their investigations.

Despite the contributions, the limitations of the present study have to be acknowledged and future directions are discussed below. The present study only focuses on the moderator of prior experience, and only investigates the effects of metaphorical framing on one type of telecom fraud. Future research on additional individual differences and the effects of metaphorical frames on other kinds of telecom fraud should also be investigated.

8. Conclusion

The article conducted two experiments to test whether the public's attitudes toward loan fraud, including risk perceptions, public support, and behavioral intentions, would be influenced by war or disease framings. Five hundred forty-seven and Six hundred and four participants were exposed to either war-framing, disease-framing, or issue-framing messages in the two experiments, respectively. They were asked to read anti-telefraud messages where metaphorical frames were realized through multiple metaphorical expressions and linguistic relations in Experiment 1, and relatively short messages where metaphorical frames were instantiated through one metaphorical word in Experiment 2. We found out that participants without prior experience with telecom fraud perceived severity as significantly higher in the war-framing condition than in the issue-framing condition. Besides, the framing effects were only detected in anti-telefraud messages in a short length. Altogether, the two experiments demonstrated a scenario of the potential effects of metaphorical

messages on people's attitudes in anti-telefraud risk communication. As a result, this study may potentially be useful to public legal educators whose job is to use effective ways to communicate telecom fraud risk to a general audience.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Guangdong University of Foreign Studies. The patients/participants provided their written informed consent to participate in this study.

Author contributions

ML and JC conceived of the initial idea, designed the study, collected the data, and analyzed the data. ML drafted the manuscript. JC revised subsequent versions, proofread the manuscript, and finalized the manuscript for submission as the corresponding author. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1093933/full#supplementary-material

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Global bibliometric analysis of conceptual metaphor research over the recent two decades

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Conceptual Metaphor has been a prevalent theme in the linguistic field for the recent twenty years. Numerous scholars worldwide have shown interest in it and published many academic papers from various stances on this topic. However, so far, there have been few rigorous scientific mapping investigations. With the help of bibliometric analysis tool, we selected 1,257 articles on Conceptual Metaphors published from 2002 to 2022, as collected in the Web of Sciences Core Collection database, from unique cognitive perspectives. The global annual scientific output of Conceptual Metaphor, including the cited articles, sources, keywords, and research trends, will be examined in this study. The most notable findings of this study are the following. First, there has been an upward trend in Conceptual Metaphor research over the last two decades. Second, the five most prominent research groups on Conceptual Metaphors are in Spain, the United States of America, China, Great Britain, and Russia. Third, future research on Conceptual Metaphors may focus on corpus linguistics, neurolinguistics, psychology, and critical discourse analysis. The interdisciplinary study may enhance the growth of Conceptual Metaphors.

KEYWORDS

bibliometric analysis, interdisciplinary study, quantitative and qualitative, evaluation, research trends

Introduction

There is an enormous amount of literature in numerous research areas in the times of big data (e.g., Faust et al., 2018; Alnajem et al., 2021; Bashir et al., 2021; Abdul et al., 2022). Much research, however, is dispersed and difficult to compile in an orderly and visible manner. Therefore, finding specific literature quickly and accurately relevant to the research issue has always been challenging. For example, since Lakoff and Johnson proposed conceptual metaphors (CM) (Lakoff and Johnson, 1980), academic papers on the growth of CM have undoubtedly increased over the past decades, and they have helped to advance numerous facets of CM study. However, keeping up with everything published instantaneously becomes more problematic. In terms of CM research, there are increasing studies on linked subjects, and various reviews have been conducted (e.g., Allahmoradi, 2018; Holyoak and Stamenkovic, 2018; Bundgaard, 2019; Gandolfo, 2019; Tohidian and Rahimian, 2019; Kövecses, 2020; Bearman et al., 2021; Jensen et al., 2021; Abdul et al., 2022). However, these studies mainly focused on qualitative analysis. So far, little research has been done on a general picture of CM research. Therefore, this study uses

Bibliometrix metrology software, a statistical package called R (Biblioshiny), to visually analyze academic articles on CM over the recent two decades. The prevalent topics in different areas on the present research status, research themes, and future research directions in CM will provide references for scholars to research CM and predict its future direction.

This study is a valuable resource for academics and researchers working in the CM field. Beginners interested in CM can be offered the information required to start their research. Experienced CM researchers can familiarize themselves with the advances in the field and promote collaboration and networking between institutions and authors.

CM research (2002–2022): A bibliometric analysis

Bibliometric tool

Bibliometrics is an open-source tool for quantitative research in scientometrics[1]. It is a unique tool using the R programming language for statistical computation and graphics following a logical bibliometric process. The bibliometric tool is controlled by Bibliometrix and its web-based graphical interface based on Web of Science (WoS), Scopus, and Dimensions data (Aria and Cuccurullo, 2017). The interface is spontaneous and well-systematized, and the main menu is separated consistently with the Science Mapping Analysis system. The set menu performs analysis from eight categories: data sets, sources, authors, documents, clustering, intellectual structures, conceptual structures, and social structures in Biblioshiny. Several document formats can be transmitted, maps can be transferred to Html or Pajek, and tables can be saved as pdf, excel, or printed. The R bibliometrics package was used to analyze data, which gives more objective and dependable assessments than other methods. By providing a structured analysis of a large body of knowledge, bibliometrics becomes helpful when there is an excellent volume of new information, conceptual developments, and data to process.

Today, the bibliometric tool is increasingly utilized in numerous fields. An amount of research has been conducted (Ellegaard and Wallin, 2015; Donthu et al., 2021; Efron et al., 2021), including tsunami research (Chiu and Ho, 2007; Jain et al., 2021), the circular economy (Geissdoerfer et al., 2017; Bui et al., 2020; Luis and Celma, 2020; Alnajem et al., 2021), green supply chain management (Fahimnia et al., 2015; Amirbagheri et al., 2019), deep learning for healthcare applications (Faust et al., 2018; Saheb et al., 2021; Zhu et al., 2021), environmental hypothesis (Sarkodie and Strezov, 2019; Bashir et al., 2021; Hashemi et al., 2022), and COVID-19 research (Verma and Gustafsson, 2020; Yan et al., 2021). Waltman et al. (2010) assert that scholars frequently mix mapping and clustering techniques when analyzing bibliometric networks. They employ bibliographic data from publishing databases to build structural pictures of scientific domains (Zupic and Čater, 2015). The growing number of papers using bibliometric analysis across all disciplines suggests that it meets the desire of researchers who want proper research based on a wealth of literature.

Attributable to its reliable and scalable statistics, the bibliometric tool has compelling features and is becoming increasingly important in research. In contrast to other methods, it can introduce a systematic, transparent, and repetitious review procedure based on statistical assessments of science, or scientific activity. It adapts when the focus on empirical inputs results in extensive, dispersed, and contentious research streams, making it a particularly effective tool for science mapping (Aria and Cuccurullo, 2017). This tool allows us to infer CM research trends and various themes researched, identify shifts in the boundaries of disciplines, find the most prolific scholars and institutions, and provide the large picture of prevailing research. Popular and thorough bibliometric analysis allow us to sift through and make sense of massive amounts of scientific data (Donthu et al., 2021, p. 285). This study aided us in analyzing the nuances of the CM research field's evolutionary process and sheds light on its developing regions.

Conceptual metaphor research

In cognitive linguistics, conceptual metaphor (CM) refers to comprehending one thought or abstract concept in terms of another. Since 1980, theoretical clarification of CM has been the topic of extensive studies and lengthy introductions by many researchers (e.g., Lakoff, 1987; Lakoff and Turner, 1989). They showed great interest in CM research. According to Lakoff and Johnson, the mechanism of CM is as the following. "In a metaphor, there are two domains: the target domain and the source domain; in addition, metaphoric mapping is multiple. Two or more elements are mapped to two or more other elements. Image-schema structure is preserved in the mapping." (Lakoff and Johnson, 2003, p. 266). They argue that metaphor is internally structured, and its meaning is derived from transferring specific characteristics from the original to the new field. As the surface manifestation of this mapping, the metaphorical expressions might be words, phrases, or whole sentences. The source domain is a somewhat tangible or, at the very least, strongly organized realm that often derives from our everyday experience. However, the target domain is where the metaphor is applicable and originates, a somewhat more abstract or unorganized field using unknown notions. Metaphor is the process of understanding one idea in a target domain *via* the other in a source domain. For instance, in the frequent metaphorical expression LOVE IS A JOURNEY (Lakoff and Johnson, 2003, p. 45), the target domain "LOVE" is abstract and difficult to construe. "JOURNEY" is the realm of the source. "LOVE" somewhat maps the "JOURNEY" structure in the following procedure: departure, on the way or lost way, and destination. As the conceptual metaphor is a mental construct, it is only meaningful when represented in more tangible elements. Therefore, this sentence consists of many metaphorical analogies that form a unified inner structure. "LOVE" and "JOURNEY" are strongly connected in this sense. The idea of "love as a journey" shapes the conceptualization of love itself. Even though "love" might be understood in ways other than a journey, we use this comparison to impact our understanding and attitude toward LOVE. This approach is how we may see, experience, participate in, and refer to LOVE IS A JOURNEY. Metaphor infuses our language, daily lives, and actions. Because the mind is experienced, our cognition is experiential. Remarkably, human cognition derives from our personal experience of the external world, shaping our perspective on the outer world.

1 https://www.bibliometrix.org/home

Undeniably, the growth of academic papers on CM has contributed to the advancement of CM research. Numerous scholars have conducted a significant amount of research into CM from various perspectives, such as psycholinguistic metaphor research (Murphy, 1996; Gibbs, 2013; Qiu et al., 2022); deliberate metaphors and embodied simulation research (Gibbs, 2006; Cuccio and Steen, 2019; Cuccio et al., 2022); conceptual conflicts in metaphors and translation (Prandi, 2017; Rizzato, 2021, 2022); corpus-based metaphor research (Sinclair, 1991; Charteris-Black, 2000, 2004; Semino, 2002; Deignan and Potter, 2004; Allen, 2006; Fabiszak, 2007; Tissari, 2010; Shutova et al., 2013; Burgers and Ahrens, 2018; Zhao and Zhou, 2019; Zhao et al., 2019, 2020; Silvestre-López, 2020; Bosman and Taljard, 2021; Kazemian and Hatamzadeh, 2022), critical metaphors in discourse analysis (Charteris-Black, 2004; Ferrari, 2007; Musolff, 2012) and metaphors in classroom teaching (Thomas and McRobbie, 2001; Andreou and Galantomos, 2008). There is also increasing research on various reviews of CM research (e.g., Allahmoradi, 2018; Holyoak and Stamenkovic, 2018; Bundgaard, 2019; Gandolfo, 2019; Tohidian and Rahimian, 2019; Kövecses, 2020; Bearman et al., 2021; Jensen et al., 2021; Abdul et al., 2022).

However, researchers need help to pinpoint the research status and anticipate research trends rapidly and correctly. Keeping up with articles published instantly also becomes increasingly challenging. By using a bibliometric analysis, this knowledge map will be an invaluable resource for beginning researchers to learn more about information and study results to start their investigation as soon as possible. Additionally, this study will identify future research gaps and find potential cooperators for seasoned scholars. In addition, this study will provide some rating agencies with a trustworthy benchmark to assess the effectiveness of authors, institutions' sources, and nations in CM research. Nevertheless, there has not been a thorough visual of CM studies so far. The bibliometric analysis of Bib text provides extra data statistics, including author, affiliation, and keyword (Fahimnia et al., 2015). Therefore, this study will fill the gap by analyzing the state of CM's research over the past 20 years, its current focus areas, and future research directions.

Methodology

Research questions

With the bibliometric tool, this study aims to provide an overall picture of CM research over the recent two decades and address the following three questions:

(1) What was the basic information about the development of international CM research in the past two decades?
(2) What is the present situation, including yearly scientific advancements, subject orientations, most renowned authors, and the most pressing issues in CM research?
(3) What predictions may be made regarding its future development based on a bibliometric study?

Data source

All the data in this study were obtained from WoS Core Collection. It is the platform's flagship resource, covering over 21,000 peer-reviewed, high-grade scientific articles (containing Open Access journals), more than 205,000 conference proceedings, and more than 104,000 editorially selected book[2].

It offers more reliable journal coverage of scholarly published articles (Birkle et al., 2020) than any other databases like Scopus and Google.

Data collection

This study discerningly chose the WoS that confined the data from 2002 to 2022. The literature data gained comprised the whole archives, such as the author's name, source year, abstract, keywords, citation frequency, DOI number, and references in the article. Data collection consisted of three stages. The first was data reclamation. We prudently chose the papers and early access collected in the arts and humanities citation index (AHCI) and the SSCI to evaluate research questioning. We scrutinized the principal articles consistent with the research topic. The second step was data scrubbing. We sifted papers discreetly to avert data duplication. In the third step, documents were downloaded and compacted. We downloaded 1,000 files the first time and 257 the second time. Subsequently, the two files were compacted using bibliometric instruments. Currently, diverse instruments are accessible to present visual studies, such as CitNetExplorer, CiteSpace, and VOSviewer. This study selected a Biblioshiny program to obtain an overall visual picture of CM study in the past two decades because it has unique features. The set menu in Biblioshiny presents analysis from source, author, and document dimensions. Additionally, this menu offers conceptual, intellectual, and social knowledge structures. Maps can be exported to HTML or Pajek, tables can be copied to the clipboard or saved as Excel or PDF files, and maps can be printed. We analyzed the data using the Rstudio software and the bibliometric R-package version 4.2.0. The bibliometric analysis was first enabled in the R environment using the following command code:

```
install. Packages ("bibliometrix," dependencies = TRUE)
library (bibliometrix)
biblioshiny()
```

The Biblioshiny web interface was presented once the Google Chrome browser started with the above code. Raw WoS data were imported and analyzed using the Biblioshiny. We then went on to describe and evaluate the critical results of the study, which were shown with the statistics and pictures. This study employed pertinent authors, institutions, countries, articles, top highly cited publications, keyword co-occurrence, word clouds, thematic maps, trend topics, and conceptual framework to answer the above three research questions of the study.

Results and discussion

Position of CM research in the past two decades

Table 1 presents the key findings of the entire CM research from January 1, 2002, to July 10, 2022. In total, 1,257 documents

2 https://clarivate.com/webofsciencegroup/

were present. There were 317 sources for the CM research, including books, journals, and other materials. The average number, like years from publication, citations per document, and citations per year per document, were 7.49, 8.228, and 0.7505. The number of references cited in the studies reached 33,265, demonstrating the popularity of CM research over the previous two decades. The 956 papers represented the most significant categories of published documents. The author's keywords and the plus were 3,130 and 846, respectively, in terms of the document contents. It demonstrates the variety of topics covered by CM research and 1,544 contributors to CM studies from 2002 to 2022. There were 613 authors of single-authored documents and 931 authors of multi-authored documents. The single-authored documents are 776, showing that the scholars are highly interested in this area. The documents per author were 0.814, while authors per document, co-authors per document, and collaboration index were 1.23, 1.59, and 1.94. It indicates that more scholars concentrate on CM research, and the direction conducted by multiple authors was the most important means for CM research in the past two decades (see Table 1).

TABLE 1 Main information about data.

Description	Results
Main information about data	
Timespan	2002: 2022
Sources (journals, books, etc.)	317
Documents	1,257
Average years from publication	7.49
Average citations per documents	8.228
Average citations per year per doc	0.7505
References	33,265
Document types	
Article	956
Article; early access	19
Article; proceedings paper	21
Book review	40
Editorial material	13
Proceedings paper	198
Review	9
Review; early access	1
Document contents	
Keywords plus (ID)	846
Author's keywords (DE)	3,130
Authors	
Authors	1,544
Author appearances	1,993
Authors of single-authored documents	613
Authors of multi-authored documents	931
Authors collaboration	
Single-authored documents	776
Documents per author	0.814
Authors per document	1.23
Co-authors per documents	1.59
Collaboration index	1.94

Annual scientific production

A highly intriguing phenomenon has been discovered in annual scientific production. Figure 1 depicts the dynamics of document creation. The number of papers published annually was balanced from 2004 to 2006 and steadily rose from 2002 to 2022. The most productive year for the output was 2020, with 119 publications, including *Gender, Ideology, and Conceptual Metaphors: Women and the Source Domain of the Hunt* (Maestre, 2020) and *Conceptual Metaphors Leading to Some Names of Anger in the Indo-European Languages* (With Focus on the Romance Languages) (Georgescu, 2020). Notably, this number has steadily increased, with a yearly growth rate of 2.05 percent. The number of studies on CM and the total number of articles published has expanded significantly over the past 5 years. The yearly variation in literature production may represent the shift in the research subject, research interest, depth, and future development direction. CM has been a prevalent topic in the linguistic field over the past two decades, and it may continue to be a future topic in this field. In other words, the CM in Cognitive Linguistics has garnered great academic interest over the past two decades.

Analysis of cited documents

Average annual citations

In Figure 2, we can see the typical annual number of article citations. The most significant number of citations was 2,796 in 2006, while the least was 0.546 in 2019. Typically, the yearly average citation rate of recent articles is low. There is a surprising phenomenon: the citation rate of CM articles in 2006 reached a peak, but the publications in 2006 were low. Therefore, the citation rate may be more relevant to the articles' quality and themes rather than their quantity. The top four average annual citations articles in 2006 are the following, *Metaphor Interpretation as Embodied Simulation* (Gibbs, 2006), *The Emergence of Metaphor in Discourse* (Cameron and Deignan, 2006), *Does Understanding Negation Entail Affirmation: An Examination of Negated Metaphors* (Hasson and Glucksberg, 2006), *Metaphoric competence, Second Language Learning, and Communicative Language Ability* (Littlemore and Low, 2006). The constant average citation per year after 2014 in Figure 2 shows that CM research has lately had a stable development.

Most global citated articles

Figure 3 shows CM's top 20 most globally cited documents from 2002 to 2022. According to Figure 3, Gibbs's article *Metaphor Interpretation as Embodied Simulation* (Gibbs, 2006) was most passionately cited with 198 citations, hierarchical first among all other documents. In this study, Gibbs (2006) claims that part of

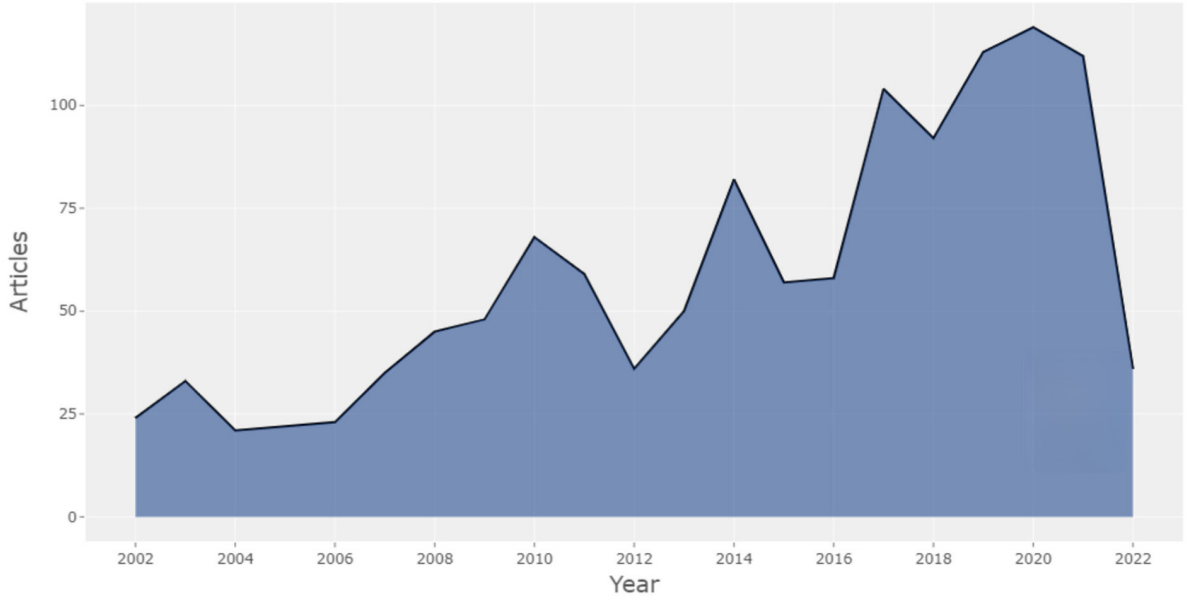

FIGURE 1
Annual scientific production.

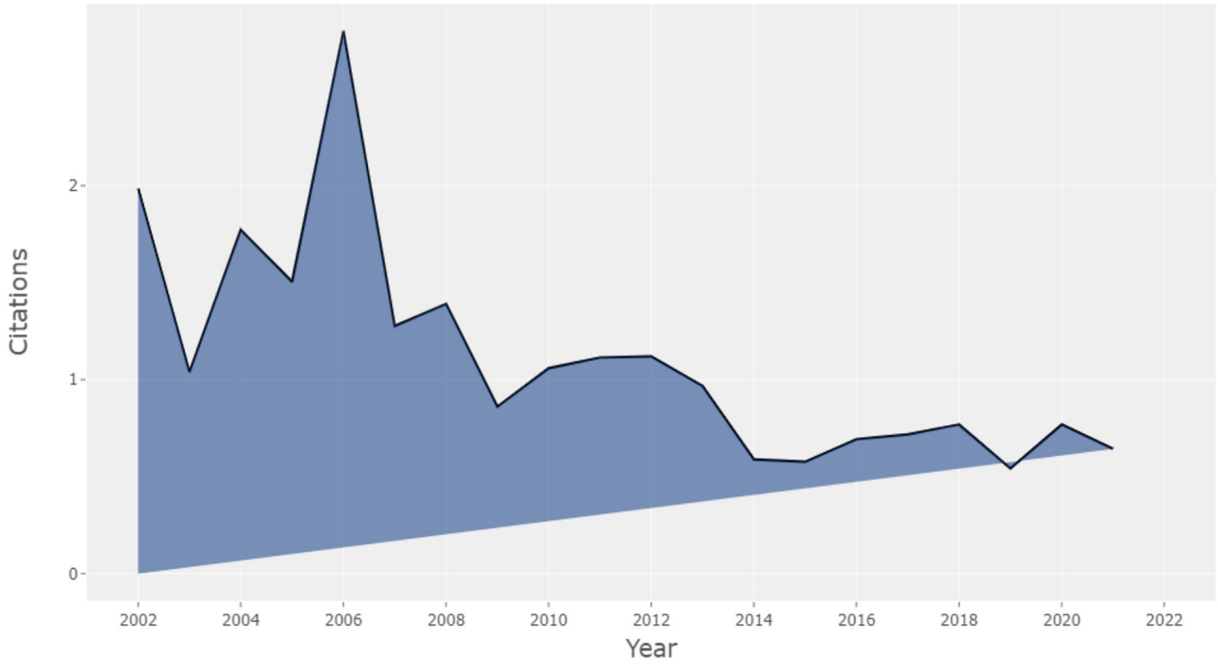

FIGURE 2
Average article citations per year.

our ability to make sense of metaphorical language, both individual utterances and extended narratives, resides in the automatic construction of a simulation whereby we imagine performing the bodily actions referred to in the language. *As Time Goes by: Evidence for Two Systems in Processing Space → Time Metaphors* (Gentner et al., 2002) has 189 total citations and demonstrates that individuals employ spatial metaphors in temporal thinking. The metaphoric systems' status implications are examined in it. With 169 citations, Gibbs et al. (2004) review the empirical evidence and discuss the methodological strategies employed by linguists and psychologists seeking connections between embodiment and CM. Subsequently, *The Emergence of Metaphor in Discourse* (Cameron and Deignan, 2006), *Literal vs. figurative language: Different or Equal*? (Giora, 2002). Other significant subjects of CM research are the relationship between CM and metonymy, studying psychology and politics of metaphors, and CM based on language theory. Most of the literature that generates the most citations has been published for more than ten years, indicating that the topic and authority

of the publication may be the reason for the number of citations. Figure 3 also shows that the years of highly cited literature on CM were 2006, 2002, and 2004, representing that CM has made a breakthrough in development during these years. Besides, Figure 3 suggests that a longitudinal study of how CM works over time is crucial to scrutiny. In general, the more citations an article has, the more influential it will be in the CM field. Moreover, Figure 3 proves that Gibbs' article published in 2006 was the most relevant document contributing to the CM research. The research of CM is closely related to human psychology and cognition, and it may be more concerning and exciting to scholars when they conduct empirical research.

Source growth

Figure 4 depicts the source dynamics of the top five journals from 2002 to 2022. Regarding the number of articles, Figure 4 shows a significant increase trend, with the peak in 2022 and the lowest in 2002. The corresponding maxima are the following: *Review of Cognitive Linguistics, Metaphor and Symbol, Cognitive Linguistics, Journal of Pragmatics,* and *Journal of Literary Semantics*. The increase in sources illustrates the main application areas of CM research over the past two decades and its multidisciplinary development trend. As indicated in Figure 4, *Journal of Review of Cognitive Linguistics* has published CM articles in recent years with the highest growth rate, particularly between 2012 and 2022. This Journal's quick expansion indicates that several experts enthusiastically pursue the debate and research on CM. Despite being among the top five, as shown in Figure 4, *Journal of Literary Semantics* had a steadily increasing number of CM papers published from 2002 to 2022. Only 21 articles were published in this journal in 2022, but there were 110 articles in *Reviews of Cognitive Linguistics*. The number indicated that the Journal's discussion subject might diverge from the study category of CM. From 2002 to 2022, we judged from the growth trend of article sources that CM's research showed a sound momentum of rapid progress over the last two decades.

Authors, affiliations and countries

Prolific authors

Gibbs was the most significant researcher, who published 17 articles and ranked first in document number on CM, concentrating on the embodied metaphor and mapping in cognitive linguistics in terms of the author's output from 2004 to 2022. Gibbs's articles *On the Psycholinguistics of Sarcasm* and *How to kick the Bucket and not Decompose: Analyzability and Idiom Processing*, with more than 200 references to *Spilling the Beans on Understanding and Memory for Idioms in Conversation*. Gibbs is committed to studying embodied metaphors and mapping in cognitive linguistics and makes significant contributions to the CM research. Following Gibbs, Yu published nine documents mainly scrutinizing the spatial subsystem of moral metaphors in English. De Mendoza Ibanez represents Spanish research on CM with nine articles. He explores metaphors concerning cognitive prominence and conceptual interaction issues.

Moreover, he deals with the problems of constraints on metaphor and proposes three complementary kinds of constraints. Over the past two decades, these three authors were the most productive and essential in the CM research field. They are vital scholars, and their views may provide a theoretical and practical framework for further research.

Most relevant affiliations and countries

Most relevant affiliations can present the top most relevant affiliations according to the number of articles about CM. The University of La Rioja, the University of California, Santa Cruz, the University of Birmingham, Castile La Mancha University, and Guangdong University of Foreign Studies were the five most relevant affiliations by producing 68, 30, 28, 28, and 25 articles in the past two decades, respectively. They are also the bases for linguistic research. The result derived from the cooperative efforts of various institutions and was focused on CM subjects.

Figure 5 shows the countries of the top 20 corresponding authors. The collaboration of authors of the same nationality was far more than that between nations. According to Figure 5, the top 20 countries contributed a lot to the research of CM during the past two decades. Among them, Spain contributed the most to it, with 171 publications, followed by the United States (138), China (131), the United Kingdom (87), and Russia (83). These countries occupied the top five in the WoS Core collection. The result showed that CM research attracted the attention of researchers in these countries in the past two decades. To some extent, the publications of these authors will benefit CM's future development.

Table 2 lists countries, average article citations, and total citations for the top 20 relevant nations. Table 2 shows that the United States made the most considerable contribution to CM research, with 3,203 total citations and an average article citation rate of 23.210. The United Kingdom and Spain came next with 1,378 and 1,112 total citations, respectively. It implies that scholars from the top three nations show great interest in CM research. A particular topic of study was directly tied to the context of the nation. Therefore, the United States, the United Kingdom, and Spain contribute to CM research development and associated linguistic issues with more attention. The fact that more nations, including the Netherlands, China, and Italy, are paying attention to CM research shows how prevalent it has become over the past two decades.

We can also see from Table 2 that although the corresponding authors of CM research in the United States ranked second, their citation rate ranked first. Similarly, the corresponding authors in the UK rank fourth, while the citation rate of their authors ranks second. Therefore, the number of correspondents does not have a one-to-one proportional correspondence with their citation rate. From this, we can infer that the citation rate may relate to the article's quality and themes.

Conceptual structure

Figure 6 presents the current status of thematic groups in CM research. Thematic maps illustrate a particular topic and help reveal geospatial patterns and relations (Schaab et al., 2022). A thematic map is separated into four quadrants grounded on the degree and density of centrality. High density and centrality in the upper right quadrant represent well-developed Motor Themes in the CM research area. In this quadrant, many themes comprised the emphasis and center of CM research, such as "comprehension," "conceptual integration," "words," "metaphors," "English," "space," and "language." These themes had outstanding growth in the

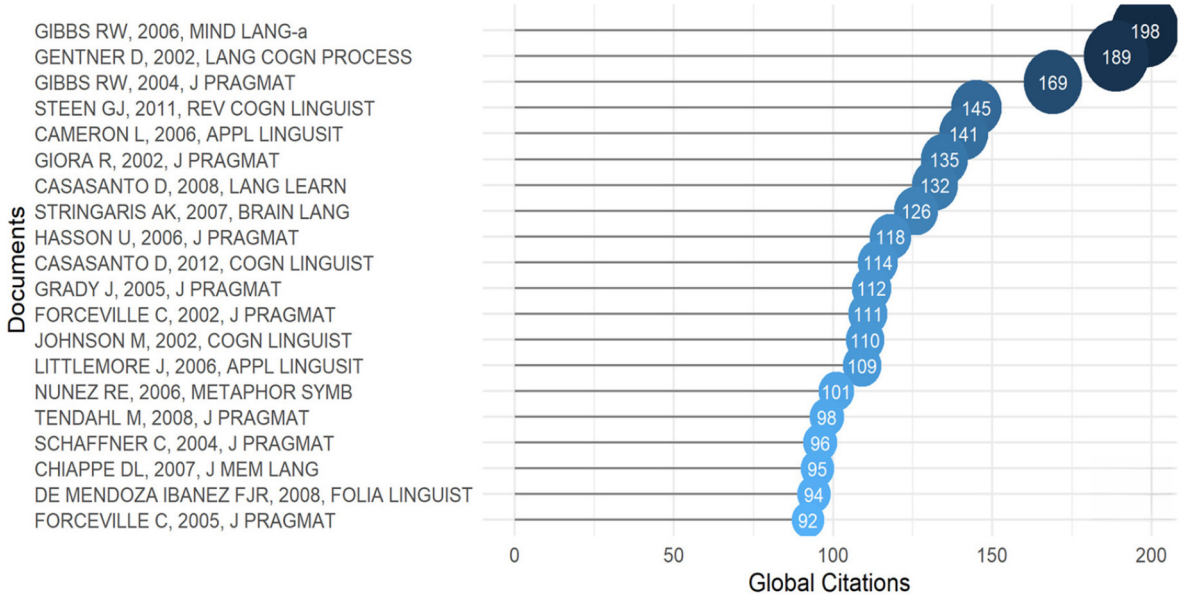

FIGURE 3
Most global cited documents.

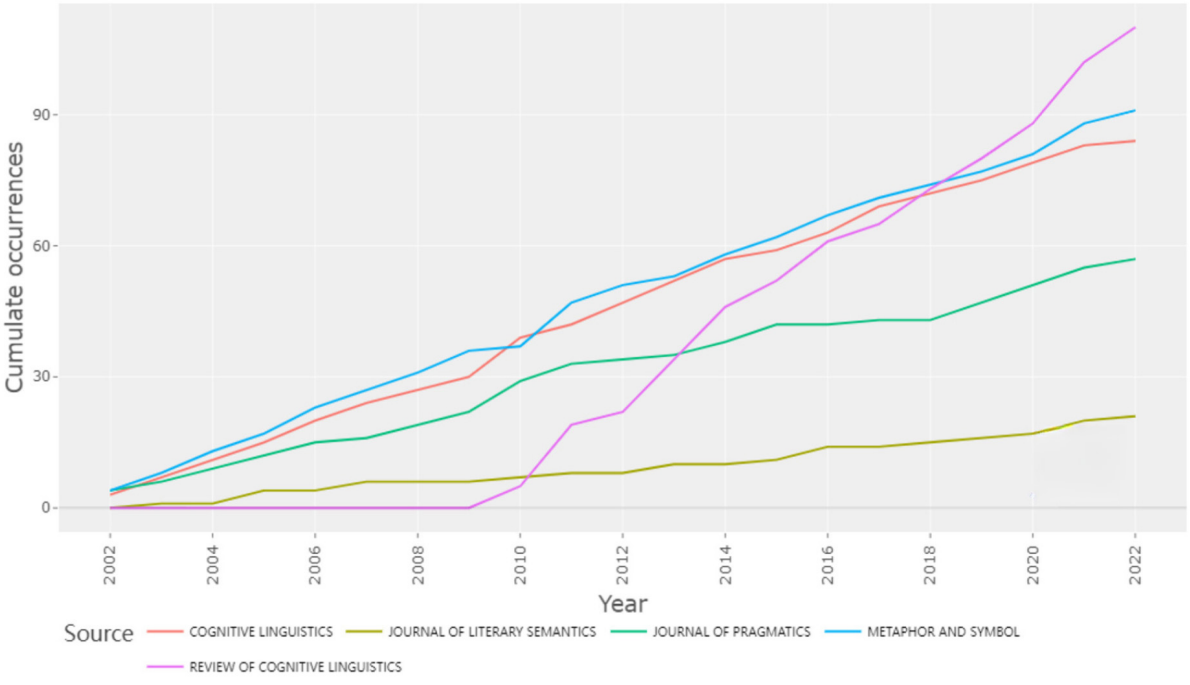

FIGURE 4
Source dynamics.

past two decades. The second quadrant's high density and low centrality imply niche themes with good development prospects but a limited influence on the research field. Although scholars have created a "mechanisms" research group, its prospects are unsure. Subject clusters have poor centrality and density in the lower-left quadrant. It implies that different types of "semantics," "vocabulary," "metaphor," "discourse," "conceptual metaphor," and "metonymy" are marginalized. It suggests they are new or waning themes. The fourth quadrant's high centrality and low density indicate that "mind," "children," "deficits," "idioms," and "memory" are the primary topics in CM. Their theoretical systems are more thorough and mature, and these core topics may provide the theoretical foundation, reasoning, and technique for CM research.

Figures 7, 8 graphically depict the development of the CM study subjects. 2016 was the dividing line and the two time periods were 2002–2016 and 2017–2022. The topics from 2002 to 2016 may be summed up as "context," "conceptual

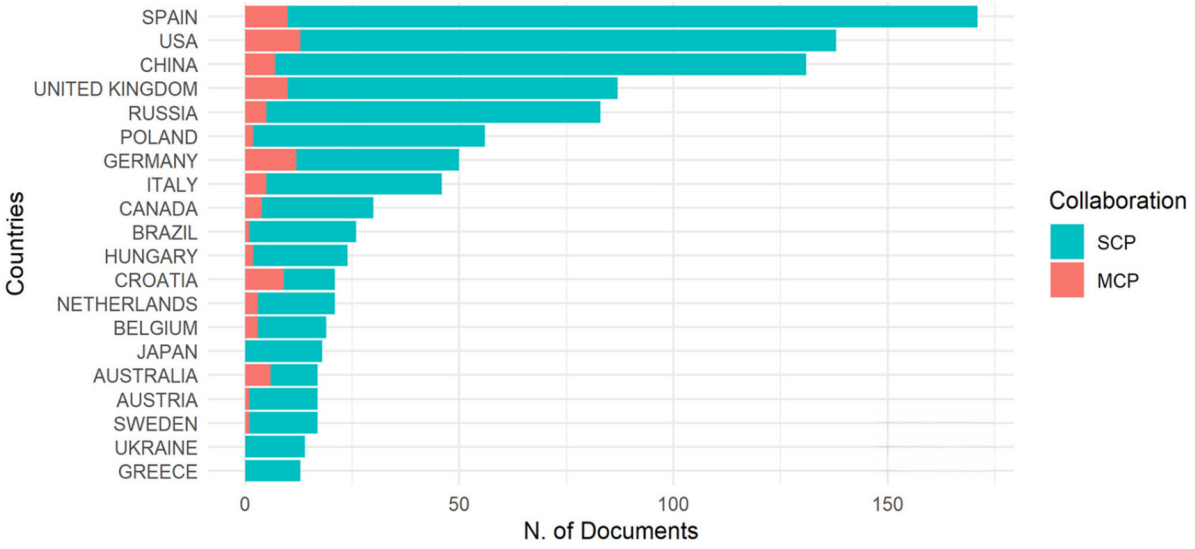

FIGURE 5
Corresponding author's country. Multiple country publications (MCP), the number of papers co-authored with authors from other countries; SCP, the number of papers co-authored by authors of the same nationality. The MCP ratio represents the ratio of international cooperation.

integration," "language," and "time," with researchers focusing on conceptual integration. According to the CM hypothesis, metaphor incorporates two cognitive domains, while abstract blending theory theoretically converts two cognitive parts into four mental spaces (Fauconnier and Turner, 1998). It may more precisely characterize people's psychological processes while using metaphor. In Conceptual Blending Theory, the creation and functioning of conceptual blending are creative. This theory may thus explain not just established mental metaphors but also novel metaphors. Individuals' daily communication and understanding process is an innovative online mapping and integration process. The relationship between online mapping and fixed mapping is tight. The idea of conceptual blending is comprised of four cognitive domains. According to the theory, the human thinking mode is not a direct, unidirectional, and absolute mapping of the source domain to the target domain but rather a dynamic integration process in which the shared mental schema is a generic space. The two input spaces of the source domain and target domain are bidirectionally mapped to the blending space. Mental space, not the cognitive part, is the fundamental unit of cognitive structure in conceptual blending. Mental space is an abstract area created when individuals think, act, and communicate, intending to achieve local comprehension and action. It is only a transient framework comprised of conceptual aspects like time, belief, desire, possibility, virtuality, place, and reality and depends on the cognitive field, a broader and more fixed knowledge structure associated with a particular cognitive area. It reflects the specific mental schema generated by the cognitive domain and it is dynamic, adaptable, and active throughout the thought process.

TABLE 2 Most cited countries.

Country	Total citations	Average article citations
USA	3,203	23.21
United Kingdom	1,378	15.839
Spain	1,122	6.561
Netherlands	590	28.095
china	446	3.405
Italy	307	6.674
Hungary	275	11.458
Canada	266	8.867
Israel	257	28.556
Germany	241	4.82
Austria	227	13.353
Sweden	194	11.412
Denmark	171	24.429
Belgium	136	7.158
Poland	134	2.393
New Zealand	118	23.6
Russia	115	1.386
Japan	104	5.778
Greece	102	7.846
Australia	86	5.059

From 2017 to 2022, the nature of the mental processes involved in metaphor comprehension was the focus of debate (Stamenković et al., 2019), with dispute focusing on the relative function of common analogical reasoning versus language-specific conceptual blending. The accompanying research indicated that the blending theory framework had explanatory power and practical use.

Figure 9 shows that the three fields plot can comprehensively analyze the relationship between measurement indicators of different literature and build a comprehensive network map. According to the statistics, among the periodicals published from 2012 to 2022, *Metaphors We Live By* (Lakoff and Johnson, 2008) was

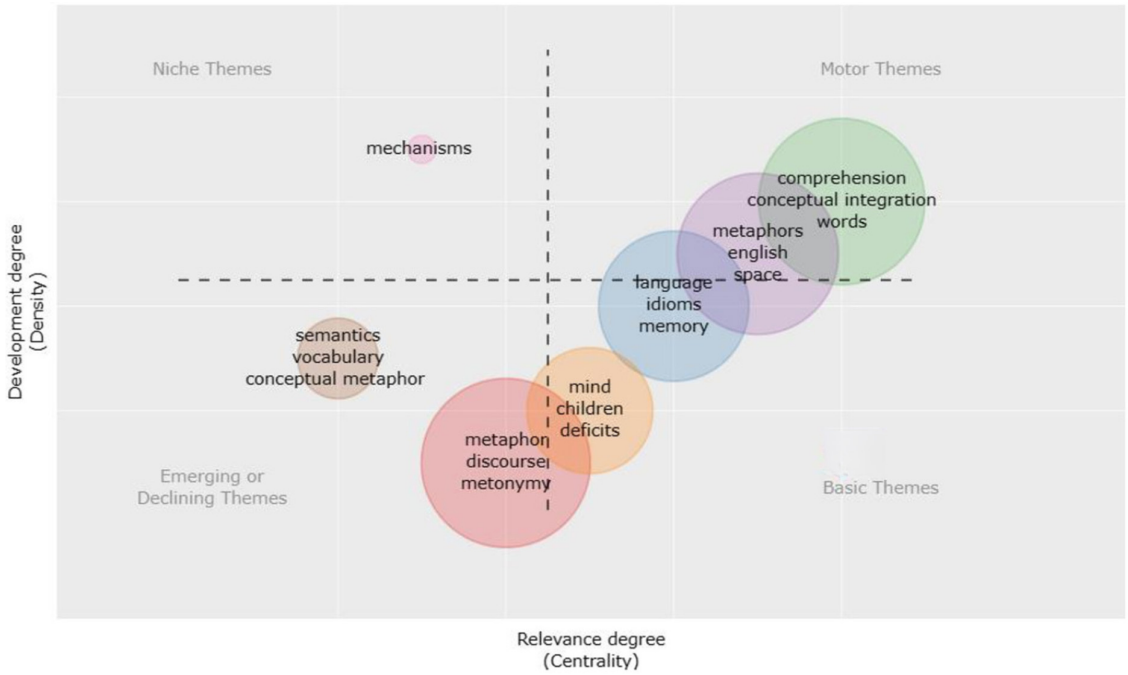

FIGURE 6
Thematic map.

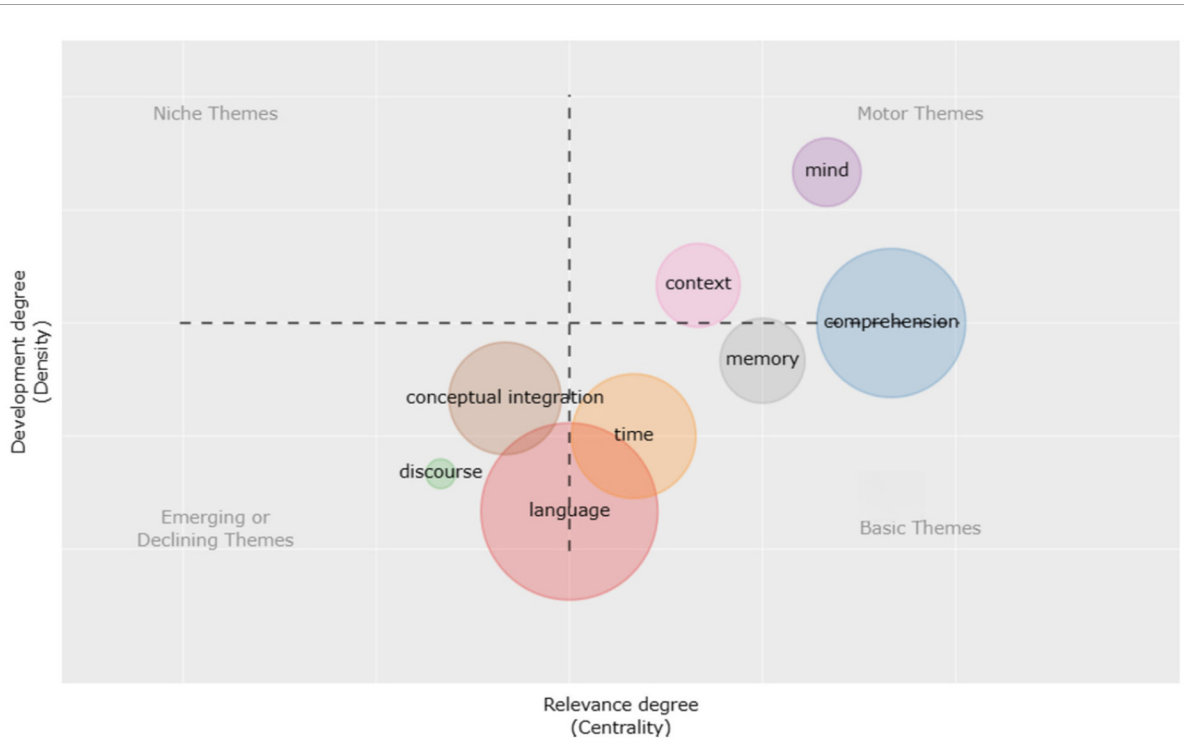

FIGURE 7
Time slice 1: thematic evolution during 2002–2016.

cited first, followed by *Women, Fire and Dangerous Things*: *What Categories Reveal about the Mind* (Lakoff, 1987). The middle part of the Three-fields Plot is the Citation Source. *Cognitive Linguistics* ranks first in this field, followed by *Metaphor and Symbol* and *Metaphors We Live By*. *Cognitive Linguistics* is the first citation source, and its corresponding citations are mainly George Lakoff's books, which shows the authority of George Lakoff, the founder of CM theory, in this field. On the right is the authors' keyword part. We can see that "metaphor" ranks first on the pyramid, and "metonymy" ranks second. which is consistent with the following Co-occurrence Network (see Figure 11).

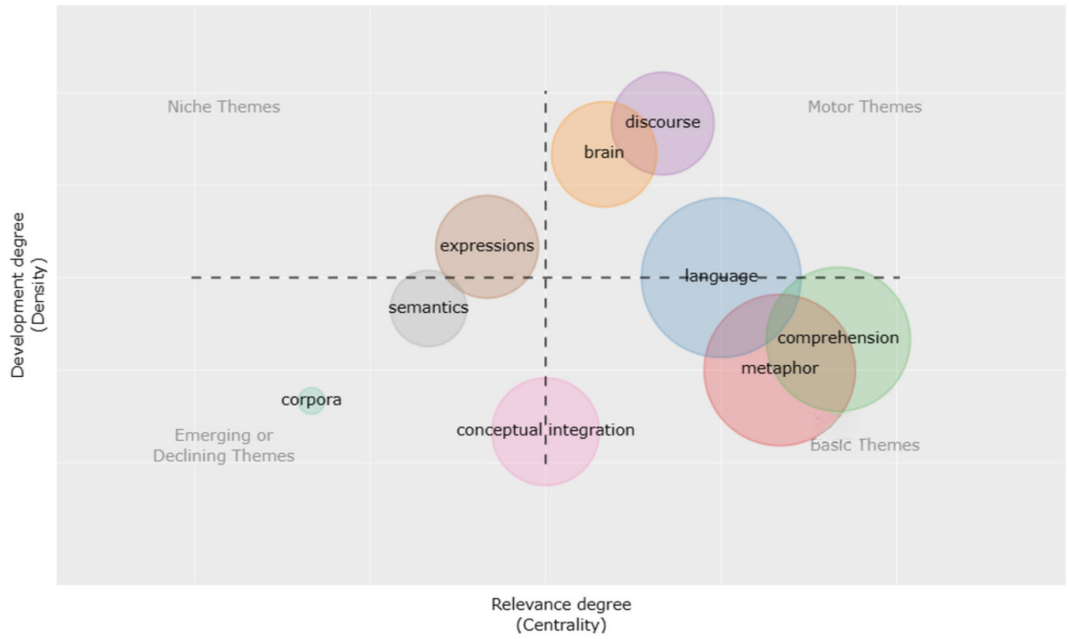

FIGURE 8
Time slice 2: thematic evolution during 2017–2022.

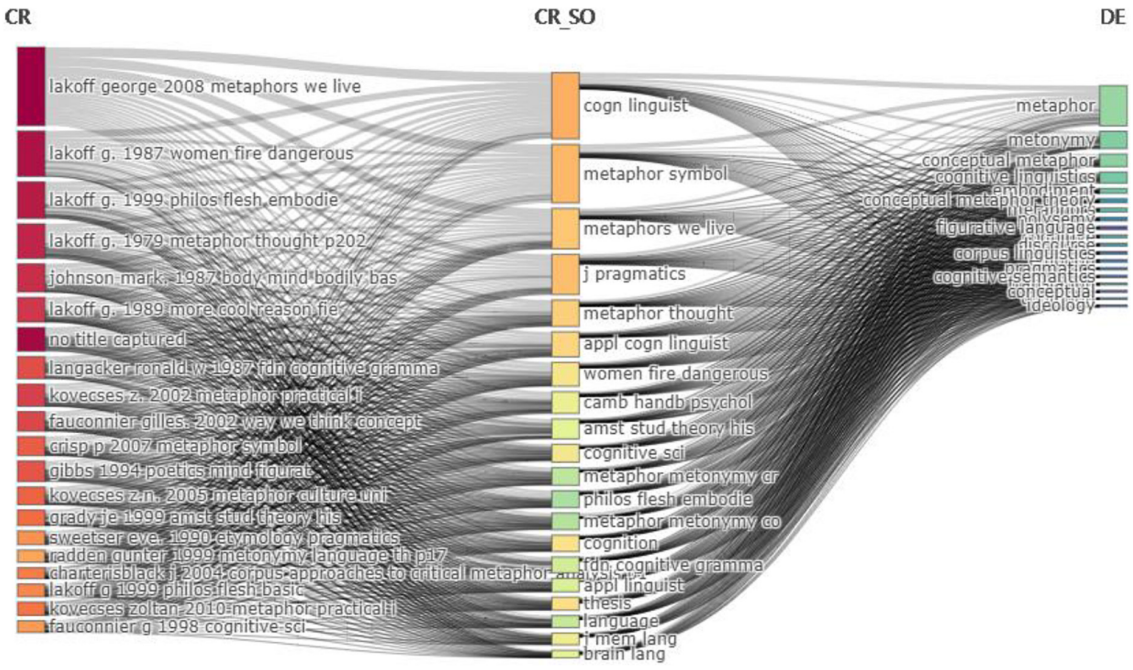

FIGURE 9
Three-field plot. The middle field is cited sources, the left refers to references, and the right refers to the author's keywords.

Research topics in CM

Research in the recent two decades

Content analysis was employed to illustrate the CM research issues. Word Cloud, a thematic map of word growth, a conceptual structure map, and the co-occurrence of the author's keywords were utilized to show study subjects in CM research during the recent two decades.

Word cloud

Word clouds are a valuable tool for providing overviews of texts and visualizing relevant words (Herold et al., 2019). Word Cloud was based on the author's keywords for CM research between 2002 and 2022. With a visual depiction of the Biblioshiny, words with greater volume and keyword density were shown in a bigger and clearer typeface. Word Cloud was used to evaluate commonly used terms in CM research to reveal study subjects. To be more

FIGURE 10
Word cloud. Different words were colored differently, and the size and placement of the phrase denoted their frequency. The size of the colored words depicts the frequency of their occurrence.

precise, the frequency of usage of a term increased according to its centrality. Based on the author's keywords, we selected the top 20. First, **Figure 10** shows that "metaphor" was the most frequently used term in the authors' publications, with 143 times in the extracted database, followed by "language (129)," and "comprehension (61)." The number indicates that CM was a vital study issue in cognitive science over the last two decades. The other terms "discourse," "mind," and "metonymy" were also used extensively as keywords by writers. It demonstrates that these were essential subjects in the CM field.

Conceptual structure map

Researchers may utilize Biblioshiny for Bibliometrix's Conceptual Structure Map for multiple correspondence analysis (MCA), which aids in sketching a conceptual structure of the area and locating groupings of texts that express similar concepts. Using MCA, one may do a mathematical and graphical analysis of seemingly multivariate data (Greenacre and Blasius, 2006). **Figure 11** displays the results of MCA's clustering on the keywords. The terms "metaphor," "conception," and "conceptual integration" often occur in the red set. "Frames," "future," and "construal" were added to the blue grouping. **Figure 11** shows progress has been made toward developing a significant study subject of CM, and specific research issues around CM have been advanced a fair amount. Metaphors in "time," "space," "context," "emotion," "anger," and "expressions" have been analyzed. Multiple fields, such as "pragmatics," "semantics," and "memory," have been thoroughly researched in terms of CM. In addition, the CM research was related to "cognition," among other things, and not only "discourse," "metonymy," "corpus," and "mind." Many scholars have conducted studies on metaphor from the perspective of psycholinguistics. Cuccio and Steen (2019) emphasize that attention is a crucial notion in defining deliberateness in metaphor processing because it is the attention we pay to the source domain of a metaphor in working memory that makes a metaphor a deliberately processed metaphor. Gibbs (2013) describes a few complications in psycholinguistic investigations of metaphor and explains the variability of study results. It is common knowledge that engaging in insightful metaphor analysis can be helpful in better comprehending how psychological trauma is conceived. As [Cuccio et al. (2022), p. 1] go, "we need to explain how we use symbols and how we make meanings out of them." Increasingly, scholars talk about the construal of CM, such as the role of context in the interpretation of CM (Zhao, 2008; Zhao et al., 2020).

Co-occurrence of keywords plus

Figure 12 presents four distinct clusters: blue, green, red, and purple. The blue cluster focuses on "language," "representation," and "communication;" the green cluster emphasizes "comprehension," "mind," "idioms," and "words," and the red cluster emphasizes "metaphor" and "discourse." Clustering in purple mostly depends on "time," "space," and "perspective." Consequently, Conceptual Metaphor research emphasizes linguistic theory study, corpus empirical research, and discourse analysis. Critical Metaphor Analysis, also known as CMA, is a method that is typically applied to the process of analyzing metaphors in various critical discourses to reveal the feelings, attitudes, and thoughts that lie behind metaphors. Charteris-Black (2004) proposed "Critical Metaphor Analysis," which combined pragmatics, cognitive linguistics, and critical discourse analysis. He argued that while cognitive semantics provided a suitable description of how humans comprehended metaphors, the social effect of ideology, culture, and history might give a more persuasive explanation for why specific metaphors were selected in contexts. "Discursive-pragmatic factors, as well as sociolinguistic variation, have to be taken into account to make cognitive analyses more empirically and socially relevant" (Musolff, 2012, p. 301). When it comes to addressing persuasion in text, CM, as it relates to emotion, is a crucial tool because it helps identify the ideological root and persuasive strategy of a given discourse (Ferrari, 2007).

Co-occurrence network development relies heavily on correlation inference. The co-occurrence network has several study and application disciplines, and each color refers to a field. Language is a cognitive tool and a product of human intellect. With the rise of multidisciplinary study, cognitive explanations for grammar creation, semantics, discourse, and metaphor have become widespread, founded on empiricism and cognitive science research. It attempts to explain that language phenomena conform to the human understanding of the brain and thinking, i.e., human language is the product of the human brain, and its construction principle is identical to that of other cognitive domains. Therefore, **Figure 12** shows the most significant community, the blue "language." The closer to the central district, the closer to the "Conceptual Metaphor." The figure presents that the closest to "language" takes "metaphor" and "comprehension" as the keywords.

The co-occurrence of keywords analysis is a valuable method for constructing a comprehensive framework for comprehending the significant areas of CM study during the past two decades. **Figure 12** illustrates a network of co-occurrence between keywords in different types of publications that were established. When two or more of an author's keywords appeared together, it might indicate how often those terms appeared together in the same publication. Each period was represented as a node, and the greater the node's size, the more times that the keyword was cited. The greater the thickness of the line that connected two nodes, the more often those terms appeared together.

In the same way, **Figure 12** also displays five distinct groups, each representing a different hue. In particular, the terms "discourse" and "metaphor" often co-occurred and were distributed heavily in the red cluster. This suggests that "discourse," "expressions," and "English" were prioritized in the CM study, and CM research was practically inseparable from "mind" research. In the center of the purple circle stood the word "time," but it was disconnected from the surrounding

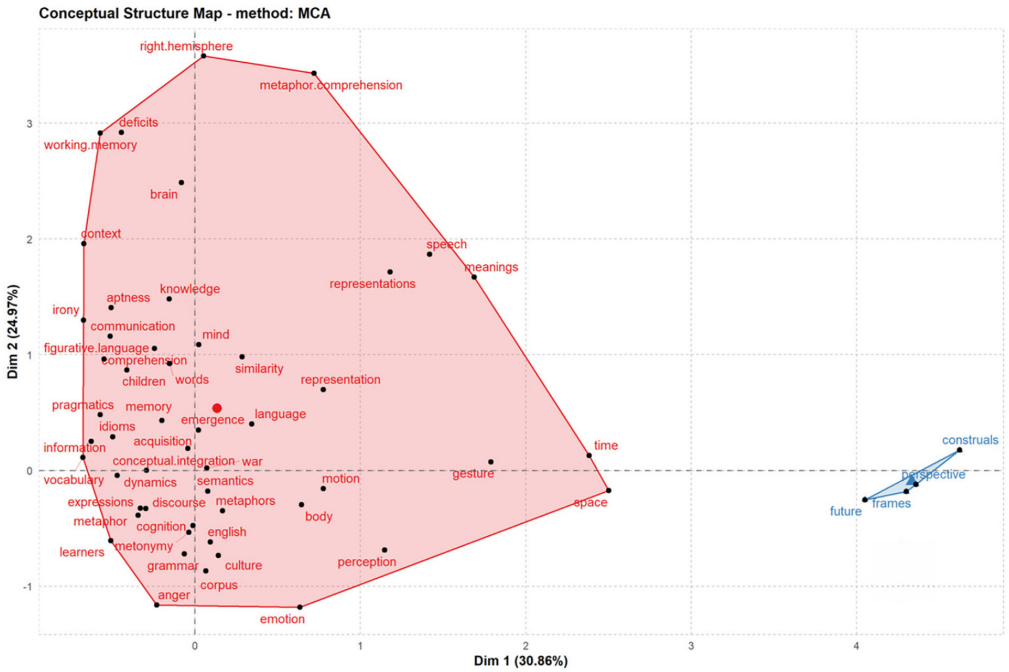

FIGURE 11
Conceptual structure map. The map is split in half. Clusters are indicated by color, proximity between keywords mean their relationship, the vertex is an illustration of the term in question, and the node's size is proportional to the frequency with which it appears.

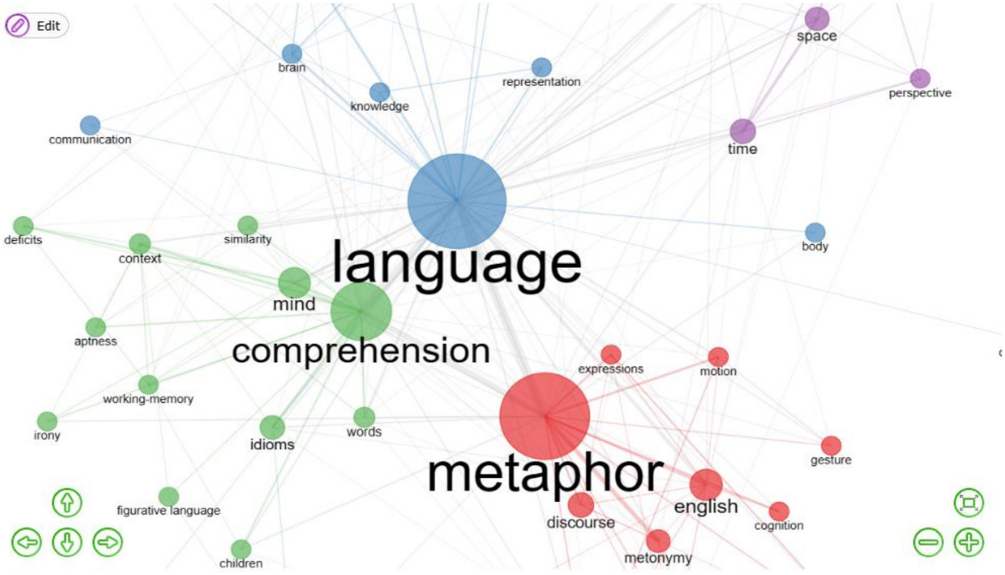

FIGURE 12
Co-occurrence of keywords plus. The four distinct clusters are blue, green, red, and purple.

words. However, the connections to "space" and "perspective" were weak. In addition, this analysis discovered that "comprehension" and "metaphor" were often investigated together and that "words" and "idioms" research were linked based on the frequency with which these terms occurred in green nodes. The small size of the nodes and the scarcity of connecting lines suggested that these concerns had not been well-explored.

In conclusion, several terms were used in the investigation of CM. The terms "metaphor," "language," "comprehension," and "English" featured prominently and were among the most often co-occurring in the text. This demonstrated that these issues were central to the CM study. Words like "brain," "discourse," and "deficits" also occurred together at the network's edges, which demonstrated that a wider variety of issues were investigated in CM studies. Despite these variations, it is safe to say that "metaphor," "language," and "comprehension" were essential and fundamental study issues, while "knowledge," "mind," and "discourse" had an impact on the development of CM and were also widely studied.

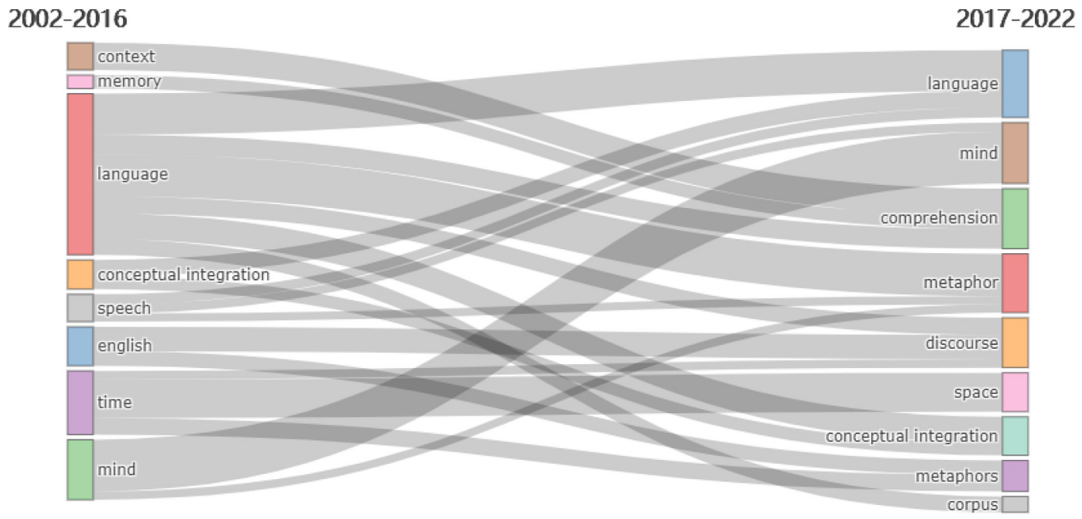

FIGURE 13
Thematic evolution. Each hue represents a distinct subject, and the size of the rectangle means the depth of study.

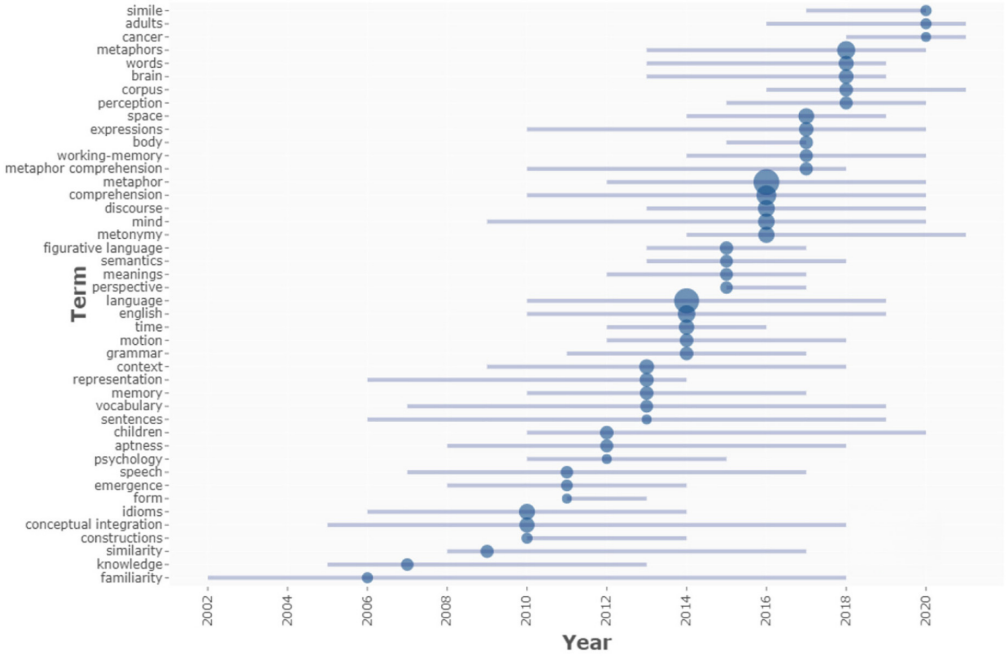

FIGURE 14
Trend topics by keywords plus. The size of the nodes in Trend Topics represents the total number of publications for a particular topic and the peak popularity of that topic over time.

CM research trend

The bibliometric tool of Thematic Evolution and Thematic Trends is employed to predict the directions of potential future CM studies.

Thematic evolution

Examining Thematic Evolution and Trend Topics may reveal interesting research subjects and possible future orientations. Figure 13 demonstrates the dynamic nature of the metaphor study and the several research topics included. As time went by, "time," "language," and "mind" were maintained to be prominent academic areas. Metaphors may offer a practical and memorable method of structuring newly learned terminology. A lexical set is a concept that is well-known to most instructors. A linguistic set groups vocabulary according to a theme, such as "food" or "transportation." By combining the words and sentences with a metaphorical meaning rather than a literal one, teachers may expand this concept to form "metaphorical sets." Many scholars have shown their interest in this area. For example, Thomas and McRobbie (2001) emphasize how metaphors may help teachers and students establish a common language of learning. Andreou and Galantomos (2008) investigate the

possibility of developing a conceptual curriculum for the instruction of metaphors and idioms in a foreign language setting.

However, throughout 2017–2022, "language" became the primary area of research interest, shifting attention away from "context" and other growing topics like "mind," "comprehension," "metaphor," "discourse," and "corpus" of CM. Some scholars conducted research into combining critical discourse analysis with self-constructed corpora of diverse genres to determine the underlying ideology metaphor (Semino, 2008; Silvestre-López, 2020). Some academics concentrated on political speech and its associated discourse tactics. For instance, Pilyarchuk and Onysko (2018) found that Trump relied nearly entirely on conventional conceptual metaphors in his talks. Musolff (2011) studied the literary design of the dialog system in Shakespeare's play and emphasized the general feature of metaphor's dialogic role, which was further explored concerning the current use of body-based metaphor in political discourse. Koller (2004) explored metaphor and gender in electronic text corpora in the context of the commercial conversation. As for economic discourse, Chen (2018) utilized Wmatrix as a retrieval tool in conjunction with the "MIPVU" to identify and summarize the most prominent conceptual metaphors in economic speech and investigated the significance of metaphors.

Regarding discourse analysis, several efforts emphasized CM used in literary discourse (Zhao and Zhou, 2019). Using the corpus tool Antconc3.2.4w, Zhao et al. (2020) conducted a study on Pearl S. Buck's novel *Dragon Seed* and pointed out CMT and CBT were concerned with interpreting higher-order concepts such as meaning, language, sign, and representation and their interrelations. They complemented each other and contributed to discourse analysis. CM in literary works might be related to the writer's cognitive and social contexts. Pearl Buck's metaphorical thinking was closely related to her experiences in China. It may be extrapolated that these themes have a significant potential for CM research to continue to flourish.

Trend topics

Figure 14 indicates that, from 2002 to 2013, research subjects were relatively few, but their diversity increased after 2013. The wider the circle in the image, the greater the topic's popularity among researchers was. **Figure 14** shows that 2016 was a banner year for research on "metaphor," "comprehension," "discourse," "mind," and "metonymy," as evidenced by the magnitude of the blue node. Between 2002 and 2022, "metaphor" was the most popular subject, appearing 143 times, followed by "language" (129), "comprehension" (61), "synthesis" (61), "metaphors" (43), "English" (38), "discovery" (33), "mind" (33), "meteorology" (28), "idioms" (26), and "space" (25). In 2016, research subjects were the most prevalent and featured the most often. They have been shown, once again, to be central and essential to CM research in recent years, and they may get even more emphasis in the years to come. It happened simultaneously as the Thematic Evolution, which ran from 2017 to 2022. In addition, critical new areas of study, including "metaphor," "comprehension," "discourse," "corpus," "brain," "language," and "mind," maintained their popularity. The "corpus" of CM studies peaked in 2018 and predictions for its continual fruitfulness in the future were promising. Based on broad corpora, the first kind of investigation establishes the systematicity of conceptual metaphors or summarizes grammatical aspects that conventional metaphor studies cannot notice, compensating for CMT's deficiencies (Skorczynska and Deignan, 2006). Using CMT as an example, Charteris-Black (2004) proposed a novel research technique that integrated corpus linguistics, critical discourse analysis, and metaphor study to initiate a corpus-based metaphor study and develop new tools for identifying metaphors. Therefore, it is safe to say that "simile," "adults," "cancer," "metaphors," "words," "brain," "corpus," and "perception" all have promising futures as research areas of CM.

Conclusion and implication

This study employed a bibliometric technique to investigate 1,257 papers on CM research over the past two decades. The following are significant findings with productivity, content, and citation analysis. First, CM is a cognitive concept and has a widespread academic interest. "Metaphors," "place," "discourse," and "corpus" were the central issues among the various study subjects. "Conceptual integration," "comprehension," "language," and "mind" are also active and popular study topics in CM research. Second, in the past two decades, CM has been a research focus that has included many aspects, including authors, institutions, countries, and sources. Most of the cooperation survey was done with writers and institutions from many nations. The top five countries are Spain, the United States of America, China, Great Britain, and Russia. A rise in the number of academics studying CM suggests that CM research in cognitive linguistics applies to several facets of human cognition. Great Britain and China contributed the most to the growth of CM research, and substantial cooperation and networks were developed among them. These components of CM research are intertwined since the most cited individual contributes to establishing nations, institutions, and papers that significantly impact CM research.

Third, based on an examination of the Thematic Evolution and Trend Topic, we can infer the essential themes in CM research, such as "metaphors," "discourse," "space," and "corpus," may get greater attention in the future, which aligns with the Thematic Evolution between 2017 and 2022. In addition, "simile," "adults," "cancer," "metaphors," "words," "brain," "corpus," "perception," "conceptual integration," "mind," and "comprehension" will remain popular themes. The "interdisciplinarity" of CM demonstrates the effect of cognitive context, social context, and other cultural aspects on the framework of CM. The growing number of papers using bibliometric analysis across all disciplines suggests that it meets the desire of researchers who want proper research based on a wealth of literature.

This study will be helpful for beginners in the CM field, allowing them to classify information and find research results of CM quickly so that they may start their research projects. In addition, it may serve as a reference for seasoned researchers to comprehend the progress of CM research over the last two decades, find a suitable collaborator for their present research, and identify research gaps that they may block up in the future.

Limitation

This study emphasizes the presentation of images and statistics because it is a quantitative study using a bibliometric tool based on data gathered from a database. However, it needs to go more in-depth to complete an evaluation of any specific theme of CM. We urge future research to broaden the study to use a range of more data gathering to examine concerns in CM to create a more thorough comprehension of CM.

Data availability statement

The original contributions presented in this study are included in this article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

XZ initiated the research idea, instructed YZ to analyze the data using bibliometric software, and co-wrote the article. Under the direction of XZ, YZ gathered and extracted the data and co-wrote the article's analysis. XCZ contributed to the manuscript's design, drafting the first part, introduction. All authors participated in revising and approving the version that was submitted.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Research trends in multimodal metaphor: a bibliometric analysis

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The concept of multimodal metaphor has generated a growing body of literature over the past decades. However, a systemic review of the domain seems to be lacking in relevant literature. This study, therefore, is an attempt to conduct a bibliometric analysis of the field of multimodal metaphor during 1977–2022, with a focus on 397 relevant publications retrieved from the Web of Science Core Collection (WoSCC) with the visualization tool VOSviewer. Some major quantitative findings are: (i) the number of publications in multimodal research began to surge in 2010 upon the seminal work of Forceville's (2009); (ii) USA, China and Spain are the most productive countries; (iii) journals in the field of advertising, communication and linguistics are important sources of publications; and (iv) eleven clusters of keywords are identified, such as "visual metaphor", "persuasion", "pictures", "impact",, "multimodal metaphor", "model", etc., representing crucial areas of interests. We also identified, by qualitative observations, three research trends in multimodal metaphor, driven by cognitive linguistic theory, the theory of pragmatics and visual/multimodal rhetoric theory, respectively. Various theoretical perspectives may shed light on possible further research on multimodal metaphor.

KEYWORDS

multimodal metaphor, visual metaphor, pictorial metaphor, bibliometric analysis, web of science (WoS) database, trends

1. Introduction

The concept of multimodal/visual/pictorial metaphor has generated a growing body of literature over the past decades since the seminal works of Forceville (1996). Multimodal metaphor, according to Forceville and Urios-Aparisi (2009: 4), is a phenomenon that the target and source are each represented "exclusively or predominately" in different modes, while the visual/pictorial metaphor is considered a phenomenon where the target and source are represented predominately in one mode. However, Eggertsson and Forceville (2009: 430) argued the definition of multimodal metaphor was a "pure" or "strict" metaphor and was "distinguished for analytical purposes only." They further explained that since "the majority of multimodal metaphors in moving images cue target and/or source in more than one mode simultaneously," they could be labeled as multimodal metaphors in the broad sense. The definition of multimodal metaphor thus in a broad sense presents its potential to be an umbrella term embracing visual or pictorial metaphors. For the convenience of discussion,

we use multimodal metaphor as a general term to name such type of phenomenon in this review.

Multimodal metaphor could appear in various multimodal discourses, such as picture books, posts, magazines, TV shows, films, etc., which comprises different modes (written language, images, sound, gestures, etc.). The interpretation of multimodal metaphors is highly related to traditional metaphor studies. It could be classified into three major dimensions. One is studied within the framework of rhetoric. In rhetoric, the metaphor was used for persuasion or decoration. The representative scholar is Barthes (1977), who first applies the theory to image studies. Another perspective is offered by pragmatics, which considers metaphor as creativity (Sperber and Wilson, 1995) and should be understood with respect to context. Two relevant theories are developed under the perspective: the interaction theory and the blending theory. The interaction theory is developed by Indurkhya (1992). It focuses on "interaction" and tries to invent a relation between the source and one of its activated features. Metaphor interpreted in this approach is often coined as a creative metaphor. The blending theory proposed by Fauconnier and Turner (2002) presupposes that different input spaces merge to create a new "blended space". It combines selected elements from the input spaces, and as a result yields new, emergent meaning that is not present in either of the input spaces. The third dimension proceeds from a cognitive linguistic perspective. It is inspired by Lakoff and Johnson's (1980) monograph *Metaphor we live by*. A metaphor is not only a rhetorical device but also a way of thinking and acting, whereas language is just an external manifestation of metaphor (Lakoff and Johnson, 1980). Multimodal metaphor within this theory, according to Forceville (1996), is a strictly directional phenomenon, positing a relationship between pairs of mental representations. It is concerned with entrenched conceptual relationships and how they may be elaborated.

In Forceville's (2006) review, a number of issues concerning multimodal metaphor research are pointed out. Those issues include, such as the nature of multimodal metaphor, the difference between structural and creative metaphor, how important genre is for the construal and interpretation of metaphor, etc., (Forceville, 2006: 379). To address those issues, more and more scholars have come to extend the multimodal metaphor research to discourses of various genres such as advertising, political cartoons, comics, animation, TV news, films, etc. Those works have not only enriched multimodal metaphor studies but also improved theoretical models due to observations on data of greater varieties.

Despite the significant academic advancement made in multimodal metaphor research by far, the existing pile of literature has received scanty attention of systemic review. An investigation is thus necessary to take stock of the current state of the studies over the past decades. Therefore, this paper conducts a bibliometric analysis, using information visualization methods to make quantitative analysis and observe the indicators of authors, journals, countries, institutions, references and keywords of worldwide literature in a certain field. In this way, we can consolidate the understanding of the nature of multimodal metaphor and propose implications and research directions for future work to promote multimodal metaphor research. Our analysis is guided by the following research questions:

> Q1: Who are the most influential authors on the subject of multimodal metaphor?

> Q2: What countries/regions and journals are the most influential in the research field of multimodal metaphor?

> Q3: What are the most important sub-fields of multimodal metaphor studies?

> Q4: What are the research trends and possible future directions in the field of multimodal metaphor?

2. Data and methodology

We retrieved the data in our study on Oct 28, 2022 from the Web of Science (WoS) Core Collection Database in all editions excluding Conference Proceedings Citation Index - Science (CPCI-S), Current Chemical Reactions (CCR-EXPANDED), and Index Chemicus (IC). We searched "Topic" with the keywords "multimodal metaphor," "pictorial metaphor" and "visual metaphor." The procedure above generated a search result of 397 articles. Then we exported full record and cited references of the 397 studies and imported it to VOSviewer (version 1.6.18) for further analysis. The basic information of all documents including publication year, author, and country is also exported to an EXCEL file for analysis of possible patterns. We have adopted a minimal intervention approach in the data retrieval process to ensure that the quantitative results generated in our research presents least bias.

Following Brika et al. (2022), we have gone through seven steps in the whole study process: study design, research questions, selected types of analysis (co-authorship, co-occurence, citation, bibliographic coupling, and co-citation), data compilation, exportation of basic document information including publication years, author, country/region to EXCEL, visualization (to both network maps in VOSviewer and curve/bar chart in EXCEL) and discussion. We have opted for a relatively low threshold and corresponding weight in visualization in VOSviewer for each type of analysis to present a thorough view of link strength in every network, as shown in **Table 1**. In the final step, the three authors discussed and illuminated on the quantitative findings for interpretation.

3. Quantitative results

3.1. Publication features

3.1.1. Publication years

As is shown in **Figure 1**, the multimodal metaphor research exhibits an overall increasing trend over the decades. Several

TABLE 1 Threshold and visualization for each type of analysis in VOSviewer networks.

Type of analysis	Unit of analysis	Weight in visualization
Citation: country/region	Min number of citations of a country/region = 1	Documents
Citation: source	Min number of citations of a source = 1	Documents
Co-citation: source	Min number of citations of a source = 3	Citations
Co-authorship	Min number of citations of an author = 2	Documents
Citation: author	Min number of citations of an author = 2	Documents
Citation: document	Min number of citations of a document = 1	Citation
Bibliographic coupling: document	Min number of citations of a document = 9	Total link strength
Co-occurrence: key word plus	Mini occurrences of a key word = 2	Occurrence

features are noteworthy here. First, the period from 1977 to 2010 witnessed relatively small amounts of literature in this field with a peak at 7 studies in 1998. Second, the number of papers in the domain of multimodal metaphor began to surge in 2010, and reached a record high at 48 in 2020, since Forceville (2009) brought the term "multimodal metaphor" into the spotlight and began to draw increasing scholarly interests in the field.

3.1.2. Country/region participation

A total of 53 countries or regions were involved in research related to multimodal metaphor across the whole world. As shown in Figure 2, there are only 11 countries with more than 10 publications. The most productive countries or regions are USA (80), People's Republic of China (41), Spain (41), England (34), and Netherlands (23). It is interesting to note that Canada (19), Germany (18), Australia (16), Italy (16), and France (15) share very similar total counts.

Figure 3 reveals the result from citation analysis in terms of participating countries or regions. The top four countries are USA with a total number of documents of 75, People's Republic of China with 73, Spain with 41 and England with 34. However, the number of links in England is 20, exceeding that in People's Republic of China (18) and that in Spain (15). In other words, England is the second most influential country in the number of citation links, while People's Republic of China and Spain are the third and the fourth. All the countries or regions involved present a certain degree of collaboration with others, albeit with a few of them including Slovenia, Norway, Chile, Lithuania, Saudi Arab and South Africa the least collaborative with only 1 link separately.

3.1.3. Journal participation: citation analysis; co-citation analysis

Figure 4 reveals the most important sources of publication in terms of co-citation analysis. According to the assigned total link strength, the most influential journals for multimodal metaphor research are (as shown in Table 2): Année Psychologique (12), Journal of Advertising (44), Metaphor and Symbolic Activity/Metaphor and Symbol (59) (in separate clusters), Journal of Pragmatics (66), Sage Open (7), Accounting Education (9), Monographs of the Society for Research in Child Development/Social Semitoics (6), Multimodal Communication in the 21st century: Professional and Academic (9), Frontiers in Psychology (13), Food Research International (7), Review of Cognitive Linguistics (28), Metaphor and the Social World (13), Visual Communication (44), Semiotica (20), Tydskrif vir Geesteswetenskappe (2) and Discourse and Communication (4). Among all the sources, Journal of Advertising and International Journal of Advertising are clearly the most influential, with a link strength of nine. This is followed by the linkage between Journal of Pragmatics and Visual Communication with a strength of eight. It is worth noticing that the connection between Journal of Pragmatics and Metaphor and Symbol is also strong with a link strength of four. However, when it comes to the number of total citations, Journal of Advertising is the most influential with 358 publications, while Journal of Pragmatics, the second, has 301. The fact that the two journals, Journal of Advertising and Journal of Pragmatics, have such considerable impact shows how the research of multimodal metaphor becomes recognized in the academia of related disciplines.

In addition, it is clear from the network map in Figure 5 that a significant number of these sources are co-cited. As shown in Table 3, five sources seem to hold a dominate position over the others: Applied Cognitive Linguistics (263 citations and 8,665 total link strength), Journal of Advertising (217 citations and 8,600 total link strength), Journal of Consumer Research (215 citations and 7,972 total link strength), Journal of Pragmatics (192 citations and 7,369 total link strength) and Metaphors We Live By (1980) (115 citations and 3,370 total link strength). It can be seen that although Lakoff and Johnson (1980) set out by defining conceptual metaphor and implicated its potential in multimodal meaning making, it is other sources that serve to extend the application of CMT theory in the multimodal fields.

3.1.4. Participating authors: co-authorship of authors, co-citation of authors

Figure 6 illustrates the partnership network between all the authors as the co-authorship analysis is considered with a minimum of two citations of an author, showing the most influential authors. As is shown, the co-authorship network presents seven prominent authors divided into two clusters. The leading authors in Cluster #1 are Gerhard Schmalz and Dirk Ziebolz, each with three documents and total link strength of 12. In Cluster #2, Tom Sensky is slightly more influential than the other two authors, as he features three documents and total link strength of 10.

The citation pattern of the other authors is shown in Figure 7 with a minimum of two citations per author. These authors are grouped into four clusters. Charles Forceville is clearly the most influential author in Figure 7, with the total link strength reaching 76 and the total number of citations standing at 361. It is found that Charles Forceville is the most important author in two clusters generated by VOSviewer, whereas in the remaining two, Amitash Ojha and Peter Kravanja contribute the most with the total link strength of 35 and 22, and the total number of citations, 26 and 11.

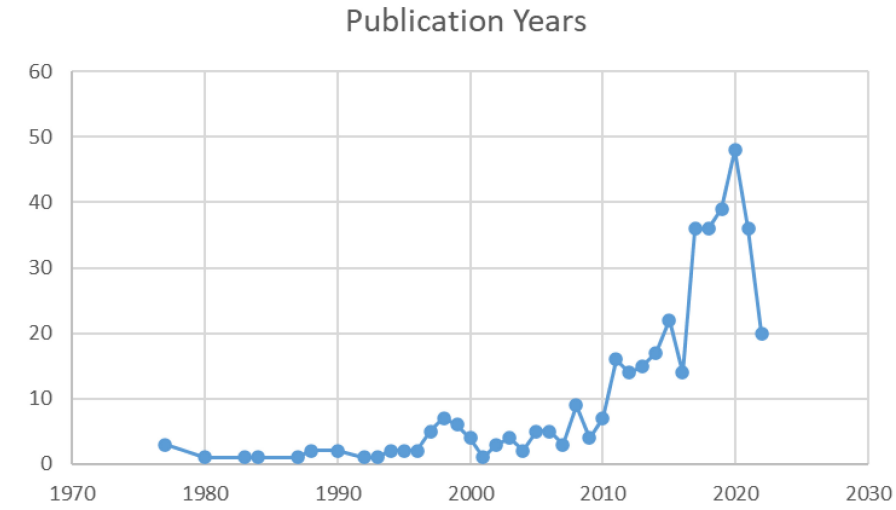

FIGURE 1
Trends of annual publication of research in multimodal metaphor.

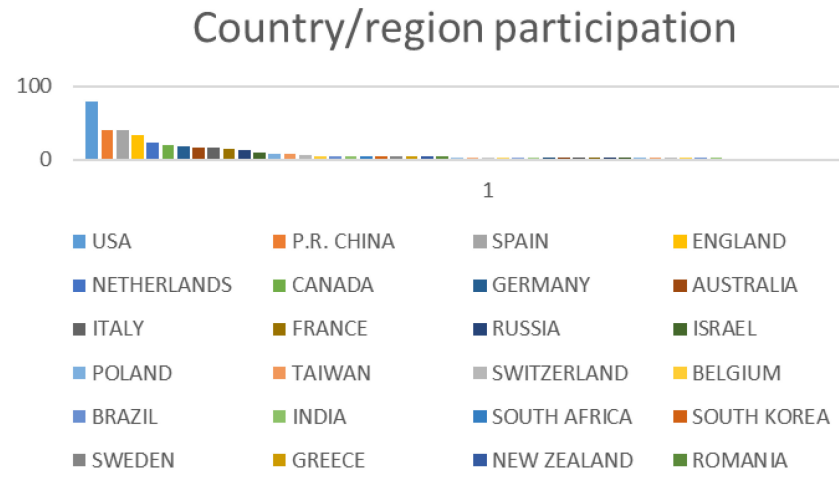

FIGURE 2
Countries or regions that participated in research related to multimodal metaphor.

3.1.5. Citation: most cited reference, bibliographic coupling

The citation analysis of documents as revealed in **Figure 8** shows there are 15 clusters with a minimum of one citation accounted. As is presented in **Table 4**, the leading references in each of these clusters are: Kogan et al. (1980), Johns (1984), Forceville (2002), Teng and Sun (2002), Tsakona (2009), van Mulken et al. (2010), Bounegru and Forceville (2011), Delbaere et al. (2011), Hidalgo Downing and Kraljevic Mujic (2011), Ortiz (2011), Yu (2011), Feng and O'Halloran (2013), Indurkhya and Ojha (2013), Danado and Paternò (2014), Hart (2017).

Bibliographic coupling shows the extent to which the documents share the same citations. The network map in **Figure 9** shows a total of nine clusters with a minimum of nine citations in one document, as the lowest number of citations among the leading documents listed above is nine. In each of the nine clusters, Forceville (2002) in Cluster #1, van Mulken et al. (2014) in Cluster #2, Hlawatsch et al. (2011) in Cluster #3, van Mulken et al. (2010) in Cluster #4, Wise (1999) in Cluster #5, Tsakona (2009) in Cluster #6, Stark (2011) in Cluster #7, Ng and Koller (2013) in Cluster #8 and Lee (2007) in Cluster #9.

3.2. Research domain of co-occurrence: key word plus

The purpose of co-occurrence keyword analysis is to look into the relationship between keywords in a set of publications to uncover the topical issues and help scholars better grasp current research concerns. A total of 549 keywords were investigated, 137 of which appeared more than two times. **Figure 10** shows the visual network map of keyword co-occurrence. There are in total 137 items, 11 clusters. The total link strength is 803. The different colored nodes represent different domains of interests in

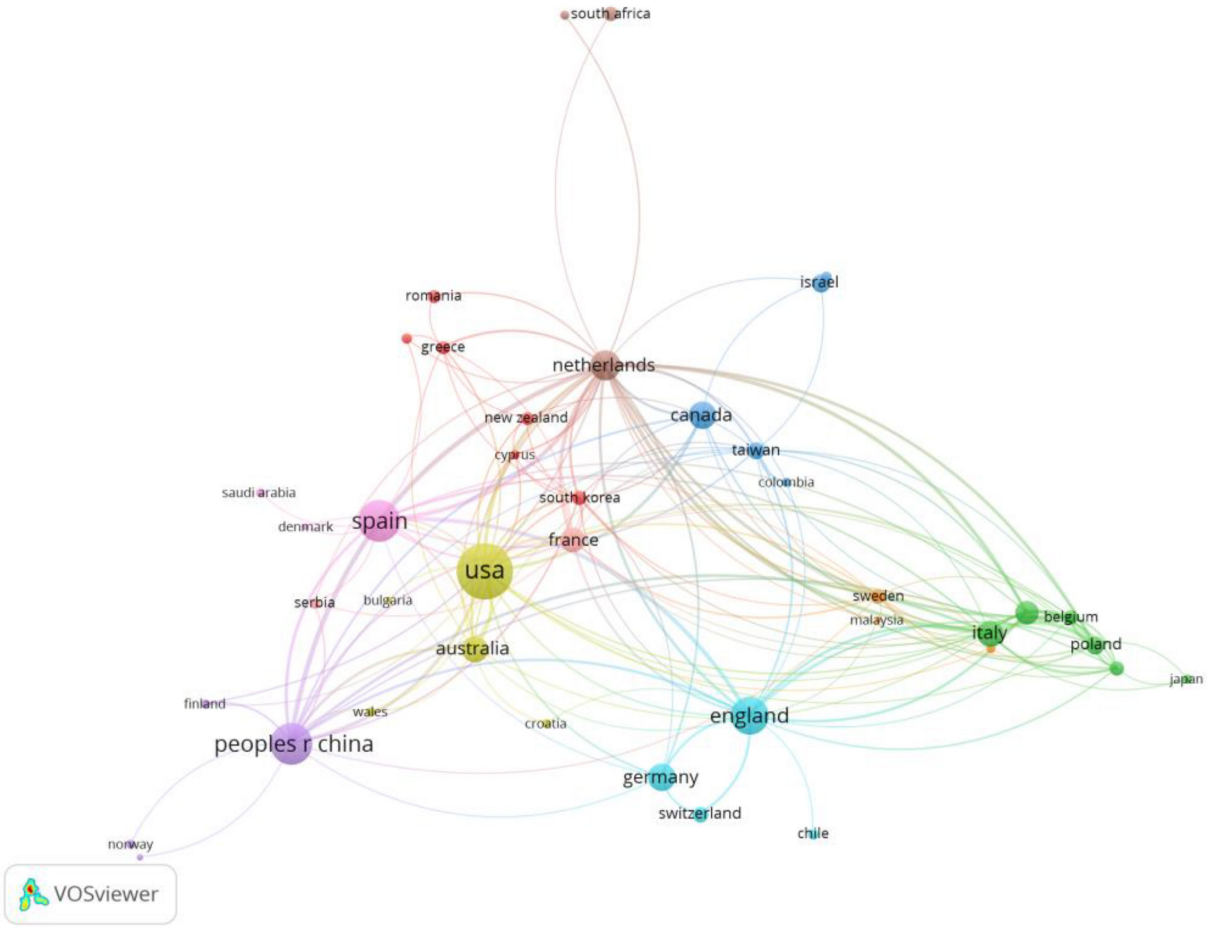

FIGURE 3
Countries or regions that show collaboration by citation in multimodal metaphor research (min number of citations of a country/region = 1; visualization by weight of documents).

multimodal metaphor. The size of a node implies the occurrence of keywords. The closeness of the relationship between any two items is shown by the thickness of the connection lines.

According to the results of cluster analysis, 11 key areas of research are found: Cluster #1 is related to the visual metaphor comprehension ability of the individuals with intellectual disability. For example, Shnitzer-Meirovich et al. (2018) conduct a program to enhance their analogical thinking and find they can recruit the ability required for visual metaphor comprehension.

Cluster #2 concerns the visualization of the attitudes and the framework for multimodal metaphor comprehension. One of the representative works is Forceville's (2009) model of multimodal metaphor within a cognitive framework which becomes the mainstream in this field.

Cluster #3 is about the information design and the exploration of the images. For instance, Ojha and Indurkhya (2020) apply perception theory to analyze the design of visual metaphors.

Cluster #4 reveals a perspective from discourse approach to the metaphor representing various emotions. Feng and O'Halloran (2013), integrating social semiotic theory and cognitive linguistic theory, proposes a multimodal discourse approach to explore the structural features of the visual metaphor mapping various emotions.

Cluster #5 concerns the appreciation of visual metaphor in people with old age-related diseases. One of the representative works explores those people's humor preferences, which finds that they enjoy simple and familiar ones (Kmita et al., 2022).

Cluster #6 is related to the contribution of metonymy to multimodal metaphor or visual metaphor. Those studies demonstrate the unignorable function of metonymy in understanding multimodal metaphor and propose the types of the interaction of multimodal metaphor and metonymy (e.g., Forceville and Urios-Aparisi, 2009).

Cluster #7 focuses on the impact of the persuasion of visual metaphors. Such studies prove that the persuasive effect could be more positive if the message designed in the form of visual metaphor (e.g., Meijers et al., 2019).

Cluster #8 is about space-time metaphor system. In this cluster, the issue is related to use visual metaphor method to understand space-time accessibility. For example, Jiang et al. (2022) use visual metaphor to understand the space-time accessibility of the Hong Kong-Zhuhai-Macao Belt.

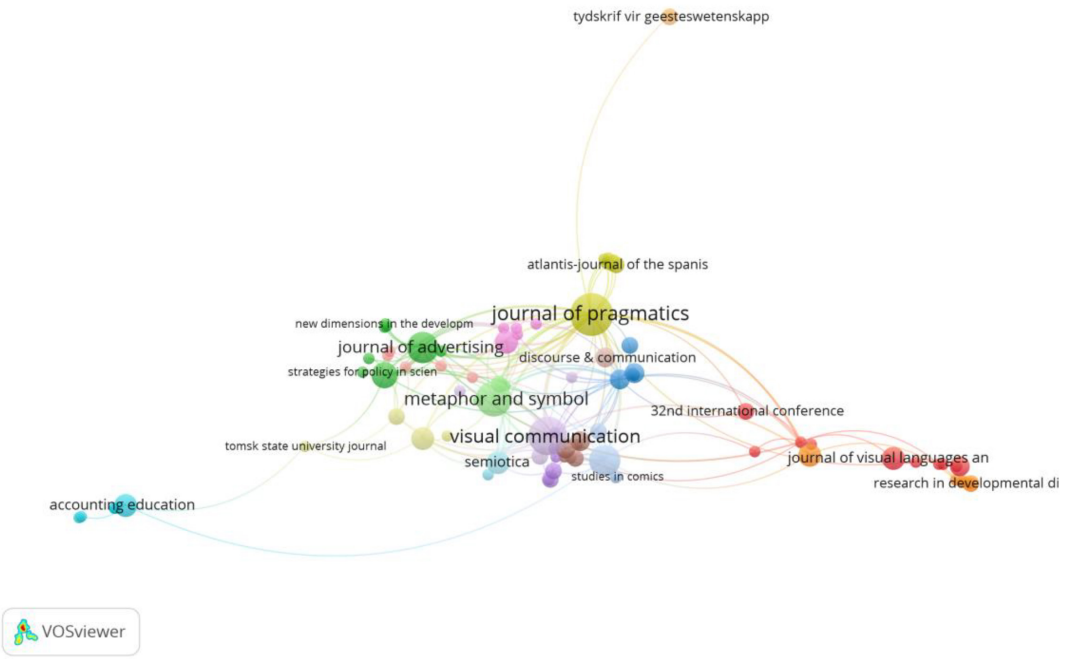

FIGURE 4
Citation analysis by sources with all sources in account (min number of citations of a source = 1; visualization by weight of documents).

TABLE 2 Journal(s), citation and link strength in the 17 clusters from citation analysis by sources.

Journal	Documents	Citations	Link strength
Journal of Pragmatics	13	301	66
Journal of Advertising	7	358	44
Visual Communication	11	159	44
Metaphor and Symbolic Activity/Metaphor and Symbol	12 (3 + 9)	182 (86 + 96)	59 (27 + 32)
Review of Cognitive Linguistics	7	66	28
Semiotica	4	14	20
Metaphor and the Social World	4	10	13
Frontiers in Psychology	4	25	13
Année Psychologique	1	0	12
Accounting Education	4	28	9
Multimodal Communication in the 21st Century: Professional and Academic	3	18	9
Food Research International	1	7	7
Sage Open	1	0	7
Monographs of the Society for Research in Child Development/Social Semiotics	1/4	28/8	6
Discourse and Communication	3	55	4
Tydskrif vir Geesteswetenskappe	2	0	2

Cluster #9 reveals a relation to the contribution of visual metaphor. For example, one of the studies show that the advertisement metaphorically representing the product with personification, appears to lead to more positive brand liking (Marjorie et al., 2011).

Cluster #10 is about the function of visual metaphor in representing the evolution of the eubacteria. Those studies demonstrate the appropriateness of visual metaphor to depict the formation of phenotypic variants of bacterial cells (Sánchez-Romero and Casadesús, 2021).

Cluster #11 concerns the understanding of the art of the images. In this cluster, a representative work is by Poppi et al. (2020), who point out the current interpretations of the metaphorical structures do not always work within the domain of art cognition and thus propose a participant-based framework.

According to the clustering topics, we find that the main issues of multimodal metaphor studies concern what framework to use, what model to interpret, and how to interpret metaphors in different genres, such as advertisements, films, etc. The co-occurrence of the keyword analysis also shows that the effect of multimodal metaphor is one of the hot topics. Those hot topics can be concluded as six top keywords. They are "visual metaphor" with 24 occurrences. "pictures" with 15 occurrences, "persuasion" with 14 occurrences, "model" with 12 occurrences, as well as "impact" and "multimodal metaphor" with 11 occurrences, respectively.

The result implies the current research trend of multimodal metaphor is still in trying to develop an applicable model and in understanding their impacts.

4. Discussion

The co-occurrence of the keyword analysis displays that the hot topics related to multimodal metaphor studies could be classified into two research aims. One is related to the framework or the

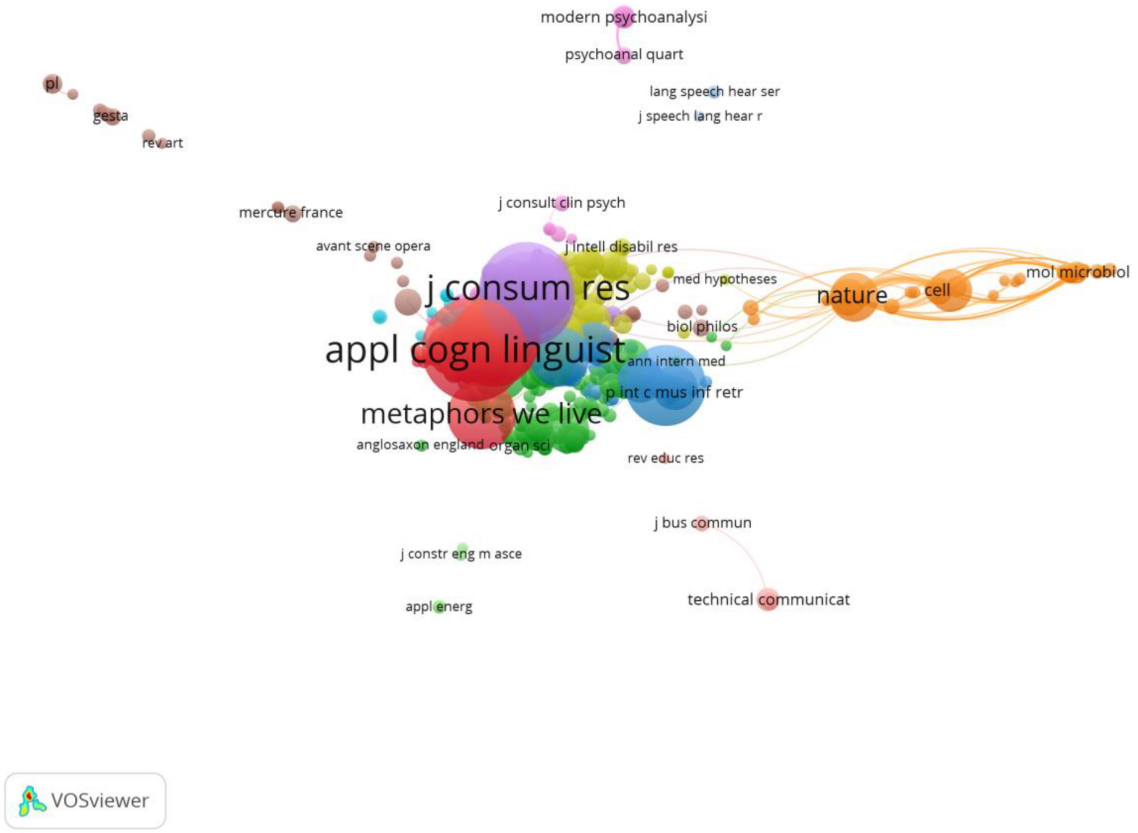

FIGURE 5
Co-citation Analysis of Cited Sources (min number of citations of a source = 3; visualization by weight of citations).

models for the exploration of visual or multimodal metaphor, the other is related to the impact or the power of the multimodal metaphor. The three major approaches driven by the interaction, the conceptual and the blending theories have been used widely and further developed by scholars to study different types of multimodal discourse. The major concern is on the impact of visual metaphor (van Mulken et al., 2010, 33), such as the persuasion of advertisements, cartoons or political discourse (Teng and Sun, 2002; Tsakona, 2009; Hidalgo Downing and Kraljevic Mujic, 2011; Indurkhya and Ojha, 2013). The following sections discuss the research trend and possible future directions in multimodal metaphor studies.

TABLE 3 Top five sources according to link strength from co-citation analysis by sources.

Journal	Citation	Link strength
Applied cognitive linguistics	263	8,665
Journal of advertising	217	8,600
Journal of consumer research	215	7,972
Journal of pragmatics	192	7,369
Metaphors we live by	115	3,370

4.1. Research direction driven by cognitive linguistic theory

The conceptual multimodal metaphor initiated by Forceville (1996, 2006) has been integrated with social semiotic theory and further developed by Feng and O'Halloran (2013). Feng and O'Halloran (2013) explored the structural features of visual images and models the visual representation of metaphor with respect to the representational, interactive and compositional metafunctions. Their social semiotic model provides a comprehensive account of the visual realization of both creative and conventional metaphors. The model has been widely applied in studies with a social semiotic background and has been used to address the impact of multimodal metaphor in different types of multimodal texts, such as advertisements (e.g., Liu and Zhang, 2020). Nonetheless, more empirical studies concerning more different genres are needed to demonstrate its usefulness. Further, how multimodal metaphor works and how to interpret its power is a research direction in the current research landscape.

4.2. Research direction driven by the theory of pragmatics

Within the interaction theory, Ojha and Indurkhya (2016) proposed an improved model for metaphor processing based on the perception theories (O'Regan and Noe, 2001;

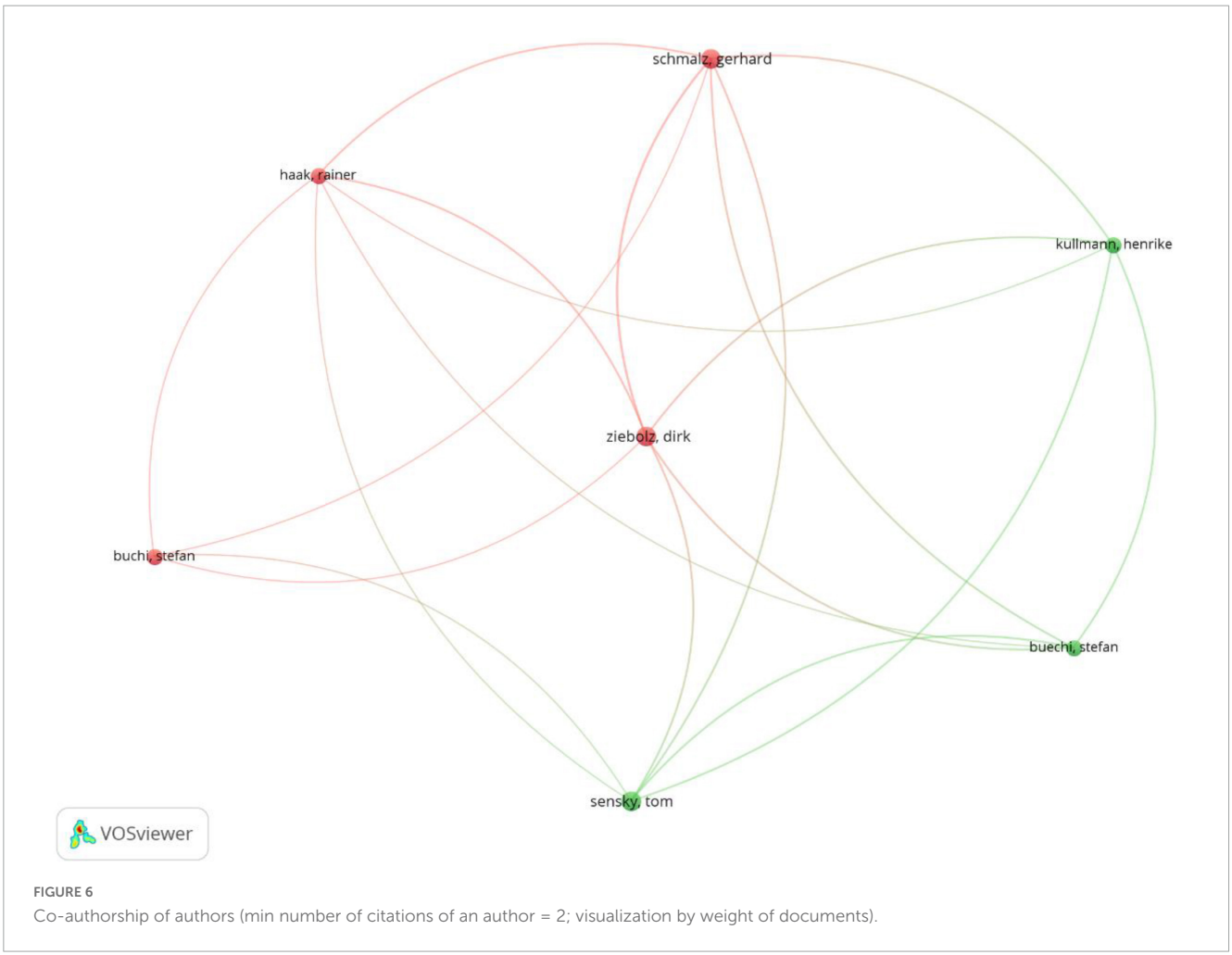

FIGURE 6
Co-authorship of authors (min number of citations of an author = 2; visualization by weight of documents).

Zimbardo and Gerrig, 2002) and integrated model of text and image processing (Schnotz, 2002). The model comprises top-down and bottom-up mechanisms, which allow the conceptual and the perceptual features to stimulate each other. Such metaphor features are seen as emergent features. In their model, context is a key role in identifying the source and the target of a visual metaphor. The model has provided implications for the analysis on the design of visual metaphors (e.g., Ojha and Indurkhya, 2020), which would continue to be a direction worth further study.

In the blending theory, Fauconnier and Turner (2002) developed the model into a more systematic, mature and adaptive theory. The three dimensions for the interpretation: composition, completion and elaboration, have been further expanded. The generated emergent structure in the three dimensions is called "running the blend" and is seen as a dynamic and complex cognitive process highly related to the social world. This model thus concerns the pragmatic and sociological interpretation. This model has been applied by Li and Dai (2020) to explore the hidden ideology of print advertisement. It has also been used in the science education field, such as Fredriksson and Pelger (2020). They use it to help students verbalize and visualize abstract phenomena and concepts. Their study demonstrates that the model could support students to understand science matters and their learning process and suggests research directions both in exploiting the use of multimodal metaphors in the education field and in evaluating the use of multimodal metaphors.

4.3. Research direction driven by visual/multimodal rhetoric theory

While the above three approaches have illuminated the major directions of multimodal metaphor studies, recent research shows there is another emerging new direction in multimodal metaphor studies. Such studies tend to use the term visual metaphor and draw on rhetoric, pragmatics and argumentation theories, aiming to analyze the impact of multimodal metaphors in, particularly, multimodal arguments. The researchers apply the visual rhetorical theory driven by Barthes's rhetoric of images, to understand what rhetorical effect of the use of visual metaphor or other rhetorical devices for the reconstruction of argumentation (Kjeldsen, 2018; Tseronis, 2021). The study implies a research tendency of combining multimodal rhetoric theory and argumentation theory to investigate the power of multimodal metaphor in multimodal arguments. The exploration in this field could make clear how multimodal argumentation works as well as how to evaluate them.

In all, the studies within cognitive linguistic theory provide an access to understanding the operation of

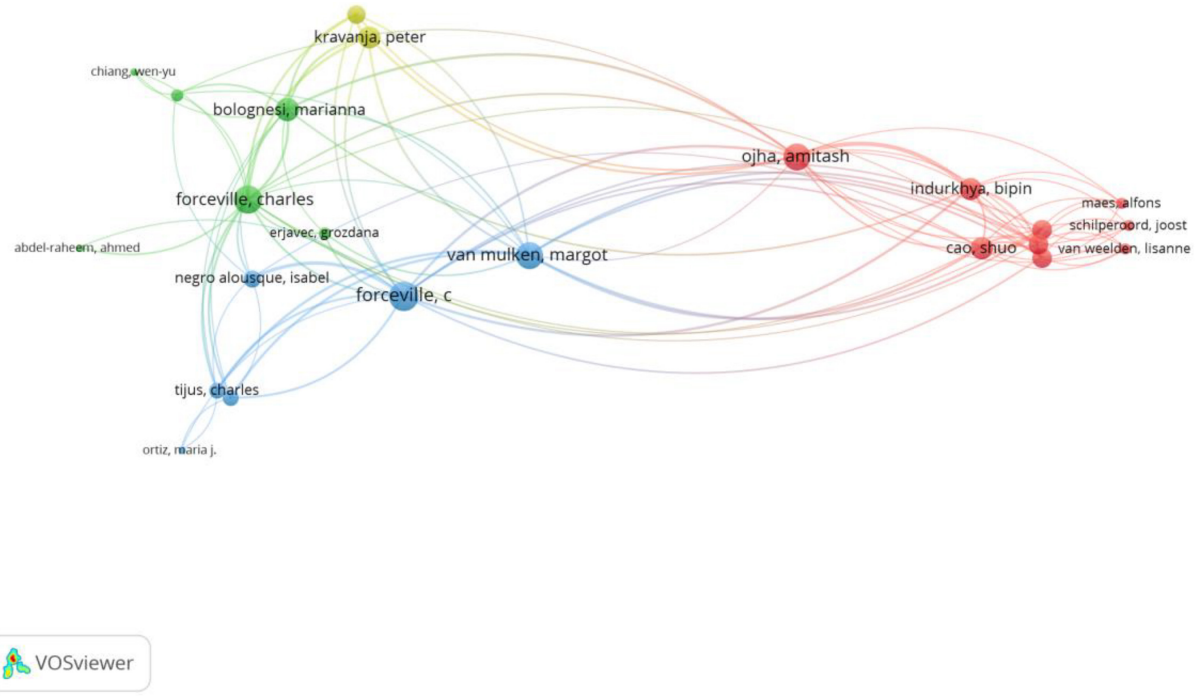

FIGURE 7
Network of cited authors (min number of citations of an author = 2; visualization by weight of documents).

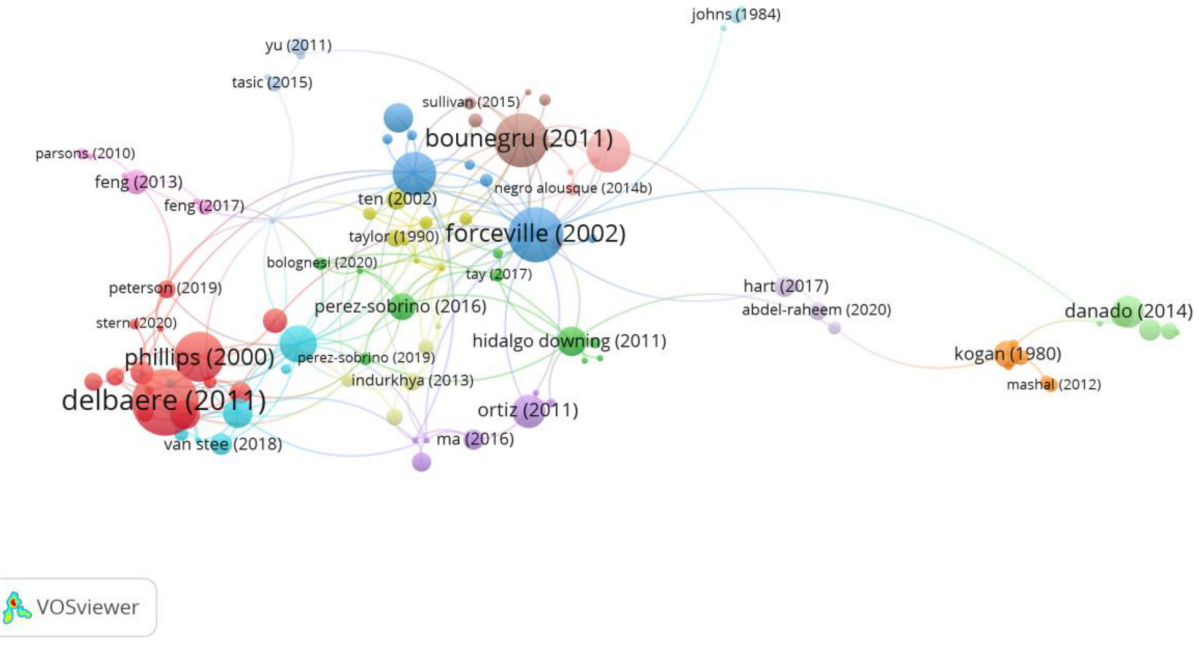

FIGURE 8
VOSviewer network map showing the most cited reference (min number of citations of a document = 1; visualization by weight of citations).

multimodal metaphor mechanism. The studies within pragmatics accentuate the role of social cultural context and the pragmatic functions of multimodal metaphor. Further, the studies from a visual rhetoric theory are enlightening in integrating conceptual metaphor theory, pragmatics and argumentation theory to explore the rhetorical effect. Those studies also show an interdisciplinary approach to multimodal metaphor research.

To conclude, based on the literature review, we have found that cognitive topics are still the common trend in multimodal

TABLE 4 The representative document in the 15 clusters according to citation analysis.

Cluster	References	Article	Journal	Citation
Cluster #1	Delbaere et al., 2011	Personification in Advertising	Journal of Advertising	166
Cluster #8	Bounegru and Forceville, 2011	Metaphors in editorial cartoons representing the global financial crisis	Visual Communication	106
Cluster #10	Tsakona, 2009	Language and image interaction in cartoons: Toward a multimodal theory of humor	Journal of Pragmatics	70
Cluster #5	Ortiz, 2011	Primary metaphors and monomodal visual metaphors	Journal of Pragmatics	41
Cluster #11	Danado and Paternò, 2014	Puzzle: A mobile application development environment using a jigsaw metaphor	Journal of Visual Languages and Computing	39
Cluster #6	van Mulken et al., 2010	The impact of perceived complexity, deviation and comprehension on the appreciation of visual metaphor in advertising across three European countries	Journal of Pragmatics	33
Cluster #2	Hidalgo Downing and Kraljevic Mujic, 2011	Multimodal metonymy and metaphor as complex discourse resources for creativity in ICT advertising discourse	Review of Cognitive Linguistics	32
Cluster #7	Kogan et al., 1980	Understanding Visual Metaphor: Developmental and Individual Differences	Monographs of the Society for Research in Child Development	28
Cluster #9	Feng and O'Halloran, 2013	The visual representation of metaphor	Review of Cognitive Linguistics	23
Cluster #14	Hart, 2017	Metaphor and intertextuality in media framings of the (1984–1985) British Miners' Strike: A multimodal analysis	Discourse and Communication	17
Cluster #4	Teng and Sun, 2002	Grouping, Simile, and Oxymoron in Pictures: A Design-Based Cognitive Approach	Metaphor and Symbol	16
Cluster #13	Indurkhya and Ojha, 2013	An experimental study on the role of perceptual similarity in visual metaphors	Metaphor Symbol	13
Cluster #11	Yu, 2011	Beijing Olympics and Beijing opera: A multimodal metaphor in a CCTV Olympics commercial	Cognitive Linguistics	13
Cluster #15	Johns, 1984	Visual metaphor: Lost and found	Semiotica	9

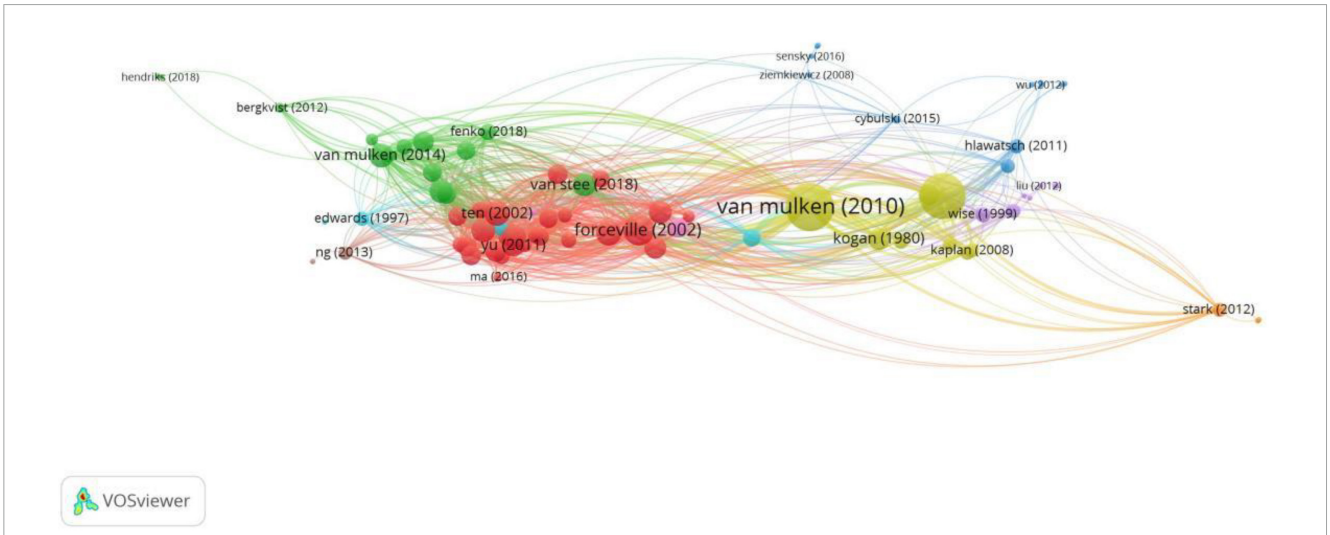

FIGURE 9
VOSviewer network map showing the bibliographic coupling of documents (min number of citations of a document = 9; visualization by weight of total link strength).

metaphor studies. Second, most of the multimodal metaphor studies taking advertisements as data. Further research may include more types of multimodal discourse to understand multimodal metaphor more systematically and therefore to further improve current modes for multimodal metaphor interpretations. Third, the impact of multimodal metaphors in multimodal arguments is a new field worth further exploration. Last, more works should be done using multimodal corpus analysis and empirical approaches to prove the applicability of various models.

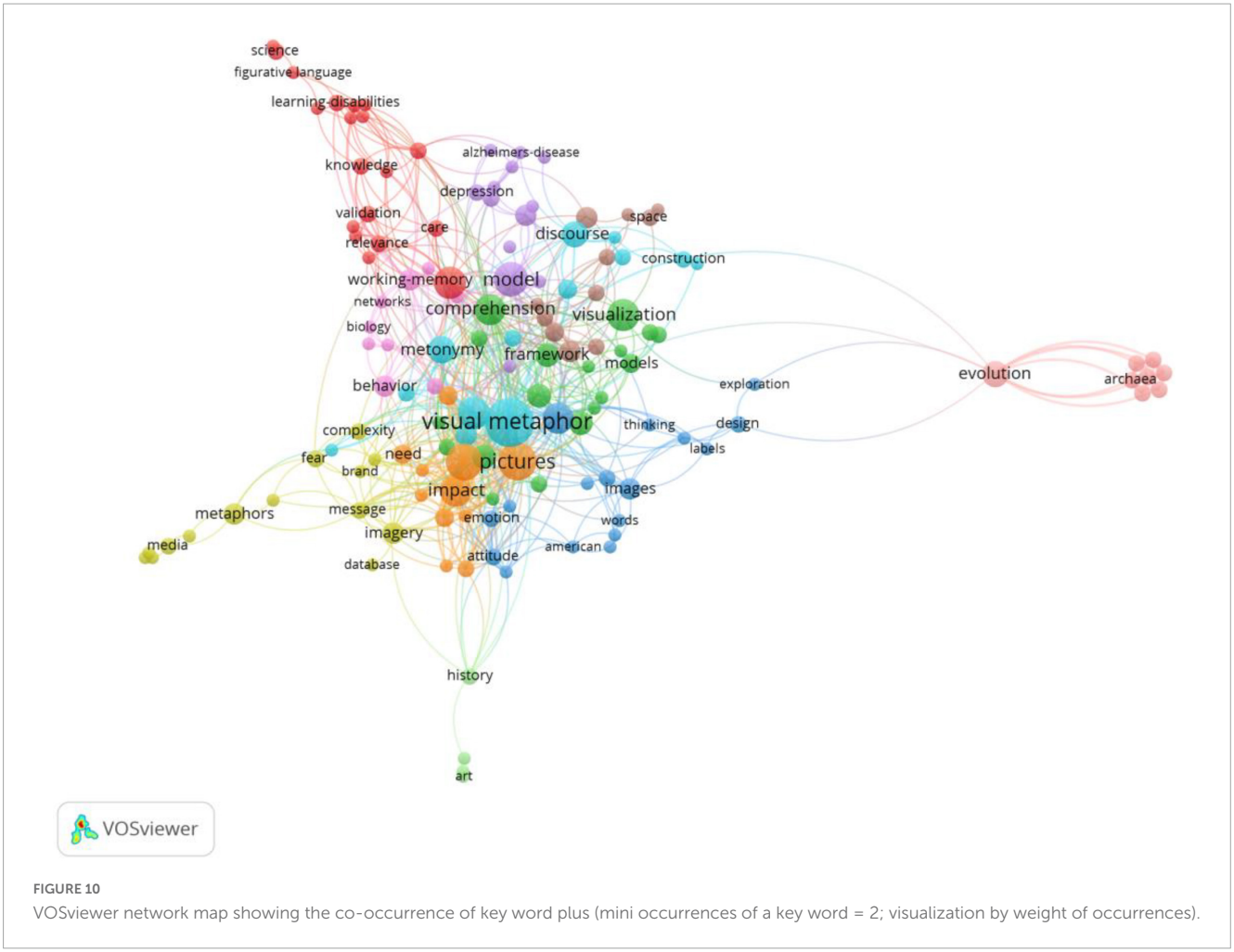

FIGURE 10
VOSviewer network map showing the co-occurrence of key word plus (mini occurrences of a key word = 2; visualization by weight of occurrences).

5. Conclusion

Multimodal metaphor including metaphor constructed in non-verbal expressions, i.e., pictorial/visual metaphor is an important concept as it is based on theoretical mechanisms of interaction, blended space and conceptual blending and is applicable in many practical scenarios such as advertisement and animation. While multimodal metaphor has been a prospering concept that has been increasingly investigated, there remain few studies that address its research trend through a bibliometric analysis.

Based on the 397 articles obtained from the Web of Science (WoS) Core Collection Database in all relevant editions, the current study reveals significant patterns in publication features including publication years, country/region participation, journal publication, participating authors, citation and research domain of concurrence. It is found that there has been a general rising trend in the research on multimodal metaphor with 2020 the most fruitful year. USA is the country with the highest number of documents and collaboration links. Journal of Advertising and Journal of Pragmatics are two most influential sources in terms of the number of citations and co-citations. With minimal co-authorship with others, Charles Forceville is the most impactful author as far as the total link strength and the total number of citations are concerned. This has been confirmed by citation analysis of most cited reference and bibliographic coupling. Co-occurrence in key word plus suggests 11 research domains related to what framework to use, what model to interpret, and how to interpret metaphors in different genres.

In addition to the two research aims concluded from the most frequent hot topics, we have discussed three research directions driven by three different strains of theories, while they are all cognitive in nature. Our findings suggest that the research trends in existing research on multimodal metaphor lie in the types of multimodal discourses, the investigation in multimodal arguments and the use of multimodal corpus analysis.

This study can be potentially useful for those attempting to contribute to the existing line of research, as it provides a detailed account of the entire landscape of literature on multimodal metaphor and sheds light on the possible research directions for further exploration. However, there are limitations that should be noted. First, only one source of data is considered. Future research can involve other sources of data such as Google Scholar and Scopus to generate a more extending view. Second, we have only used VOS viewer as the only bibliometric tool, which means the aspects discussed on the scholarship collected are restricted. It is possible to employ other similar tools such as CiteSpace and Network Workbench to look into more features of the publications.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

ZZ compiled the data and did the statistics and was devoted to chapters 2, 3.1 and conclusion. SW was devoted to chapters 1, 3.2, and 4. SC participated in the discussion and proofread the whole manuscript. All authors annotated the data, contributed to the article, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Emblematics and metaphor: theoretical facets and hermeneutic issues

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The article focuses on Renaissance emblematics and its privileged relationship with metaphor, considered in the light of contemporary theories as an inherently tensional form, steeped in interchange and transition and heavily relying on a basically conflictual dynamic. Though often dismissed as an academic, antiquarian form of figurality or as a pleasing symbolical form steeped in monologic stability, emblematics was in fact conceived as a brand-new hybrid textual mode whose complex interplay of signs favored multiplied discursive models and the constant relay between visual and textual elements, between abstract conceptualization and thoughts-made-visible. The paper, in other words, will try to reassess and re-evaluate emblematics as a profoundly plural form of communication whose connections with metaphor were much deeper and qualitatively different than it is usually thought. This slant approach to what is conventionally considered a tame example of early modern textuality highlights, on the contrary, its idiosyncratic meaning procedures: the metaphorical conceptualizations of emblematic compositions were not necessarily based on similarity and testify to their cognitive potential which ushered in an idea of communication as projective and dislocating, as a dialogic space allowing for the paradoxical copresence of ideological consistency and its deconstruction.

KEYWORDS

emblem, *impresa*, conflictual metaphor, early modern textuality, critical stylistics, representation and communication, multimodality

1. Introduction

This article focuses on Renaissance emblematics[1] and its privileged relationship with metaphor, considered in the light of contemporary theories as an inherently tensional form, steeped in interchange and transition and heavily relying on basically conflictual dynamics. After a general discussion of emblematics and its features, the paper will try to reassess

1 The term will be used throughout the essay to allude to the symbolical form which was concretely embodied by emblems and *imprese*. The difference between the two is not easy to draw as confirmed by the title of the famous collection by the German Gabriel Rollenhagen, *Nucleus emblematum selectissimorum. Quae Itali vulgo impresas vocant* (Rollenhagen, 1611). In this paper the two terms will be used in their customary meanings: an *impresa* was a symbolic composition made up of a motto (*inscriptio*) and a (usually symbolic) image (*pictura*), had a strictly personal and programmatic character (hence its name) and it was tied to specific circumstances; the emblem had a motto, a symbolic image and an accompanying, longer text (*subscriptio*) which emphasized its more didactic and general character. The bibliography on emblematics is huge: see the classic studies by Gombrich (1948), Praz (1964) and the more recent ones by Russell (1985, 1995), Bath (1994), Pinkus (1996), Spica (1996), Manning (2002), Visser (2005), Graham (2016, 2017), and Benassi (2018), which offers the most updated discussion on this topic.

and re-evaluate it as a profoundly plural form of communication whose connections with metaphor were much deeper and qualitatively different than it is usually thought. This slant approach to what is conventionally considered a tame example of early modern textuality highlights, on the contrary, its idiosyncratic meaning procedures: the metaphorical conceptualizations of emblematic compositions were not always based on similarity but often conflictual and testify to their cognitive potential which ushered in an idea of communication as a dialogic space allowing for the paradoxical copresence of ideological consistency and its deconstruction.

After an introductory presentation of some fundamental aspects of emblematics and metaphor, the article will discuss some theoretical issues and concrete examples in which the relationship between metaphor and emblematics features prominently and opens stimulating hermeneutic paths.

2. Theoretical background

2.1. Emblematics

Though often dismissed as an antiquarian form of figurality, or as a pleasing symbolical expression steeped in monologic stability and surreptitiously employed to manipulate its audience, Renaissance emblematics was in fact conceived as a brand-new textual form[2] whose hybrid nature and interplay of signs seemed to open up ground-breaking epistemological perspectives. In particular, it seemed to satisfy the need for a kind of knowledge which could express material concepts in an intuitive way: through its union of figurative and poetic language, two completely diverse forms were forcibly joined in a syntagmatic unity which was transformed and fulfilled at a higher level in the form of a paradigmatic course of action or an exemplary anecdote with sweeping effects. Emblematic writers were enthused over the revolutionary possibilities opened up by this new construct: the "what"—the meaning—could be shaped by the "how"—the mode of its comprehension and vice versa; the interaction between visual and verbal elements favored multiplied discursive models and the constant relay between abstract conceptualization and thoughts-made-visible; Neoplatonic and Neoaristotelian paradigms could be (though not always deliberately or consciously) mixed; symbols and analogies could be used in a rhetorical as well as metaphorical way.[3] The "invention" of emblematics, in other words, was the proof that mankind had found an advanced form with a wide cognitive scope which could expand human faculties and make communication basically akin to divine knowledge.[4]

These features had a profound impact on the reader response that authors anticipated: on the one hand, the union of two different modes of perception provided writers with a new language, reliable and adaptable, and qualified to "redistribue la fragmentation de tous les aspects de l'univers à l'intérieur d'une recréation poétique et du monde et des lettres" (Spica, 1996, p. 230). On the other, the importance of the interpretative moment and the repeated appeal on the reader's ability to infer the message implied a parallel proliferation of meanings: the necessity of deriving interpretations from the interaction of the visual and textual elements meant that any emblematic composition was able to produce cognitive effects not only by conveying clear, universal moral messages (for example, strengthening traditional assumptions), but also by inducing the active participation of a hermeneutically committed reader in the negotiation of meanings. After all, emblematics did not aim at duplicating already known information and theorists stressed that texts should never repeat or simply describe what was already evident in the picture or vice versa.

In short, emblematics was seen as a pioneering and incredibly effective intellectual instrument, which sat at the very heart of foundational epistemological debates in the early modern period concerning which signs were expressive and how they meant. Despite its quaint and apparently frivolous nature, it can be considered as a wide cultural index, as a space serving as both meeting ground and battle ground for encoded but heterogeneous sign systems, as a conflictual cognitive field, as a form able to appropriate and reactivate collective memories and unspoken attitudes and to provide "partisan representations of discursive and pictorial traditions and mentalités" (Wagner, 1996, p. 37).

Unsurprisingly, these innovative features of emblematics were contained and progressively distorted by an anchorage practice[5] which prevented its multiplicity from thriving, ultimately transforming this form into a homogeneous, static site of ideological as well as semiotic coherence. Readers, who were trusted to imagine a whole range of premises or draw conclusions for themselves, were progressively limited in their freedom and encouraged to pursue an effortless hermeneutic

2 Ammirato (1562, p. 32) stressed that the "meraviglia" of an emblematic construct was produced by the coupling of two intelligible entities which produce something new, which is not that particular verbal or visual part but "quel misto, o terzo, che risulta, & nasce dalla sentenza, et dalla cosa, o imagine riceuuta" (that mix, or third element, which derives and was born from the saying and the thing or received image. All translations are mine unless specified otherwise). Bargagli (1594, p. 14) made a sort of genealogy of the various "modi vsitati dall'huomo, del palesare i propi concetti suoi" (wonted ways employed by men to reveal their conceptions) culminating with *imprese* "questo eccellente mostro di Natura fabbricando opere di figure di cose, e di voci insieme" (this excellent monster of Nature by contriving works which join figures of things and of voices together). Tesauro as well highlighted the novelty of *imprese* claiming that they were born together with poetry and painting but with a special cognitive capacity, since the poetic quality of this "sign" made it "più nobile" (nobler) and "più difficile" (more difficult), overcoming all the other persuasive arts (Tesauro, 1670, p. 625).

3 On these aspects see Klein (1957).

4 Le Moyne (1666, p. 11) was outspoken in associating the synthetic quality of emblematics to divine communication: "Surquoy, si je ne craignois de monter trop haut, & d'en dire trop, je dirois qu'il est de la Devise en cela, comme de ces images universelles données aux Esprits superieurs, qui representent en un moment, et par une notion simple & degagée".

5 As Barthes (1977) suggested, in relay texts words and images stand in a complementary relationship which ultimately guarantees the unity of the message and its performance as a meaningful story. Anchorage, on the contrary, characterizes those texts in which the linguistic message no longer guides identification but the interpretation of the images they refer to, constituting a kind of vice which guides the text and limits the projective power of the image.

approach and accept the one, predetermined meaning. The latter model was obviously functional to a more pervasive ideological practice, particularly evident in religious emblematics, where texts featured a monologic consistency and a prevalence of what Foucault (1983) would call resemblance over similitude, functional to interpellating readers and "re-creating" their souls and bodies. This, however, was not a uniform and successful practice, with some borderline cases whose idiosyncratic meaning procedures ushered in an idea of communication as projective and dislocating.

2.2. Emblematics and metaphor

From a certain point of view, the relationship between emblematics and metaphor is so obvious that it could be taken for granted as a matter of fact. The reliance on symbolical conventions and on metaphorical procedures of signification was so strong that *imprese* were often identified with metaphors and, well into the seventeenth century, Tesauro summarized and perfected a century of theories "subsuming visual and verbal manifestations of ingegno under an 'interdisciplinary' notion of metaphor" (Gilman, 1978, p. 14). In his *Idea delle perfette imprese*, a short unpublished treatise probably composed before 1629, Tesauro (1975, p. 38) had already stressed that *imprese* featured "una perfetta somiglianza di proporzione" (a perfect similarity of proportion) emphasized by an "arguto motto" (witty motto) and that their invention was a splendid gift from the poets "essendo quelle sopra qualche metafora fabricate" (they being constructed on some metaphor; 1975: 45). Then, in his later and most famous treatise, Tesauro (1670, pp. 635–636) explicitly associated *impresa* and metaphors, defining it "metafora in fatti" or "metafora dipinta" (actual metaphor and painted metaphor) and concluding that "la Perfetta Impresa è una metafora" (the most perfect *impresa* is a metaphor).

These ideas stressed that emblematic artifacts were far from being the static, idiosyncratic creations of pedantic antiquarians and that their metaphorical affiliation was deeper than a superficial connection with a rhetorical figure. Emblematics was deemed superior to other existing forms of communication because its metaphorical features allowed for new possibilities to analyze and "tell" the world. The cognitive bearings and the peculiar capacity of teaching in an entertaining way thanks to its bimedial nature meant that an emblematic artifact, while customarily aiming at conveying messages in a pleasant but unambiguous way, was in fact a very complex artifact and featured syncretical elements, combined and valorised in their diversity in order to make the message richer and more fulfilling. The co-presence of verbal and visual elements, joined together though keeping their prerogatives, also implied a marked revision of the traditional roles and claims of communication in early modern discussions on the ways meaning was produced and figures signified: emblematic compositions utopistically tried to produce granted and reliable signs in a new form, "writable" texts whose non-artistic status underscored a typically unstable referential quality and stimulated the reader's hermeneutic cooperation.

These peculiar features demonstrate that emblematics can be fruitfully read in the light of some contemporary critical approaches, such as Conceptual Metaphor Theory, which stressed the inherently metaphorical nature of human communication.[6] However, when authors discussed the quality of their works and customarily defined metaphors from a comparative perspective,[7] they always had in mind a trope in which the function of designation had lost its centrality in favor of more conflictual aspects. Taegio (1571, p. 15v) for example, recommended that from both the figure and the motto "ne deriui non certezza, ma dubbio … Tal che di due cose incerte & imperfette ne riesca una certa, & perfetta" (derive not certainty but doubt … so that out of two uncertain and imperfect things a certain and perfect one may come out). Twenty years later, Capaccio (1592, p. 48v) explicitly praised emblematic compositions featuring "due Figure contrarie per antipatia, come il Fuogo col Leone, e con l'Elefante il Porco" (two figures contrasting each other due to antipathy, such as the fire and the lion, or an elephant and a hog) because an *impresa* which "haurà questa contraria maniera di Comparatione, sarà bella, e giudiciosa, più che quando gli ogetti saranno di Comparatione vniforme" (will have this contrary way of comparison will be more beautiful, and sensible, than when objects will feature a uniform comparison).

Emblematists would have undoubtedly subscribed to Ricœur's idea that the "tendency toward further development distinguishes metaphor from the other tropes, which are exhausted in their immediate expression" (2003, p. 224), because their emblematic constructs did not pursue a mere resemblance doubling what was clearly visible, but rather a similitude capable of revealing what known, recognizable objects hid behind the film of familiarity. Metaphors, in other words, were not only linguistic tools deployed to confirm shared concepts and ultimately overcome differences between apparently distant realities; the metaphorical quality which was extolled in an emblematic text was its capacity of generating new, creative conceptualizations.

This proves that emblematics shared with metaphors the same epistemological potential as described by recent scholars such as Black (1962), Ricœur (2003), or Prandi (2017), who variously highlighted their projective nature, their inherently dynamic and even conflictual essence. The open-endedness of metaphoric interpretation and the resulting wide range of implications that may be recovered are exactly what authors of *imprese* or emblems were after. Indeed, it was exactly the tendency of metaphors to transfer a concept into an alien domain which was prized for its cognitive bearings and as a pleasant instrument of interaction and creation.

6 The bibliography on Conceptual Metaphor Theory is broad. Apart from such fundamental classics as Lakoff and Johnson (1980) and Lakoff and Turner (1989), most ideas and theoretical issues are usefully summarized by Kövecses (2015).

7 Bargagli (1594, p. 37) saw the *impresa* as an "espressione di singolar concetto d'animo, per via di similitvdine" (expression of a singular concept of the soul, by way of similitude). Similarly, Capaccio (1592, p. 53r) averred that an *impresa* was "fondata nella Comparatione" (founded on comparison) and that comparison was "quasi forma dell'Impresa" (almost the form of the *impresa*; 71r). Taegio (1571, p. 16r) suggests that the meaning and noble concept of an *impresa* is visible "sotto il vago, leggiadro, & trasparente velo d'una accomodata similitudine" (under the charming, lovely and transparent veil of a convenient similarity).

Prandi (2017, p. 114) convincingly stressed that any metaphor "stems from the transfer of a concept into a strange domain" and that conflict is an inherent characteristic of metaphors and figurative language. In his view, conflictual metaphors are the consequence of a contingent interpretation of expressions that do not match with a consistent conceptual model, even if they follow a customary scaffolding at a syntactical level[8]: this means that "a conflict is not a structural property of the expression, but the outcome of a choice made by the interpreter" (2017, p. 42). Conflictual metaphors do not originate from the polysemy inherent in language, but from the perception of a set of inconsistent relations and a contingent interpretation of complex meanings. In other words, a "normal" linguistic form is used to convey new meanings and modify the consistent conceptual structures belonging to a shared heritage of everyday notions and expressions.

These ideas are particularly pertinent to emblematics: emblematists drew abundantly on metaphor because it was the most powerful and productive conceptual tool they could use to reassess the whole traditional lore of proverbs, commonplaces, and popular wisdom on which their compositions were built. The positive modification of an established vision of the world produced by the interaction between words and images meant that these artifacts refused to be merely perfunctory, claiming, on the contrary, the right to negotiate the world and create new meanings. By avoiding direct, referential descriptions in favor of more heuristic and creative conceptualizations, emblematic constructs fostered a tensional approach aiming at the same extension of knowledge as Carston (2010, p. 298) carved out for metaphor: "what a metaphor does is bring to our attention aspects of the topic that we might not otherwise notice, by provoking us or nudging us to 'see' the topic in a new or unusual way".

Similarly, the co-presence of incompatible elements (the verbal and the visual text, real objects and abstract categories, impossible chronologies and topographies and so on) in an otherwise well-arranged and disciplined formal text (an *impresa* or an emblem) implied a conflict between literal and metaphorical interpretation, a reinterpretation of the concepts and realities inherent in the tenor, a valorization of metaphor not in its substitutive but in its predicative aspect: in metaphors, Ricœur (2003, p. 292) suggested, "The copula is not only relational. It implies besides, by means of the predicative relationship, that what is redescribed; it says that things really are this way."

3. Discussion

3.1. Body and soul

The ideological and critical background outlined above provides a useful framework to recontextualize and discuss a few issues involving the relationship between metaphor and emblematics. Early modern treatises on emblematics, particularly the Italian ones on *imprese*,[9] made subtle distinctions and precise qualifications to define the various features of emblematic compositions, but all of them devote extensive treatment to the relationship between the verbal and visual parts, customarily describing them as the soul and the body.[10] This metaphorical conceptualization is particularly significant for a "new" form that allowed authors to use visual and verbal elements together, though their union was far from being innocuous. After all, in most Medieval thinkers, the source of truth was placed within the soul, while knowledge based on the senses was deemed as basically unreliable, necessary only to get along in the world, a doubtful mirror of a transient world if not a vehicle of temptation, which could not lead to happiness and produced a dangerous involvement of the soul with bodily sensations.

The distinction between body and soul acquired a new dimension after Giovio, in his seminal treatise, resorted to the same metaphor to describe the structural basis of *imprese*, although it was detached from moral issues to be specifically applied to an epistemological dimension. The correct balance between words (the soul) and images (the body) implied exhilarating but also dramatic epistemological negotiations between the verbal and the visual: since emblematic constructs were composite, hybrid signs, they also abolished the conventional separation between visual representation and linguistic reference and could thus overcome the Platonic stigmas against writing as a place of non-presence (denounced in *Phaedrus*) and images as false simulacra (condemned in the *Republic*). Emblematics was thus repeatedly stretched between the attempt to reconcile the visual-verbal dualism to extract knowledge from it, and the stimulating possibility of producing new constructs in which meaning potentials were left to proliferate in a sort of chain reaction; between an attenuating, didactic use in which images increasingly became mere illustrations of verbal texts, and an intensifying, productive use stressing the "mutual" reading of text and image.

The creation of this visuo-verbal experience inevitably entailed a model of communication in which the idea of a fixed, hierarchical relationship between authors and readers was repeatedly questioned: a dynamic, multi-layered textual form, theoretically prone to manifold interpretation, inevitably triggered a more unstable and performative form of viewership, activated by and dependent on a participatory reader, which in turn triggered fundamental questions involving the agency of texts.[11]

8 An inconsistent sentence "violates no formal distributional restriction. On the contrary, it is precisely its formal scaffolding, which is insensitive to the pressure of the connected concepts, that gives a sentence the strength to put together atomic concepts in a creative way" (Prandi, 2017, p. 56).

9 As Russell (1985, p. 31) reminds, in France devices tended to be simpler and endowed with practical functions, whereas in Italy *imprese* "tended to be more abstract, complex and conceit-like" and theoretical discussions were accordingly more widespread because of the wider range of symbolic motifs and the higher complexity of their interaction between verbal and visual parts.

10 Ruscelli (Giovio, 1556, p. 208) was particularly exacting as to the necessary coexistence of words and images intertwined in an analogical relationship, so that figures without mottos (or vice versa) did not mean anything and only "insieme uengano à rappresentare interamente l'intentione dell'Autor dell'Impresa" (together they come to represent fully the intention of the author of the *impresa*). Ammirato (1562, p. 10), too, stressed the link between words and images defining an *impresa* as a significant form "sotto un nodo di parole, & di cose" (under a knot of words, and things). On the various aspects of the body-soul dichotomy see the monographic issue of Emblematica (2002).

The resort to the body/soul metaphor quintessentially summarized this opposition: the theoretical discussions and definitions of early modern theorists extended the inherent tension of the human source domain into a conflictual conceptualization correspondent to the conflict between the two forms. When Giovio's terminology was partially superseded by Ruscelli's, the agonic relationship between words and images became even more central and, though it often resulted in the victory of the verbal over the figural[12] the necessary coexistence of visual and verbal elements meant that emblems and *imprese* were inherently paragonal meaning structures in which two opposing and apparently mutually exclusive forms were artificially made to coexist within the same representational space. This, in turn, means that emblematic constructs should be addressed as tensional forms in which the presence of heterogenous forms artificially bound together bore special cognitive relevance, and in which the decorative and moral functions could never erase the dynamic and conflictual nature of these artifacts. This may appear surprising if seen in the light of the huge corpus of comparative studies on emblematics which tend to privilege its cultural associations or intertextual allusions; however, an emblematic composition must not necessarily be treated as a "homogeneous site of ideological and semiological coherence" and can be more fruitfully approached as a "space of dispersion and sedimentation in which conflicting possibilities work in parallel with—or, in certain cases, against—authorial cl/aims and objectives" (Mermoz, 1989, p. 502).

Emblematics can then be considered as a privileged cultural moment in which some recent critical issues concerning the agonic relationship between the verbal and the visual found an initial, embryonical instance: the possibility of a semiotic regime where the world of things was inherently penetrated by discourse, together with the disruptive potential of a tensional, bimedial form, will acquire paramount importance in post-structuralist studies such as Foucault's or Barthes'. When Mitchell (1986, p. 49) discussed the conflictual relationship between poetry and painting, he again resorted to the body/soul metaphor, claiming that there are

> powerful distinctions that effect the way the arts are practiced and understood. [...] there are always a number of differences in effect in a culture which allow it to sort out the distinctive qualities of its ensemble of signs and symbols. These differences, as I have suggested, are riddled with all the antithetical values the culture wants to embrace or repudiate: the *paragone* or debate of poetry and painting is never just a contest between two kinds of signs, but a struggle between body and soul, world and mind, nature and culture.

Also Wagner's of discussion iconotexts[13] is particularly interesting form the perspective of emblematics, since he defines iconotexts as artifacts "in which the verbal and the visual signs mingle to produce rhetoric that depends on the co-presence of words and images" and, more specifically, "integrate the semantic (denotative and connotative) meaning of the written texts that are iconically depicted, urging the 'reader' to make sense with both verbal and iconic signs in one artifact" (Wagner, 1996, p. 16). This definition, which underscores how "the visual is as rhetorical as the verbal" (p. 33), could be easily applied to emblematics, although Wagner himself (p. 16) too hastily dismisses this possibility asserting that emblems were "a classical example of iconotexts which are, however, pre-determined in that the reader was expected to recognize and accept commonplace assumptions". On the contrary, as was repeatedly stressed above, in emblematics words and images were mutually interpenetrating (what Wagner terms intermediality: p. 17) and there was mobile intertextuality between texts and images when it came to semantic and rhetorical relations, so the reader was invited not to forget that this "mutual illumination" must not erase the difference and *différance* in each medium and between them.

3.2. Hermeneutic practices

Although the preceding section testifies to the conflictual nature inherent in emblematic artifacts, mirrored by a parallel conflictual metaphorical juxtaposition, it must be stressed that their primary function was never to create ambivalent compositions or foster ambiguity. The possible indeterminacy derived from lexical and meaning aspects, not from the structural construction of an emblem, even though the co-presence of visual and verbal elements, as argued above, made them a dialectical field of forces which were inevitably to be recognized and negotiated. As Pinkus (1996, p. 8) rightly stresses, "a hybrid, or combinatory, form like the emblem might effectively temper writing with images to mediate fears of misreading or dissimulation", but at the same time "the copresence of both word and image only increases the silence emitted, so the form could potentially be replenished with meaning by readers who are ill prepared to extract the one, true significance".

In a way, the metonymic evolution of emblematics was an inevitable consequence of the attempt to contain the conflictual metaphorization triggered by this tension between visual and verbal. After all, emblems themselves were born as a "bourgeois" form, a repository of moralistic ornaments in the form of Latin epigrams composed over several years by a learned Milanese jurist with an eminently practical function (see Alciato, 1531). However, even if they were less "noble" than *imprese*, emblems were structurally and semiotically more complex, with longer and more particularized texts accompanying more assorted and elaborated images, thus requiring a prolonged reading process.[14]

11 An emblematic creation was, by definition, co-created by the author and the reader and its impact as work of art was coproduced, confirming that "Relations are not just modes of regulation or encroachment, but inescapable conditions of being. In short, attachment and mediation are not obstacles to art's agency but essential preconditions of agency" (Felski, 2017, p. 169). On the concept of agency see Gell (1998).

12 On this see especially Mitchell (1986) and Gilman (1989).

13 On iconotexts see also Louvel (2011).

14 Being strictly personal and temporary statements, *imprese* were more prone to rely on metaphorical conceptualization, but something similar also happened to them: Paradin (1551) was a mere presentation of *devises* with just the motto and the image. Paradin (1557), however, radically changed the

The general idea of creating a text to convince and persuade in an entertaining way progressively yielded to a parallel necessity of limiting the multiplicity of meanings and painstakingly guiding their interpretation by making them as univocal as possible: the reciprocal mirroring of figures and words, which should induce an active appreciation from the reader in a sort of intellectual short circuit, was increasingly transformed into a sort of duplication, two media put together with illustrative and descriptive aims so as to circumscribe, contain and direct interpretation.

The tensional features of emblematic constructs, in other words, were not erased but redirected in order to exploit them for moral edification, even though this ideological practice was typically hidden behind the veil of merely witty, delightful entertainment.[15] The images, accompanied and interpreted by the verbal part, were fundamental to spark off the process of personal meditation, striking the reader's imagination and triggering emotions, but this was not the end of meditation because sensible forms must be abandoned at some point in a process of gradual abstraction leading to spiritual realities. From this point of view, images and figurative language were no more vehicles of truth but disposable imaginative aids for the anagogical advancement of the reader.[16] Quarles (1635, sig. A3r) made this explicit from the outset of his book by reminding the reader that an emblem was a "silent Parable" which must be "presented so as well to the eye as to the ear". It was basically a return to some well-established rhetorical strategies, such as the resort to *enargeia* through eye-catching images: Wilson's *Arte of Rhetorique*, the most popular Elizabethan treatise on rhetoric, recommended that "Images must bee set foorth, as though they were stirring, yea, they must be sometimes made ramping, & last of al, they must be made of things notable, such as may cause earnest impression of things in our minde" (Wilson, 1909, pp. 213-14).

Yet, the cognitive potential of the union of words and images was too powerful to be perfectly contained. Alternative interpretations and implications were always possible especially in those cases where long comments interacted with plurisemiotic images. The resort to longer texts, in other words, seemed to guarantee a canonical, orthodox interpretation but, at the same time, exposed the emblematic composition to the dangers of hermeneutic plurality.

FIGURE 1
From Rollenhagen (1613, p. 20).

An interesting example is provided by Rollenhagen's emblem 20 of his *Nucleus Emblematum Selectissimorum* (Rollenhagen, 1611), reused and radically transformed by Wither in his *Collection of Emblemes* (Wither, 1635). As is well known, the images in both books are the same (in his warning "To the Reader" Wither made no bones about declaring the excellence of Crispijn van de Passe's engravings): in the case of emblem 20, the figure shows a young, bare-chested man in the foreground holding a sieve over his head during a storm (the intensity of the rain is clearly expressed by the thick series of lines radiating from the cloud above); at his back, four hens (one spreading her wings, another one pecking something from the ground) are gathered near an empty farm cart, while in the background two people and a dog rush across an open space bounded by a village to find a shelter from the pouring rain. The image (Figure 1) is surrounded by a puzzling Latin motto, (TRANSEAT) which finds a similarly surprising explanation in the short text below it: "Perfer et obdura: Tempestas TRANSEAT olim,/Fulgebit puro laetior axe dies." In short, the emblem is a positive, optimistic invitation to endure and hang on, because the storm will end soon and the sun will shine brighter.

However, the whole composition features a series of elements which are clearly at odds with this interpretation. The idea of transience is clearly evoked through the sieve the young man holds above his head, but, as it turns out, it is meant in a more far-fetched

nature of the book: longish explanations were added to provide background information on the bearers of each *impresa* and a moralistic interpretation of the composition.

15 Whitney, for example, reminded his readers that obscurity amplifies the pleasure of discovering and understanding maintaining that the emblem is "some wittie deuise expressed with cunning woorkemanship, somethinge obscure to be perceiued at the first, whereby, when with further consideration it is vnderstood, it maie the greater delighte the behoulder" (Whitney, 1586: To the Reader). Stirry, in the ideologically rife year 1641, presented his emblematic book to his "iudicious Reader" as an "Aegyptian Dish drest after the English Fashion" (Stirry, 1641, sig. A2), resorting to the usual metaphor and rhetoric of the pleasant and mysterious symbolical composition even though his evident purpose was to level a bitter attack against the Church of England and to impose a very precise set of values on his readers.

16 On these aspects see Falque (2017).

way, not to describe the water literally sifting through its holes but to remind that the rain will stop and the sun will shine back soon. The contrast between the foreground and the background scene can also be interpreted as a confirmation of this: while gloomy clouds overhang the village in the far background and the people in the open space rush desperately to find shelter, the characters in the foreground give a radical different impression, the man in full light walking leisurely with the sieve above his head and the hens at his back calmly bearing the rain, perhaps already sensing the imminent return of the sun (from this point of view the radiating lines coming from the cloud seem to anticipate the radiating rays of the sun).

All this amounts to an inconsistent conceptualization of impermanence, in which the starting point is a concrete object metonymically connected to the idea of passing but here valorised as a conflictual metaphor to invite the reader to resort to his/her hermeneutic abilities, actively interpret the composition and eventually modify his/her perception of reality. Apparently, the emblem proposes a static example which progressively unfolds all its multiple configurations of ideas, ultimately amounting to a conflictual conceptual representation of Heraclitus' most famous idea that "everything flows" astoundingly evoked by the projection from the concrete domain of the sieve. In other words, impermanence is not the end of the story, it is used as an invitation to hang on in the rain but also in the act of interpretation: even more symbolically, it induces to look at the silver linings in life, because even the worst situations do not last forever and a positive outcome will emerge.[17]

The proliferation of meanings, however, does not stop here. The invitation "Perfer et obdura" irresistibly recalls Catullus' self-addressed invitation in *carmen VIII* to be strong and firm after the final break-up of his relationship with Lesbia. This potential amorous allusion further augments the emblem's resonance: are we reading a transposition of Catullus' poem, in which the end of a turbulent love relationship is conceptualized as pouring rain? Is the young man's ridiculous attempt to shelter his head with a sieve a metaphorical conceptualization to signify the inanity of sheltering from a loving passion, even if it has just ended sadly? Is the young man ironically "quoting" the poem, presenting his case as different from Catullus' (he must hold out because in the end things will get better, whereas the lovesick fool Latin poet tries to cheer himself up even though there will not be a positive outcome)? Is the emblem an invitation for readers to stop deluding themselves and be strong like Catullus, facing optimistically every day's difficulties instead of complaining? Are readers invited to consider the beauty of the young man's half naked body, stop being fools who worry and work hard instead of enjoying their lives and its pleasures? Or is the allusion to Catullus' poem simply meant to stress the illusory, transient nature of desire which will fade away like rain through a sieve?

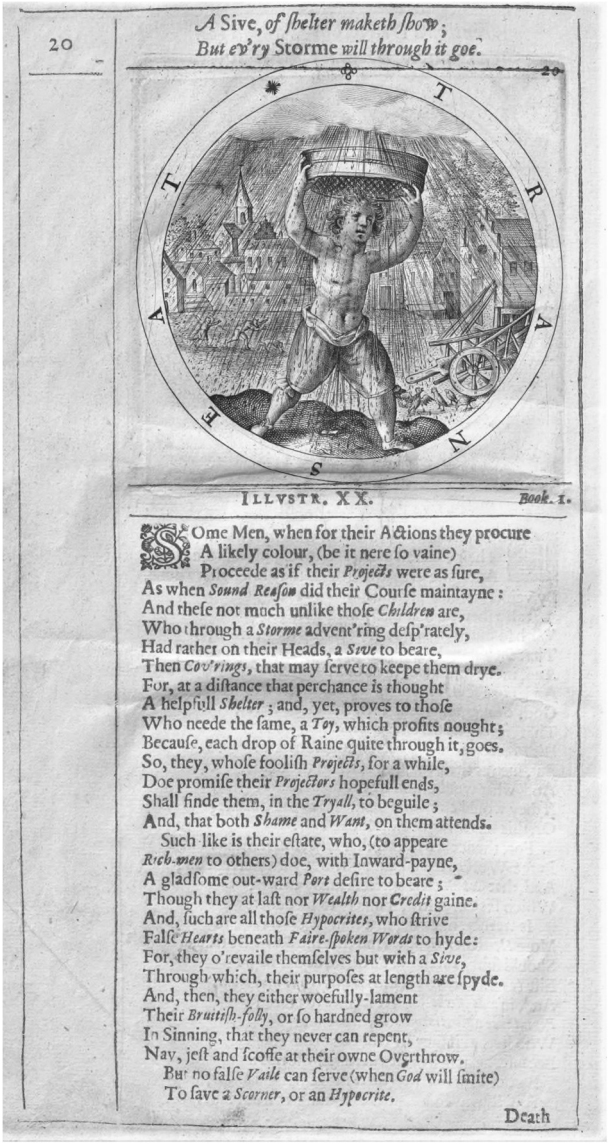
In any case, the interaction of the visual elements and the verbal allusions reinforce the impression of a centrifugal emblematic composition in which the words of the accompanying text do not tie themselves coherently to the image. The emblem amounts to a concrete, agonic ground where the verbal and the visual define two mutually distinct discursive regimes which coexist in a deconstructive activity investing both expression and signification. More importantly, it demonstrates that the teeming relationship between the visible and the expressible opens up a collateral meaning space on whose core lies a discourse imbricated in the unconscious energy of desire. In this emblem, designation has lost its centrality, it has been made permeable to libidinal forces, it has turned into the "figural" theorized by Lyotard (2001) as "more than a chiasmus between text and figure–it is a force that transgresses the intervals that constitute discourse and the perspectives that frame and position the image" (Rodowick, 2001, p. 2).

Whatever our interpretation of Rollenhagen's emblem, the allusion to Catullus' poem imposes a powerful input on the composition, reminding readers that the practice of vision imposed by emblematics was always a staggering world rife with desire. Having no pretensions to univocity, and relying more on conflictual conceptualizations than on moralistic truths, the emblem annihilates any tendency to monolithic textualism and valorises the emblematic montage as a paragonal blend where intellectual and intuitive cognition negotiates with desire and affects. The composite nature of the emblem makes the experience of reading not merely visual or intellectual, but fully embodied and affected by the material properties of the object, thereby producing outstanding cognitive effects.

Wither's version of the emblem is radically different (Figure 2). The short introductory couplet which introduces the composition (*A* Sive*, of shelter maketh show; / But ev'ry* Storme *will through it goe*; Wither, 1635, p. 20) immediately narrows down its content transforming it into a meditation on false appearances: no hermeneutic initiative is elicited from the reader, no stretching of imagination is encouraged, no conflictual conceptualization is triggered, no intertextual allusion to a distraught love passion is possible: the attention of the reader is just focused on the sieve which is taken in its exclusively material meaning as an ineffective shelter, not as a polysemous symbol of transience. The narrative character of the accompanying text is restricted and contained, aiming at conveying a single, central idea, the illogical action of the young man as a moral illustration of another illogical behavior which must be censored (hypocrisy). Visual and verbal are not put together and left free to interact in unpredictable ways: their association is governed by a methodical and rigid criterion and each detail is given a precise meaning. In short, there is no centrifugal input for the reader to start from the composition and infer or build new meanings, there is just a centripetal force which gets stronger and stronger in conveying and guiding the reader's attention and interpretation of a text in which pre-eminence is given to the verbal part, while the visual component is more and more relegated to the function of mere illustration.

The underlying principle of the composition, therefore, is an attenuating pursuit of equivalence based on similarity. There is no metaphorical conceptualization which deploys conflictual projection to valorise possible dialogical openings, no different interpretations of the compositions, no alternative meanings produced by the multi-layered image. The metaphorical nature of the sieve is clearly expressed, transformed into a comparison with

17 From this point of view the emblem is similar to n. 26, which curiously presents a similar image with a squirrel patiently enduring a heavy rain, and to emblem 82 in Rollenhagen (1613), the collection which provided the materials for Wither's Books 3 and 4.


20

A Sive, of ſhelter maketh ſhow;
But ev'ry Storme will through it goe.

ILLVSTR. XX. *Book. 1.*

SOme Men, when for their Actions they procure
A likely colour, (be it nere ſo vaine)
Proceede as if their *Projects* were as ſure,
As when *Sound Reaſon* did their Courſe maintayne:
And theſe not much unlike thoſe *Children* are,
Who through a *Storme* advent'ring deſp'rately,
Had rather on their Heads, a *Sive* to beare,
Then *Cov'rings*, that may ſerve to keepe them drye.
For, at a diſtance that perchance is thought
A helpfull *Shelter*; and, yet, proves to thoſe
Who neede the ſame, a *Toy*, which profits nought;
Becauſe, each drop of Raine quite through it, goes.
So, they, whoſe fooliſh *Projects*, for a while,
Doe promiſe their *Projectors* hopefull ends,
Shall finde them, in the *Tryall*, to beguile;
And, that both *Shame* and *Want*, on them attends.
Such like is their eſtate, who, (to appeare
Rich-men to others) doe, with Inward-payne,
A gladſome out-ward *Port* deſire to beare;
Though they at laſt nor *Wealth* nor *Credit* gaine.
And, ſuch are all thoſe *Hypocrites*, who ſtrive
Falſe *Hearts* beneath *Faire-ſpoken Words* to hyde:
For, they o'revaile themſelves but with a *Sive*,
Through which, their purpoſes at length are ſpyde.
And, then, they either woefully-lament
Their *Brutiſh-folly*, or ſo hardned grow
In Sinning, that they never can repent,
Nay, jeſt and ſcoffe at their owne Overthrow.
But no falſe *Vaile* can ſerve (when *God* will ſmite)
To ſave a *Scorner*, or an *Hypocrite*.

Death

FIGURE 2
From Wither (1635, p. 20).

a clear moral content. Even the possible ambiguity of the motto is here exclusively interpreted in its negative literal meaning (water flows through a sieve so the man you see here is doing something absurd) whereas in Rollenhagen's composition it was the element which triggered the surprising, positive idea that everything passes.

And yet, the choice itself of a long, severe reproof on those who "for their Actions … procure/A likely colour" (ll. 1-2) ironically reverberates on the author himself and his book. The "Preposition to this Frontispiece" which opens the *Collection*, for example, features a clearly antiphrastic strategy which apparently dismisses and disclaims the carefully crafted design and metaphorical richness of the image (made by the famous engraver William Marshall):[18] the original design was to be a "plaine Invention" whereas the image is a worthless misinterpretation of the author's true intention. On second thought, however, "Those Errors, and Confusions, which may, there, / Blame-worthy (at the first aspect) appeare" turned out to be fit and usable because the "Graver (by meere Chance) had hit / On what, so much transcends the reach of Wit, / As made it seeme, an Object of Delight", so much so that the reader is even invited to watch more carefully and try to decipher the meaning of the enigmatic picture:

> And, here it stands, to try his Wit, who lists
> To pumpe the secrets, out of Cabalists.
> … Moreover, tis ordain'd,
> That, none must know the Secrecies contain'd
> Within this PIECE; but, they who are so wise
> To finde them out, by their owne prudencies;
> And, hee that can unriddle them, to us,
> Shall stiled be, the second OEDIPVS.

Wither's initial rhetoric of disowning is, thus, a contrived but conventional form of authorizing and commending his book, a formula of mock-modesty which aims at underscoring the value of his highly wrought artifact. A similar effect is obtained by the ambiguous, double-dealing strategy in the warning "To the Reader": on the one hand, the author stresses that he has "*ever aymed, rather to profit my* Readers, *than to gaine their praise*" (sig. Av) and that his written intervention rescued and dignified the original "*dumbe* Figures, *little usefull to any but to young* Gravers or Painters; *and as little delightfull, except, to* Children, *and* Childish-gazers: *they may now be much more worthy; seeing the life of* Speach *being added unto them, may make them* Teachers, *and* Remembrancers *of profitable things*" (sig. A2). On the other, he admits that his "Illustrations" are the first that came to his mind, susceptible of improvement and limited by the formal requirements of the printed page:

> *I have not so much as cared to find out their meanings in any of these* Figures*; but, applied them, rather, to such purposes, as I could thinke of, at first sight; which, upon a second view, I found might have beene much betterd, if I could have spared time from other imployments. Something, also, I was* Confined, *by obliging my selfe to observe the same number of lines in every* Illustration*; and, otherwhile, I was thereby constrained to conclude, when my best* Meditations *were but new begunne: which (though it hath pleased Some, by the more comely Vniformitie, in the Pages) yet, it hath much injured the libertie of my* Muse. (sig. A2)

Also, the highly rhetorical "Authors Meditation upon Sight of his Picture" which closes the introductory material, is yet another occasion for Wither to dislocate his authority and role in order to celebrate them.[19]

18 For a full analysis of the frontispiece see Bath (1994, pp. 111-15).

19 This feature of Wither's volume did not pass unnoticed even in its own times: in his 1644 poem *Aqua Musae*, John Taylor, the "water poet" (Bath, 1994, p. 129) attacked Wither for being a sort of turncoat and reinforced this accusation by denouncing Wither's distancing from his books: "Thy picture to thy bookes was printed, put / With curious workmanship engrav'd and cut: / And verses under it, were wisely pend/Which fooles suppos'd were written by some friend. / Which God knowes, thou, I, and a thousand know, / Those lines

This whole strategy, then, does not seem to testify to an "awkward relationship of the author to his material" (Bath, 1994, p. 129): the symbolical images of the frontispiece and of the various emblems in the book can be acceptable only after they have been deconstructed in their literal, face value. But the ultimate purpose is not just to make a sophisticated self-celebration to extol the validity of what the reader has in front of him. As Wither openly admits, he does not think his "Illustrations … *will be able to teach any thing to the* Learned", whereas

> *they that have most need to be* Instructed, *and* Remembred, *(and they who are most backward to listen to* Instructions, *and* Remembrances, *by the common Course of* Teaching, *and* Admonishing*) shall be, hereby, informed of their* Dangers, *or* Duties, *by the way of an honest* Recreation *before they be aware* (sig. A2).

In other words, his text (a collection of 200 emblems assembled in a single, wonderfully illustrated volume which clearly only the rich and learned could afford) is for those who refuse instruction and the common forms of teaching and warning, that is, exactly those learned men mentioned above who need a more sophisticated and radical tuition: they will be honestly recreated (entertained, but also re-created) without even realizing it.

One would be tempted to say that the same accusation of falsity and hypocrisy which emblem 20 stigmatizes so vehemently is in fact one of the structural principles on which the whole *Collection* is built: the author's moralistic denunciation of insincerity and pretense is not very different from the folly of those who use a sieve as a shelter, both are actions "Through which, their purposes at length are spyde" (l. 24).

4. Conclusion

The idea of emblems and *imprese* as dislocating iconotextual constructs positively contributes to unsettling some critical judgments traditionally passed on them and grasp their genuine cognitive potential. In particular, emblematics' relationships with metaphor are an extremely fruitful field of investigation touching some fundamental epistemological underpinnings of early modern textuality. The metaphorical affiliations of emblematic compositions entailed a much deeper and more sweeping relationship than a general, predictable similarity between symbolical forms of expressions; for this reason, as this article tried to demonstrate, a stylistic approach to emblematics and its use of conflictual metaphorical conceptualizations seems particularly rewarding and goes a long way toward accounting for a textual form whose idiosyncratic meaning procedures ushered in an idea of communication as projective and dislocating, as a dialogic space allowing for the paradoxical copresence of ideological consistency and its deconstruction.

Undoubtedly, the "didactic turn" which made emblematic texts more and more descriptive caused an inversely proportional reduction of the reader's hermeneutic intervention: no metaphorical effort was invited; the idea of a meaning in progress was superseded; the text was no longer a starting point but the arrival of a meaning process which was set out and imposed from the outset. The emblematic text, in other words, progressively lost its allusive and stimulating aspects, forsaking symbolization in favor of description, becoming more and more exhaustive in order to stave off alternative interpretative possibilities: as Miller (1992, p. 69) perfectly summarizes in his discussion on illustration, "The elucidation of the graphic would interfere with the free growth of the verbale illustration, shade it, stunt it."

Later writers simply exploited the representative power of visual and verbal elements, leaving the cognitive dimension of their structural union aside: the teeming multiplicity of symbolical signification got attenuated and the verbal part was assigned the guiding role of providing the correct interpretation of the image. On the one hand, by describing and explaining what was already visible, the accompanying words did not aim at shifting signification to a different level. On the other hand, the image was made into a pleasing illustration to help memory and strike the imagination, emptied out of its signifying potentials, more and more an anchorage than a relay. The original, swarming relationship between emblematics and metaphor was thus radically revised and morphed into something completely different.

However, the manifold opportunities provided by the emblematic form could not be perfectly contained and, for this reason, the article also tried to shed light on some hermeneutic and ideological questions, drawing on some of the textual-conceptual functions analyzed by critical stylistics. The specific connotations, presuppositions and implicatures emerging from the different metaphorical conceptualizations discussed above encouraged the discussion of the positionings and negotiations of authors who variously dealt with the inherently plural modes of emblematic signification. Similarly, the insistence on the bimedial nature of emblematics and the importance of its integrated model of textual meaning-making is clearly redolent of multimodal studies focusing on how different semiotic resources and modes are integrated in their communicative functions and how representational and communicational modes are intrinsically connected.[20]

Of course, the article would have benefited from the investigation of a greater number of exemplary case studies and from more diverse critical methods, but such additions would have required more space than the one allowed for the present paper. The ideas presented here, however, hopefully proved that such complex, multifaceted textual forms as emblems and

(thy selfe praise) from thy selfe did flow, / Thou dotedst so upon thine owne effigies, It look'd so smugge, religious, irreligious, / So amiable lovely, sweet and fine, / A phisnomie poetique and divine: / 'Till (like Narcissus) gazing in that brook, / Pride drown'd thee, in thy selfe admiring book".

20 On critical stylistics see Jeffries (2010). On multimodal analysis see Kress and Van Leeuwen (1996), O'Halloran and Smith (2011), and Jewitt et al. (2016).

imprese require an equally wide critical approach, in which stylistics and metaphor studies may be fruitfully deployed in a synergetic way. Their joint use might also be integrated and supplemented with the insights and critical tools of corpus linguistic methodologies, text world theory, critical metaphor analysis, or social semiotics, in order to develop a larger theoretical framework and open up new perspectives to account for the cognitive, hermeneutic, and ideological richness of emblematics.[21]

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

21 For a recent survey on corpus stylistics see McIntyre and Walker (2019). On text world theory see Gavins (2007) and Gavins and Lahey (2016). On critical metaphor analysis see Charteris-Black (2004). On social semiotics see Van Leeuwen (2005). For some tentative steps in the direction of using a stylistic approach to emblematics see Borgogni (2015, 2019).

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Translator learners' strategies in local and textual metaphors

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Introduction: Metaphor is more than understanding and expressing an abstract concept in terms of a concrete one. Pre-linguistically, it is the conceptual creativity that resides in the entities yet to be expressed. Linguistically, it is the invention that expands the boundaries of words. Contextually, it is the preservation or generation of polysemy that brings about a confrontation of meanings. As such, metaphor is also a universal creative mechanism of semantic innovation and an artful discourse feature. Both Metaphor and Translation Studies, however, have mostly addressed conventional metaphors and professional translators, thereby neglecting students' behaviors when translating creative metaphors, especially at discourse level.

Methods/Aim: The main objective of this task-based descriptive study is therefore to investigate to what extent and how the translation strategies spontaneously adopted by 73 translator students are influenced by local, creative metaphors and by their textual patterning. The analysis of the data showed that while isolated, non-conflictual metaphors did not pose any challenges, the diverse patterns of conflictual ones hampered the translation outcome. At the micro-level, literal and explicitation strategies result in neutral, less connotative renditions. When omission prevails in correlation to metaphor clusters, the target texts appear more condensed, overtly informative, and lack the metaphorical diversity and cohesion of the source ones. As a result, the appealing linguistic jocularity deriving from exploiting metaphors and puns is toned down.

Discussion: Since students tend to avoid creative solutions, these findings will serve as a preliminary discussion on how students' strategic and textual competence can benefit from cognitive-informed, conflict-based inferencing skills by exploiting the metalinguistic nature of creative metaphors and puns.

KEYWORDS

novel metaphors, conflictual metaphors, conceptual metaphor theory, metaphor clusters, humor, metaphor translation competence

1. Introduction

More than forty years after the seminal work of the first generation of cognitive linguists, metaphor research is still providing fruitful ground for studying the interrelation between language and thought. Since then, metaphor has been addressed by a myriad of disciplines from different angles. In the midst of this proliferation, the field has now reached the fully-fledged status of "Metaphor Studies."

However, in the attempt to answer the call for a cognitive commitment by drawing on other disciplines (Lakoff, 1990), the main locus of cognition that can be empirically observed has been at times overlooked. Along with a multidisciplinary stance, the "systematic analysis of linguistic expressions" should lie at the core of Cognitive Linguistics (Gibbs, 1996; p. 42). Moreover, the binary opposition between conventional and novel metaphors has generated a biggest chasm at the heart of the field, leading to the appraisal of the latter as sporadic, extraordinary artifacts.

In opposing rare monosemy (Abass, 2007), metaphor is a universal artful means that expands the boundaries of meanings (Lundmark, 2005; Gan, 2015). If on the one hand novel metaphors create new conceptual boundaries where the older ones have been unset (Ricoeur, 1973), on the other hand they are potential future linguistic commonalities. At times, they can enter common usage and be lexicalized in the dictionary, thereby disguising their nature. At others, they preserve polysemy in the main locus of creativity: sentences (Ricoeur, 1973; p. 100). Insofar as texts "mean something as a whole" (Attardo, 1994; p. 69; Hempelmann, 2017), treating metaphor as a naturally occurring (Semino, 2008), dynamic phenomenon of discourse (Cameron, 2003) lying at the intersection of linguistic, textual, and conceptual factors allows us to investigate how complex meaning relations emerge in translation (Rizzato, 2021).

Along with the centrality and universality of the conceptual nature of metaphor, Translation Studies have inherited the neglection of its creative and textual factors at play in discourse (Schäffner, 2004; Dorst, 2016; Hong and Rossi, 2021; Rizzato, 2021). This is evident both in the bulk of studies addressing (mostly literary) professional translators' behavior (e.g., Jensen, 2005; Meneghini, 2018; Rojo and Meseguer, 2018; Kalda and Uusküla, 2019) and in the somewhat sparse ones that focus on students (e.g., Massey and Ehrensberger-Dow, 2017; Philip, 2019).

1.1. Metaphor, creativity, and humor

Novel metaphors have been largely equated to rhetorical figures and therefore mostly relegated to the backdrop against which Conceptual Metaphor Theory (Lakoff and Johnson, 1980) gathered momentum: the literary realm. As Cameron and Deignan (2006: 672) argue, "cognitive linguists do not generally seek to provide an account of novel metaphor use in non-literary discourse," mostly because of the apparent entropy of creative, idiosyncratic uses of language that does not align with the systematic motivation of conventionalized metaphors.

Traditionally, linguistic creativity was conceived of as not observable for occurring mostly at the parole level. In the generativist literature, it was then addressed as a natural mechanism of language production, therefore as mostly structural and rules (or principles) governed (Zawada, 2006). Such a view of creativity as creation, however, cannot give account of non-systematic, ad-hoc creations that require forms of momentary, situated cognition (Langlotz, 2016). Moreover, if the generation of syntactic and morphological structures is to a certain extent predictable, lexical creativity is less foreseeable and high-paced. It is not always possible to predict which lexical novelties will go beyond the *parole* level to become *langue*. The chief contrast, however, does not lie in the dichotomy sentences-words, as both are constrained by a set of norms and stem from speakers' need to express meanings not available in the standard repertoire (Zawada, 2006). It resides in the opposing forces of semiotic entities, signs, which are closed and finite, and semantic ones, the vehicles of meanings, which refer to the extralinguistic world and are therefore infinite (Ricoeur, 1973).

As preconceptual and prelinguistic, creativity is the need of novelty that discerns the continuum of the reality yet to be expressed via the most economical instrument as possible: our code. As linguistic, it is sensible to context and resides in sentences (Ricoeur, 1973). Under this view, it encompasses a wide range of phenomena which are placed along a continuum where the structural, predictable creation lies at the opposite end of the unpredictable (pre)conceptual creativity that drives it (Zawada, 2006). In accordance with such a view of creativity, metaphor is semantic innovation and discourse feature at the same time. By virtue of being a creative way of conveying messages, it interacts with other discourse mechanisms which mirror "playful human intelligence", like humor (Langlotz, 2016).

Classical theorists of linguistic humor, who find their pioneer in Attardo, mostly fall back on the theory of Incongruity-Resolution and on Greimas' notion of isotopy, of comprehension as disambiguation (Krikmann, 2009). The former posits that humor relies on the functional ambiguity (Ricoeur, 1973) and consequent incongruity stemming from polysemous language production. However, while polysemy is a feature of both words and sentences, ambiguity is a phenomenon of discourse emerging from the preservation of the former (Ricoeur, 1973). In the following examples:

1. Eliza passed the English exam.
2. Today, the sun is shining.

the first sentence is unlikely to generate ambiguity as it respects the Gricean relevance principle and delivers the information needed to decode the message (Grice, 1975). The second one, on the contrary, might induce the receiver to pause and formulate hypotheses on whether the sender intended the message in the literal, meteorological sense, or in the figurative one. The disambiguation is thus subdued to further contextual information.

Since any type of text can be ambiguous without being humors (Partington, 2009), especially if taken out of context (Attardo, 1994; Aarons, 2017), functional ambiguity was soon deemed as essential but not fully distinctive in humor identification. Conversely, incongruity remains the mainstream parameter. However, not all the humor is based on the incongruous juxtaposition of meanings/words. In Raskin's (1984: 110) famous example:

3. 'Is the doctor at home?', the patient asked in his bronchial whisper. 'No', the doctor's young and pretty wife whispered in reply. 'Come right in'.

a more evident script and a more hidden one, the one involving a doctor and the one involving a husband/lover respectively, form semantic networks of both lexical and non-lexical elements (Chiaro, 2017; Navarro, 2019). In this case, the two scripts are not "semantically incompatible" (Attardo, 1994: 133; Krikmann, 2009: 18) or "do not fit with our world view" (Navarro, 2019). By contrast, the membership categorization device in our mind that ascribes activities or characteristics to a group of people, namely to lexical elements (Housley and Fitzgerald, 2002), allows us to see the two personal categories (doctor and husband) as compatible and to understand the joke with such ease.

As ambiguity and possible incongruity nourish other figural speech like sarcasm and irony (Joshi et al., 2015), the specificity of humor might reside in marked and unmarked informativeness (Giora, 1991). Differently from informative texts that reduce the uncertainty of different interpretations, in this forced joke:

4. A: Did you take a bath? A man asked his friend who had just returned from a resort place
   B: No, only towels

the unprototypical script of stealing towels is inserted in the set of more prototypical and therefore accessible actions that can happen in a resort frame (e.g. washing oneself). Substituting the second exchange with a more informative answer (e.g. "no, I only took a shower") would explicate the implicatures, the surprise effect would be hindered, and the joke ruined (Giora, 1991; p. 472).

Like any discourse segment, text jokes present a manifold structure where the presentation of the input is followed by a comprehension mechanism subdivided in prediction, confirmation, and readjustment (if necessary). However, in jokes a surprise effect prevails (Giora, 1991). The punch line "only towels" is in fact a breach of expectations (Veale, 2004). Language communication requires fast processing of information, of context cues, and is dependent on our expectancy grammar (Oller, 1976; p. 4), a hypothesis internal generator underlying productive and receptive language skills. On a broad scale, language processing is a hypothesis making mechanism, as we are constantly monitoring what comes after (Oller, 1976).

By the same token, in the sentence "The first thing that strikes a stranger in New York is a taxi" (Raskin, 1984: 26), the two scripts, experiencing a sudden feeling and being hit by a car, are not utterly incongruous, otherwise the polysemous mechanisms that conventionally equates the experience of an extremely strong emotional state with a physical one (e.g., lightning) would be incongruous as well. In this specific case, it is the distance between the two meanings, along with their conceptual connection, that is emphasized to create the linguistic jocularity. More specifically, the two meanings that are competing are firstly momentarily fused and then separated, before being combined again to cause witty amusement (Kyratzis, 2003).

The disjunctor, the verb *to strike*, triggers a switch in the script, breaking the linear interpretation of the segment and changing the direction of the comprehension (Aljared, 2017). When the reader stops at the disjunctor, they are compelled to backtrack and revise their interpretation. A connector, the ambiguous term, usually precedes the disjunctor or they can coincide, like in this case, and prompts the script overlapping (Attardo, 1994). On these premises, in most humor the comprehension appears to be dislocated in a subsequent string of text and in time (Attardo, 1994).

While the doctor and the bath examples are types of jokes, the taxi one is a form of pun, the most common type of humor (Kyratzis, 2003). Broadly speaking, a pun is a specific form of humor that exploits the structural characteristics of a language system "to bring about a [...] confrontation of two (or more) linguistic structures [...]". These linguistic structures have "more or less different meanings" triggered by "more or less similar forms" (Delabastita, 1996; p. 128).

Being a borderline phenomenon (Krikmann, 2009), puns usually overlap with bridge metaphors, the most common type of indirect metaphor, especially in advertising and headlines. As ludic uses of language, they resemble Leeper's optic illusions that, nearly simultaneously and most probably deliberately, disclose a more basic, concrete meaning, and a more abstract, figurative one at the same time (Nacey, 2013; p. 182). For instance, in the church inscription "Exercise daily. Walk with the Lord" (Nacey, 2013; p. 172), the image of physical exercise is fused with the spiritual mundane one evoked by the prepositional phrase "with the Lord."

While it is easier to distinguish jokes and non-jokes for the narrative, usually punch-lined nature that generates surprise in the former (Giora, 1991; Dore, 2015), it is not as straightforward to tell a pun and a non-pun apart. The problem is that while surprise and laughter are more quantifiable, the intellectual amusement that characterizes puns is a more elusive concept (Schoos and Suñer, 2020). Due to their common dyadic nature, research has fallen short on drawing the line between metaphors and puns. While a pun is metaphorical if it entails a more concrete and a more abstract meaning, bridge metaphors and puns cannot always be discerned, as the answer would probably lie in the intention of the speaker/writer. In the scarce extant literature on this matter, the emphasis has been put on the domain boundaries, suppressed in metaphor and maintained in humor (Hempelmann and Miller, 2017). Briefly put, humor is not inherently metaphorical, and a metaphor becomes humorous if the speaker, intentionally or unintentionally, brings the attention to the boundaries of the two domains to emphasize their distance and to create friction. If metaphor enhances the similarities, humor plays on differences (Krikmann, 2009) to generate conceptual conflicts.

Polysemy and ambiguity, incongruity/opposition, comprehension delayed; reinterpretation, and disambiguation usually guide the distinction between humor and non-humor. As none of these parameters are devoid of drawbacks, a taxonomy at hand for the present purpose could focus on the semantic/phonological features involved (Attardo, 1994). Generally, puns can rely on morphological, syntactic and lexical features, and can be subdivided into syntagmatic (or horizontal), and paradigmatic (or vertical) puns. In the first both linguistic elements, or sound strings (SS), are present ("A: Where is the rent? B: In my trousers"). In the latter only one SS is visually available and the other one has to be retrieved by the reader ("A: I'm Toulouse-Lautrec. B: Where are you going to lose him?") (Attardo, 1994; Partington, 2009; Aarons, 2017). On a broader scale, the former is a type of phonological semantic puns, whereas the latter is a phonological syntactic one (Aarons, 2017). In sum, puns can exploit the signifier(s) and the signified (i.e. its polysemy). In the first case, the sound features involved would rely on homonymy (same wording and sound), mostly homography rather than homophony solely, and rarely on paronymy (similar sounds) (Vandaele, 2011).

1.2. Metaphor, translation, and specialized discourse

The research traditions of metaphor and translation are deeply intertwined. On the one hand, translation has been investigated, at times too simplistically, in metaphorical terms (St. André, 2017). On the other hand, the way metaphors are rendered in another language has revealed the underlying cognitive processes at play when translating. In concert with the major trends in Translation Studies, metaphor translation research has in turn gradually disengaged from the purely linguistic-level of

equivalence-based approaches (Newmark, 1988), to extensively delve into the pragmatic notion of *skopos* and to marginally disentangle the fabric of discourse (Dorst, 2016).

Two shifts have proved to be particularly advantageous in the study of metaphor translation: the descriptive and the cognitive ones. As it is primarily conceptual and linguistic at the same time, rather than rhetorical solely (Lakoff and Johnson, 1980), metaphor has no longer been addressed as a prospective translation problem in prescriptive approaches (e.g. Newmark, 1988), but as a solution in descriptive paradigms, therefore in retrospection (van den Broeck, 1981; Schäffner, 2004; Toury, 2012).

Mandelblit (1995) was among the first scholars to adopt the cognitive vantage point on metaphor translation by stressing the importance of shared (SMC) or different mapping conditions (DMC), where the latter might incur higher cognitive load and conceptual shifts. As the corroboration of the theory provided by Al-Zoubi et al. (2006) points out, even in the case of shared conceptual conditions, different linguistic instantiations can occur. For instance, while English and Italian share the mapping conditions of TIME IS MONEY, in Italian *time* cannot be *spent* as if it were money, unless a bizarre calque is chosen when translating (Rizzato, 2021). Conversely, the conventional metaphor *to waste time* poses no challenge when rendered from English into Italian, as the concept is derived in both languages from *to waste money*. In such a vein, translating conventional metaphors means to transpose the commonalities through which conventional metaphors address reality, while it becomes a matter of reproduction of semantic conflicts in novel ones (Prandi, 2012).

The creative metaphor in Emily Brontë's verse "winter pours its grief in snow" (Prandi, 2012; p. 149), for instance, generates a conflict in our mind where the image of winter pouring liquid in a container is competing with our common understanding of seasons. In order to carry out such an action, winter needs to acquire anthropomorphic features, and, at the same time, grief needs to be transformed into a more tangible entity, into a liquid that can flow in its container: snow (Prandi, 2012). When tension arises from preserving polysemy, it originates from conventional metaphors too, as novel metaphors seldom stem from lexicalized ones. A case in point is the above-mentioned taxi example ("The first thing that strikes a stranger in New York is a taxi"), where the verb *to strike* generates a semantic contextual tension from punning on a conventional, bridge metaphor. Here the two meanings, the more concrete and the more metaphorical one, are contextually concurrent and, as complex, need to stretch into the fabric of discourse to be framed (Prandi, 2017).

Bridge metaphors, puns and their overlapping (conflictual metaphorical polysemy henceforth) are more than play with words and sounds, they are play with ideas in a cooperative meaning construction. When framed into discourse length, any linguistic form acquires a communicative intent (Widdowson, 2007). If the addressee is in the same paratelic, non-serious state (Navarro, 2019), the text becomes dialogic (Bakhtin, 1982). Differently from forced humor where the intentions of the first speaker are compelled into a different interpretation by a second one, in written puns (or in conflictual polysemy in general), the reader is called to indulge themselves in ending the lexical conflict they are presented with (Attardo, 1994; Partington, 2009). In essence, conflictual meanings signal the parts of the text on which the reader should linger longer. If the pun is solved, a virtual intimacy bonds the sender and the receiver (Zawada, 2006). This is especially so for homonyms which disguise their nature and could lead the most attentive of the readers to think of themself as the only ones able to spot them (Bartezzaghi, 2017).

These assumptions might attest to the extensive use of conflictual metaphorical polysemy in many types of specialized texts, especially advertising and tourism discourse. In inflight magazines, for instance, a hybrid genre combining both, the potential tourist-client is guided, while already traveling, into a fictional world where the potential future destination is depicted as an agent, mostly through movement verbs (Cappelli, 2007) and metaphors. While becoming an active participant, future tourists are *infotained,* informed and amused at the same time (Maci, 2012; Khan, 2014; Dorst, 2016; Djafarova, 2017).

In preserving conflictual metaphorical polysemy, what tourism advertising exploits is not the indirect use of persuasive meanings, but the ostentation of the playful, cognitive overload required in the comprehension process. If comprehension is the reduction of multiple readings, jokes require higher reading times (Giora, 1991). Although reception and comprehension have long been regarded as synonyms, lexical conflicts are not merely receipted but constructed in an active form of meaning making. After the mere reception of the message, when letters and words are automatically decoded, comprehension proper emerges from the interaction between the message received and the recipient's world knowledge (Royer and Cunningham, 1981). This process thus generates a mental representation in our mind enriched by the world knowledge that has become part of the comprehended message.

2. Materials and methods

The bulk of studies addressing metaphor translation is mostly descriptive, corpus-based, and product-oriented (Rosa, 2010). Furthermore, considering the significant scholar attention directed to professionals and conventional metaphors (e.g., Prandi, 2012; Sjørup, 2013; Hewson, 2016; Jabarouti, 2016; Kalda and Uusküla, 2019), student translators' behavior and novel metaphors are still not sufficiently addressed (some exceptions being Jensen, 2005; Massey and Ehrensberger-Dow, 2017; Nacey, 2019; Nacey and Skogmo, 2021), especially in relation to discourse (perhaps with the sole exception of Figar, 2019).

To remedy these shortcomings, the theoretical framework of Descriptive Translation Studies (Toury, 2012) is in this study combined with cognitive approaches to metaphor translation. The aim is therefore twofold: to investigate the strategies adopted by student translators when addressing creative metaphors and to discuss whether and how local and textual metaphors have a different bearing on the translation task. While we cannot directly observe metaphorical reasoning in the mind (Gibbs, 2017; Steiner, 2021), the translation strategies adopted can be interpreted as the tangible indicators of intangible, mental processes (Lörscher, 2005; p. 599; Chesterman, 2020; p. 32). Going beyond a mere product-oriented analysis, a process-oriented discussion of the

way metaphors are perceived is also built upon the data collected through a retrospective report.

The sample examined is composed of 73 Italian students of a BA in translation and presents an intermediate level of English proficiency. Since students' specialization was translation of tourist texts from English into Italian, their L1, the material used for the data elicitation consists of 5 short texts taken from EasyJet's inflight magazine *Traveler*. It is important to stress that the students did not receive explicit training on how to identify metaphors and translate them, nor were they previously exposed to the metaphors targeted in this study. The rationale is that the way students *spontaneously* deal with novel metaphors might shed light on whether and how creativity needs to be *explicitly* addressed in Translation Pedagogy.

The texts were purposely selected for being highly metaphorical in nature and for presenting both isolated non-conflictual metaphors ($N = 31$) and conflictual ones clustered in other textual patterns ($N = 28$) (Cameron, 2003; Dorst, 2016). This way students would be mainly challenged by a varied typology of individual and patterning metaphors rather than other lexical, textual or pragmatical features (Nacey and Skogmo, 2021).

The non-conflictual metaphors include mostly prepositions and expressions like *behind the scenes*, *rumbling* and *get* in Text 1, *comes* and *DNA* in Text 2, *matching* and *panels* in Text 4. The conflictual ones can in turn be subdivided into homonymic ($N = 18$) and idiom-based puns ($N = 10$), the latter relying on paronymy via substitution (*take it cheesy* or *take the pith*), insertion (*go emmental*), extension (*Feeling blue? There is a cheese for that*) or alteration (*get off on a-peel*) (Partington, 2009). Since the classification of conflictual metaphorical polysemy explained in paragraph 1.2 is not devoid of problems, the bridge metaphors found in the texts will be treated as *potential* puns.

While the homonymic puns pivot on both conventional mappings, if a more concrete and a more abstract meaning is documented in the dictionary, and on novel ones, if the extension of the meaning of the word or expression is contextual (see Table 1), idiom-based puns stem from conventional metaphors (see Table 2). In the former, the tension arises between the conventionalized meaning and the contextual one (Samaniego Fernández, 2002), in the latter punning consists in de-automatizing the figurative meaning and revitalizing the literal one (Kyratzis, 2003). However, the metaphors based on conventional mappings can also bring about conflictual polysemy in a specific context of use. For instance, the adjective *juicy* in *uncover a juicy crime* (see Text 2 in Appendix B) usually presents two conventionalized meanings: being full of juice and being interesting. In this context, it is unusually juxtaposed to a theft of oranges, evoking the *in absentia* image of spilling orange juice but referring *in presentia* to an interesting event. The same can be inferred for *bottle*, as usually bottles contain liquids, not *karma*.

The individual conflictual metaphors identified depict feelings, events, and choices by drawing predominantly on two metaphorical themes: MOVEMENT (in the form of WAR and SPORT) and FOOD. These themes are locally interrelated and give rise to clusters of metaphors aiming at preserving the coherence of the text (Kimmel, 2010). As a discourse-oriented approach to local metaphors can be operationalized if the investigation starts from the latter (Dorst, 2016), first individual metaphors were manually identified through the MIP(VU) method (Steen et al., 2010), then clusters where discerned by calculating the Moving Metaphoric Density (MMD). In this cumulative frequency procedure (Pollio and Barlow, 1975; Cameron and Stelma, 2004; Nacey, 2019), the total number of metaphors is divided by the arbitrary number of 20 (the interval) and multiplied by 100. The MMD is then marked on the midpoint of progressively longer intervals (1-20; 2-21; 3-22;

TABLE 1 Percentage of strategy distribution for homonymic puns.

		M-M	M-M2	M-NM	M-Ø
Conventional mappings					
Text 1	(1) Arms race	19.17	2.73	76.71	1.36
	(2) Kicks off	12.32	9.58	73.97	4.10
	(3) Face-off	34.24	10.95	52.05	2.73
Text 2	(4) Reach	52.05	0.00	16.43	31.50
	(5) Peak	56.16	2.73	8.21	32.87
	(6) Turbocharge	8.21	10.95	5.47	75.34
	(7) Feeding	17.80	2.73	0.00	79.45
	(8) Dishing out	12.32	10.95	69.86	6.84
Text 5	(9) Uncover	84.93	6.84	4.10	4.10
	(10) Juicy	76.71	9.58	10.95	2.73
Novel mappings					
Text 2	(11) Bottle	94.52	0.00	5.47	0.00
	(12) Squeezing in	9.58	4.10	5.47	80.82
	(13) Hit	93.15	0.00	4.10	2.73
	(14) Point	73.97	2.73	13.69	9.58
	(15) Pack	95.89	4.10	0.00	0.00
Text 4	(16) Rolls	0.00	8.21	79.45	12.32
	(17) Big cheeses	10.95	46.57	34.28	8.21
Text 5	(18) Jam-packed	4.10	79.45	13.69	2.73

TABLE 2 Percentage of distribution of strategies for idiom-based puns.

		M-M	M-M2	M-NM	M-Ø
Text 1	(19) Made the first move	75.34	10.95	13.69	0.00
Text 2	(20) Get our hands dirty	76.71	0.00	21.91	1.36
Text 3	(21) Take it cheesy	9.58	6.84	70.08	5.47
	(22) Feeling blue	2.73	17.80	79.45	0.00
	(23) Get a slice of the action	67.12	2.73	27.39	2.73
	(24) Go nuts	2.73	0.00	91.78	4.10
Text 4	(25) Go emmental	13.69	39.77	36.98	9.58
Text 5	(26) Take the pith	0.00	54.79	41.09	4.10
	(27) Caught orange-handed	71.23	26.02	2.73	0.00
	(28) On a-peel	0.00	58.90	31.50	9.58

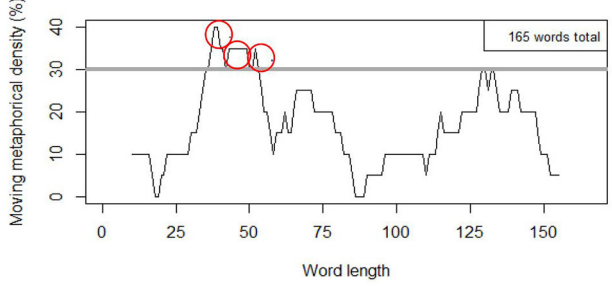

FIGURE 1
MMD of Text 1.

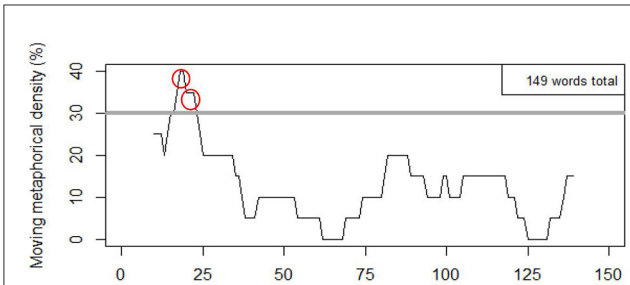

FIGURE 2
MMD of Text 2.

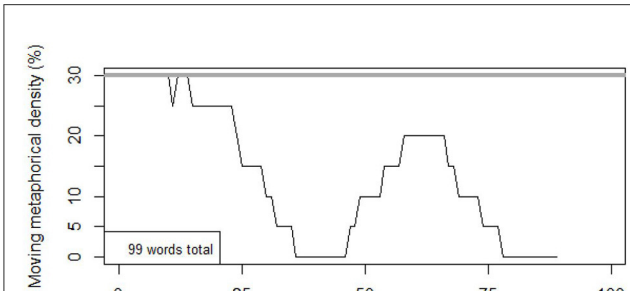

FIGURE 3
MMD of Text 3.

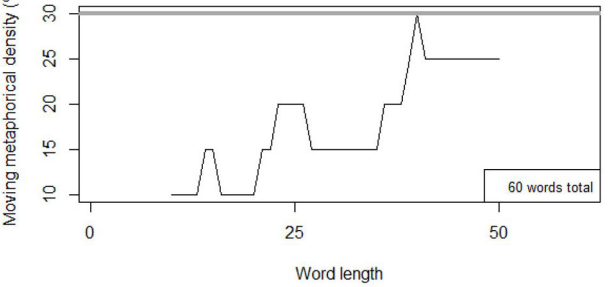

FIGURE 4
MMD of Text 4.

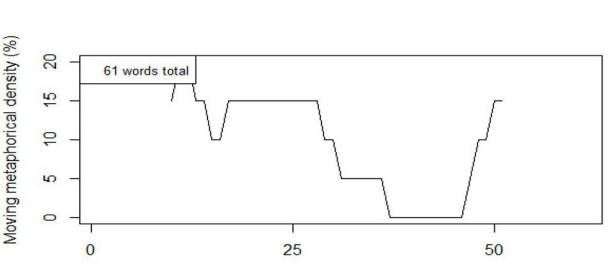

FIGURE 5
MMD of Text 5.

etc.). However, the presence of multiple related metaphors in the same discourse is not always a cluster, which is instead recognized as such in relation to its surroundings, as a sudden increase in the MMD (> 30%) (Cameron and Stelma, 2004; Littlemore et al., 2014; Dorst, 2016; Nacey, 2019). When visually displayed (Figures 1–5), this procedure showed significant bursts of metaphors (Cameron and Stelma, 2004) occurring at the beginning of Text 1 and 2 (see Appendix B).

Since MIP(VU) can mostly identify lexicalized metaphors, it can only marginally detect novel ones. If the expression does not present a more concrete, basic meaning in the dicitonary (MacMillan Dictionary, 2023), it cannot be considered metaphorical. In the case of bridge metaphors and puns, however, a more concrete meaning is oftentimes realized contextually. Cases in point are *jam-packed* and some of the idiom-based puns that could not be marked as metaphorical (i.e. *cheesy*, *go nuts*, go *emmental*, *caught orange handed* and *a-peel*). Consequently, the MMD of the three last texts is higher than what the histograms show.

Whitin the clusters, different topical patterns (Cameron and Stelma, 2004) tend to intertwine and revolve around the two metaphorical themes identified (Dorst, 2016). For instance, *arms race*, the pun in the title, is later repeated in the body of Text 1 (Dorst, 2016) where the theme of WAR/SPORT is extended through the lexical items *kicks off* and *face-off*. In line with Figar (2019), Text 1 emulates the cluster dynamicity typical of marketing discourse. In this text, CONFLICT metaphors are employed to bring the reader into the action and to guide them to see *arms race* as a "race of arms". Moreover, this initial WAR expression (*arms race*) is mixed with SPORT metaphors (*kicks off*, *face-off* and *made the first move*) in the body of the text. While WAR metaphors frame a particular representation, SPORT ones extend it (Koller, 2003).

Intertextually, we find another SPORT metaphor in Text 2: *reach peak smugness*. While the twofold metaphor WAR/SPORT (Koller, 2003) recurs also in Text 2 (*hit*, *point*), the FOOD theme is the most recurrent one as it refers to different topics in 4 out of 5 texts: the smoothie that is good for the planet, and for our conscience too (Text 2); the vegan cheese (Text 3); the cheese festival (Text 4) and the theft of oranges (Text 5).

Besides metaphor patterning, other translation challenges can be posed by the presence of SMC (e.g. *kicks off*; *face-off*), partially SMC (e.g. *big cheeses*, *jam-packed*, *take the pith*) or DMC (e.g.

rolls; *go nuts*; *take it cheesy*) and by conflictual metaphorical polysemy (homonymic and idiom-based puns). To classify the metaphors the students opted for when completing the task, MIP(VU) was also adapted to the Italian translations provided by the informants by using appropriate dictionaries for the target language (i.e. Treccani and Sabatini Colletti) (Treccani, 1929; Sabatini and Colletti, 2004). The strategies used were therefore labeled through Toury's framework which presents the potential benefits of considering renditions that enrich the target text with metaphors absent in the source one (see strategies 5 and 6) (Toury, 2012):

1. Metaphor into same metaphor (M=M)
2. Metaphor into different metaphor (M-M2)
3. Metaphor into non-metaphor (M-NM)
4. Metaphor into zero (complete omission) (M-Ø)
5. Non-metaphor into metaphor (NM-M)
6. Zero into metaphor (addition, with no linguistic motivation in the source text) (0-M).

Moreover, to examine the translations of the puns, the strategies were further classified through Delabastita' guidelines (1993):

1. PUN > PUN: the pun is translated if its polysemy and homonymy are preserved;
2. PUN> PUNOID: the pun is rendered into a pseudopun by using another rhetorical device (e.g. rhyme, alliterations, repetition, or irony);
3. PUN>NPUN: the pun is omitted.

As a compensation for the loss in the latter two strategies, addition (Delabastita, 1993) by permutation in previous or subsequent segments of the text (Holst, 2010) can occur in the form of NONPUN>PUN or ZERO>PUN.

Since neither Toury's nor Delabatista's frameworks can provide information about students' awareness of the local and textual metaphors (Maalej, 2008; Nacey and Skogmo, 2021), the data collected on the product (i.e., multiple translations of the same metaphor) is corroborated with delayed online evidence of possible mental processes. Two days after the translation task, completed in 2 h by using both offline and online tools (like dictionaries or search engines), the students were asked to self-assess the challenges faced. Through open-ended questions, they were instructed to reread the texts, report the words or phrases they considered difficult and explain why.

In the texts selected, most metaphors are indirect. At times, metaphorical expressions can be signaled by expressions like *kind of* or *sort of* (like in the case of *the size of Greenland* in Text 1). At others, punning on bridge metaphors and textual patterning can also function as signaling, as invitations to tune the brain into a figurative mode (Nacey, 2013). However, this does not guarantee that a metaphorical textual representation (Tian, 2020) is at play in the participants' minds.

3. Results

The analysis of the translations, presented thoroughly in Appendix A, revealed that non-conflictual metaphors, which are neither clustered nor interrelated, posed no challenge in the translation task, as they were all rendered metaphorically using the strategy M-M. Eight of the conflictual metaphors presented in Table 2 (*reach*, *peak*, *uncover*, *juicy*, *bottle*, *hit*, *point*, and *pack*) were also translated adopting the same strategy. These encouraging results could initially imply that students tried to preserve the metaphorical nature of the addressed items. However, the non-metaphorical translations used for the lexemes (1), (2), (3), and (8), notwithstanding the presence of a conventionalized, highly accessible counterpart in the target language, might reveal that the isomorphic strategies are actually mirroring a direct transfer (Holst, 2010). The seemingly automatic preservation of contextual (conflictual) meaning in combination with similar mapping conditions can in fact spontaneously produce metaphors (Gebbia, forthcoming). For instance, *uncover juicy crime* was perhaps rendered as *scoprire un crimine succoso* by selecting the first accessible meaning of each component.

Seemingly, the literal strategies used for (1), (2), (3), and (8) reveal the tendency to neutralize the metaphorical charge of the expressions by choosing a less connotative sense that successfully gets the message across. For *arms race*, the WAR expression *corsa agli armament/alle armi* was disregarded in favor of the more neutral *competizione* (backtranslation: competition). *Kicks off* was rendered as *inizia/ha inizio* ("begins/has begun"). The alternative *calcio di inizio*, chosen by the 12.32% of the sample, changed in turn the syntactical structure of the sentence but preserved the SPORT domain by conveying the image of the first kick that signals the beginning of a soccer game. Likewise, *face off* was translated as *confronto/scontro* in lieu of a sportive *faccia a faccia*, while *dishing out* was rendered as *consegnerà/darà* (backtranslation: will give) instead of *servirà*, where only the latter comes from the FOOD domain (Gebbia, forthcoming).

The predilection for an explicitation micro-strategy (Holst, 2010), however, is detrimental to the conflictual metaphorical polysemy evoked by the texts both locally and textually. The clusters at the beginning of Text 1, for instance, rotate around the ACTION verbs/nouns *arms race*, *kicks off* and *face off*, which are not only play *with* words but also *on* words as *arms*, *kicks*, *face* stem from the domain of BODY PARTS, usually involved in WAR or SPORT EVENTS. Ultimately, not preserving them in the translation process results in overlooking the communicative effect of the text (Gebbia, forthcoming).

By contrast, the predominant micro-strategy used in correspondence to the clusters of Text 2 is deletion (M-Ø). As Table 2 shows, although the majority of the sample (75.34% and 72.60%) preserved the metaphors (4) *reach* and (5) *peak*, a high percentage chose to delete them. This tendency increases with (6) *turbocharge* and (7) *feeding*, despite the presence of shared mapping conditions in Italian that could have favored the translation outcome. While literal translations are usually regarded as renditions close to the original, omission is considered a more creative strategy departing more extensively from the source text (Nugroho, 2003; Holst, 2010; Ageli, 2020). However, in this case, omission might indicate a compensation mechanism for the hampered comprehension caused by the clustering of metaphors. By means of example, these students' translations:

Thought you'd *reached peak* smugness by *squeezing in* your five-a-day? What if you could *turbocharge* that glow by *feeding* your conscience too?

(S12) Avevi pensato di raggiungere il massimo del compiacimento mangiando tutte le tue 5 porzioni di verdure giornaliere e nutrendo la tua coscienza? (backtranslation: Did you think you reached the peak of smugness by eating all your 5 portions of vegetables and feeding your conscience?)

(S23) Mangi 5 porzioni di verdure al giorno? E se potessi nutrire anche la tua coscienza? (backtranslation: Do you eat 5 portions of vegetables a day? What if you could feed also your conscience?)

(S39) Mangi molte verdure? E se potessi mettere il turbo anche alla tua coscienza? (backtranslation: do you eat a lot of vegetables? What if you could turbocharge your conscience?)

(S54) E se potessi raggiungere il limite delle 5 porzioni giornaliere più velocemente nutrendo la tua coscienza?" (backtranslation: What if you could reach your five-a-day faster by feeding your conscience?).

Result in condensed, paraphrased sentences that appear to have the sole aim of expressing the main message of the passage.

Differently from homonyms that mostly occur in the clusters at the beginning of Texts 1 and 2 (see Supplementary Table 4 in Appendix A for an overview of their translations), the idiom-based puns appear in shorter texts with a narrative structure that emulates the scripts typical of jokes (see Supplementary Table 5 in Appendix A). This is especially true for Text 5 where the narration depicts Seville oranges as so delicious to be object of a criminal action. The story also takes an unexpected turn with the punch line "the thieves will no doubt (wait for it) get off on a-peel," which gives rise to a catchy and humorous ending.

While the presence of homonyms is concealed in the fabric of the texts (Jared and Bainbridge, 2017), idiom-based puns might be easier to notice, especially in the case of structural alterations (e.g. the aforementioned eye pun *get off on a-peel*). The predominance of M-M and M-M2 translations for metaphors 19, 20, 23, 27, and 28 might thus lie in these assumptions.

As it stands, (19) *made the first move*, (20) *get our hands dirty* and (23) *get a slice of the action* could also be instances of direct transfer, since the counterpart of the former two idioms is highly accessible in Italian. Similarly, a simple transposition of the compositional meaning of *get a slice of the action* generates a metaphor in the target text. The creative renditions of (25) *go emmental*, (27) *caught orange-handed* and (28) *on a-peel*, in turn, might be indicative of the activation of the metaphor device. Although rendering *go emmental* as *imbufalirsi* substitutes craziness with anger, it similarly creates a conflictual polysemy in the target language that exploits an Italian type of cheese, *mozzarella di bufala*, derived from a subtype of bovines. An extended idiom was instead used for the altered one *caught orange-handed*, which was translated as *colti con le mani nel sacco* (*di arance*), maintaining the image of the oranges and the metonymy THE HANDS STAND FOR THE CULPRIT. In turn, *avranno salva la buccia/la pelle* (backtranslation: will have their skin saved) does not maintain the domain of LAW, thereby changing the metaphor (M-M2). More specifically, *buccia* metonymically refers to the skin of a fruit, while *pelle* to the life of a human being.

The same strategy was used for the paradigmatic pun (26) *take the pith*, altered in its structure by substituting *fifth* with the paronymic *pith*. In this case, *arrivare al succo* o *al nocciolo* does not preserve the LAW domain of the expression *in absentia* but renders the idea of the essence of a fruit. Yet, a vast majority of the sample (41.09%) rendered *take the pith* literally. Perhaps on the face of different mapping conditions, similar challenges were probably posed by (22) *feeling blue* and (24) *go nuts*. The idiom *Feeling blue?* in Text 3 is extended and complemented by the exclamation *There is a cheese for that*. Here, the color is not only suggesting a sad feeling but is also indicating the marbled patterns of molded cheeses. In Italian, fermented cheeses are oftentimes referred to as "blue", but the color does not assume emotional connotations. Therefore, it was translated mostly literally as *ti senti triste*? (backtranslation: *are you feeling sad*?) and only marginally metaphorically (M-M2) as *ti senti giù*?, which in turn relies on the spatial metaphor SAD IS DOWN. As for *go nuts*, probably forged by relexicalization (i.e. acquisition of new meaning) (Partington, 2009) on the same structure of *go global/green*, it was rendered as *scegli le noccioline*, neglecting the image of becoming extremely excited and preferring the sole one of "choosing nuts", therefore a vegan cheese.

Relexicalization, extremely common in most phraseplay, is also active in the altered idiom (21) *take it cheesy*. After the original idiom (*take it easy*) is brought back to its multicomponential nature where each word is processed individually, it is delexicalized to generate a new expression that does not virtually attain any new meaning (Partington, 2009). However, *take it cheesy*, the expression *in presentia*, shares more meaning with the expression *in absentia* (*take it easy*), while conveying the feeling of cheese. This linguistic illusion enables our brain to adopt a stereoscopic or gestaltic vision and to perceive two meanings concomitantly, one in the foreground and one in the background (Giora, 1991; Nacey, 2013).

Since English and Italian are mostly conceptually close but syntactically and phonological anisomorphic (Ozga, 2011), paradigmatic puns based on paronymy (i.e., *take it cheesy*, *go emmental*, *take the pith*, *orange-handed* and *on a-peel*) might pose a translation challenge. While in most puns rendering both the content and the duality of the original pun can be a challenge (Chiaro, 2010), preserving the fourfold structure of paradigmantic puns based on paronymy is an even more ambitious, at times unrealistic, goal to attain as it would mean to maintain the element *in presentia*, the one *in absentia* and their respective semantics.

As Table 3 shows, the translation of metaphors was also hindered by different mapping conditions. For instance, not only does (16) *rolls* convey the image of something arriving on wheels and in large amount, but it could also refer to cheese rolls. While this verb was mostly rendered as *arrivare* (79.45%) ("to arrive"), the only metaphorical attempt is represented by substituting the original image with the one of lending a ship in *approdare* (8.2%).

Generally, preserving the metaphor results in preserving the pun as well. As metaphors (15, 16) and (24) show, changing the metaphor (M2) can also maintain the pun if the source and target language share similar mapping conditions. This is not the case for (25) *go emmental* in its mostly adopted rendition *uscire di testa* (backtranslation: go out of own's head), which preserves the

TABLE 3 Mapping conditions and translation strategies.

	MC	M	PUN
Homonymic puns			
(1) Arms race; (2) Kicks off; (3) Face-off; (8) Dishing out	SMC	NM	NPUN
(4) Reach; (5) Peak; (9) Uncover; (10) Juicy; (11) Bottle; (15) Pack	SMC	M	PUN
(6) Turbocharge; (7) Feeding; (13) Squeezing in	SMC	Ø	Ø
(16) Rolls	DMC	NM	NPUN
(17) Big cheeses	pSMC	M2	PUN/NPUN
(18) Jam-packed	pSMC	M2	PUN
Idiom-based puns			
(19) Make the first move; (20) Get our hands dirty; (23) Get a slice of the action	SMC	M	PUN
(21) Take it cheesy; (22) Feeling blue; (24) Go nuts	DMC	NM	NPUN
(25) Go emmental	DMC	M2	NPUN
(26) Take the pith	pSMC	M2	PUN
(27) Caught orange-handed; (28) On a-peel	pSMC	M	PUNOID

meaning of becoming excited but not the type of cheese. As for *big cheeses,* this compound can be rendered in Italian as either *pesci grossi* or as *pezzi grossi*. Both these metaphors convey the metaphor IMPORTANT IS BIG but only the latter creates a pun as *pezzo*, a "piece" of something, could stand for a piece of cheese, while *pesci* ("fish") clearly cannot.

Like *big cheeses*, *jam-packed* is also based on partially SMC as the counterpart *stracolmo* is grounded on the same image schema of CONTAINER but lacks the idea of a jam encapsulated in the etymology (Hoad, 1996). In turn, a punoid is generated through the insertion of a parenthetical explanation in *colti con le mani nel sacco* (*di arance*) (backtranslation: caught with one's hands in the sack of oranges) offered as translation of metaphor (27). Similarly, the rendition of the eye pun *get off on a-peel* as *avranno salva la buccia/pelle* (backtranslation: they will save their peel/skin) preserves the image schema of the CONTAINER (skin), that metonymically stands for someone's life, but omits the formal feature, therefore generating a punoid.

Lastly, it is surprising to note that although most of the puns found in the clusters were reported as challenging, students did not highlight their figurative charge as the main reason for the difficulties faced while completing the task and explained that in most cases (87%) they could not find the correct contextual meaning in the dictionary. Another case in point is the fact that no student adopted the last strategy in Toury's framework and did not try to compensate for the loss of metaphoricity in other parts of the text. When the reproduction of the entertaining function of the source text is not as straightforward, compensation could actually constitute a valuable functional approach (Chiaro, 2010).

These findings add evidence to the hypothesis of direct transfer underlying the renditions that maintain the metaphorical charge of some of the conflictual expressions. Despite their creative and deliberate nature, local puns and their patterning did not disclose their metaphoricity. The questions thus arise of how students can be taught to identify conflictual meanings and of whether cursory or sporadic instances of individual invention can become the norm in the translation classroom.

4. Discussion

Despite the directionality of the task, the sample showed an inclination to explain puns, rather than translate them. At the micro-level, this explicitation strategy is reflected in the predisposition toward literal translations that predilect the more neutral, less connotative meaning. In a given context, we are primed to prefer an interpretation over another one (Giora, 1991). When translating from the L2 into the L1, however, the literal meaning of a figurative expression might exert a negative priming effect (Saygin, 2001) in the comprehension process and might hinder the inferencing mechanism essential in decoding conflictual metaphorical polysemy.

Being predominantly engaged in a sense-oriented approach (Lörscher, 2005), the students' semantic translations (Ageli, 2020) generate, at the macro-level, informative, clearly understandable texts. This isomorphic behavior, however, fails to reproduce the pragmatical effect of the source texts, as not preserving the local metaphors is detrimental to the textual persuasive function. If on the one hand, the explicit meanings are successfully conveyed, the implicit ones are lost and the communicative, appealing effect is toned down. As a result, the target texts appear simpler than the original one in terms of lexical diversity and of the dialogic nature of the metaphors. In other words, students' textual representations (Tian, 2020) do not appear metaphorical in the main, as omitting local metaphors or changing semantic domains results in a loss of the original metaphorical themes.

As ambiguous combination of two meanings based on similarity of sound/form, puns trigger a conflict in the recipient's mind. As such, puns are cognitively interesting, or difficult to decode and translate. Indeed, depending on the degree of entrenchment of its meanings and on the encyclopedic and lexical knowledge that the recipient possesses, the disambiguation process might not be as automatic for non-native speakers (Lundmark, 2005). Moreover, because of the phonological anisomorphism of English and Italian, preserving both the formal and semantic features of conflictual metaphorical polysemy could be an unattainable goal (Chiaro, 2017). This is probably why students mostly preserved the meanings of the puns and rarely maintained both the sign(s) and the signifier(s). This was especially so when paronymy was at play (*take it cheesy*, *go emmental*, *take the pith*) or it interacted with alteration (*on a-peel*).

Perhaps out of the fear of departing too much from the original text, the students did not venture into possible creative renditions. Only a minority of the sample tended to create metaphors out of novel mappings, whereas the majority relied more heavily on conventional ones. Translations like *braccio di ferro* (backstranslation: arm wrestling) for *arms race*, *ripieni di marmellata* (backtranslation: full of jam) for *jam-packed* or *prendila con un cheese* (backtranslation: take it with a "cheese",

that is a smile) a bilingual pun that preserves both the form and meaning of *take it cheesy*, are rare exceptions. This is in line with Atari (2005) and Jensen (2005) who found that students tend to avoid knowledge-based strategies in favor of language-based ones requiring a less cognitive load, namely a less articulated inferencing mechanisms.

When humor "does not travel well" in the translation process (Chiaro, 2017; p. 414), the combination of linguistic and cultural specificity of jokes or witticisms constitute the major obstacles to a functional translation. On the one hand, humor is generated by the combination of wit on words, which relies on language, and wit on facts, which rely on a complex repertoire of world knowledge (Chiaro, 2017). On the other hand, humor appreciation is culturally dependent and what is considered amusing in a language/culture might be less so in another. Students' L2 and L1 proficiency, along with their encyclopedic knowledge or cultural competence, could thus contribute to the predilection for more creative strategies and, as such, could be objects of future investigations.

Differently from linguistic creativity, creativity in translation is to a certain extent constrained by the local and global features of the source text. Therefore, it should be object of explicit training (Rojo and Meseguer, 2018). Moreover, when creativity emerges from the conflictual meanings evoked by metaphors, it is subdued to metaphor competence, to the ability to comprehend and use metaphors in a language, in this case in L2 (Danesi, 1992; Littlemore and Low, 2006). As Table 3 showed, puns can be maintained if the metaphor they exploit is preserved or recreated as well.

While cognitively oriented approaches have been proved to be beneficial to the translation of metaphors (Hanić et al., 2016), Conceptual Metaphor Theory solely (e.g., Jabarouti, 2016) cannot consider the complexity of local and textual mechanisms at play when bridging literal and figurative meanings. While in some cases a conceptual metaphor may motivate linguistic expressions (like KARMA IS A LIQUID which motivates *bottle good karma*), in other cases it is a matter of underlying image schemas (such as the CONTAINER that motivates *jampacked vehicles*) or of interacting semantic domains (e.g., SUSTAINABILITY, GOOD KARMA and FOOD in Text 2 or CRIME and FOOD in Text 5). As seen earlier, interacting metaphorical themes, rather than overarching conceptual metaphors in the form of A IS B, emerge at the discourse level (MOVEMENT AND FOOD).

Combining a conflict-based paradigm with the main tenets of metaphor competence would in turn address the pragmatical competence essential when translating semantic tensions (Vandaele, 2011; Rizzato, 2021). After explicit training on the dialectic of metaphors, translator students can learn to make informed, creative choices, locally and consequently textually, if the improvement of their strategic sub-competence (PACTE) follows Hewson' three stages 2016. The preparation phase includes the identification of the problems through inferencing processes and deep analysis. It is followed by the translation proper, aiming at reproducing local and global cohesiveness (Delabastita, 1994). The last phase, the revision one, can therefore be the locus of creative rewriting. Since translating conflicts might mean to manage linguistic and conceptual asymmetries (Massey and Ehrensberger-Dow, 2017), in this phase students could evaluate whether their translation reproduce or create new tensions in the target text.

As it lies both in the creations and in the creators, in the problem solving and in the solutions found, creativity has been proved to be related to longer revision (Rojo and Meseguer, 2018). Since reflective competence is a prerequisite for textual analysis skills (Massey and Ehrensberger-Dow, 2017), the preparation phase is the most crucial one and could develop inferencing mechanisms as follows (Gebbia, forthcoming):

1. Is the word/expression polysemous?
2. Is the literal meaning suppressed?
   Yes→ It is not a pun
   No→ It is a play with words
   → **2.2**. Is the form relevant? Has the form been altered?
   Yes→ It is also a play on words (i.e. play on sounds).
   If possible, reproduce or recreate a play on words in the TL
   No→ Try to preserve only the polysemy

Subsequently, a guided deep analysis of the linguistic choices of the source text could be initiated by these questions:

1. Is the pun based on a conventional metaphor? Can you find two meanings (one literal, one metaphorical) in the dictionary?
2. What are the two semantic domains creating a conflict in this context?
3. What are the associations foregrounded in the conflict?

Conversely, the revision phase could be prompted by these questions:

1. Can you preserve the two meanings by preserving at least one of the semantic domains used in the source metaphor?
2. Can you preserve the form too? If not, can you change the pun by substituting it with an altered or extended idiom?
3. Are metaphors reiterated, connected within the same text or in between texts? Which semantic domains are valuable to the overall function of the text?

In light of the explanations offered in the self-report and in line with Jin and Deifell (2013), students rely on the resources used to decipher contextual meanings, even novel ones, and tend to choose the first accessible option they encounter. As the facets of students' extralinguistic knowledge might not align with those of native speakers, instrumental competence, the ability to exploit the resources at hand (PACTE, 2011), should lie at the core of the revision (Hewson, 2016). Students should be sensitized on how to engage in longer negotiations with the source text and to find alternatives to the normative solutions in the extra linguistic knowledge documented in the resources used.

Going beyond the established discussion in grammatical and lexical terms, textual competence should in turn be addressed in the revision phase. In a cognitive vein, it should be treated as "an integrated competence in presenting the mental representations prompted by the ST in a coherent and justifiable manner in the TT" (Tian, 2020; p. 124). It should thus revolve around the notion of scenes/frames (Hewson, 2016) or text worlds (Tian, 2020), and the local metaphors should be investigated as world-building elements

(Tian, 2020) in order to identify the elements to keep, sacrifice or reframe.

In sum, Hewson's three stages combined with a conflict-based approach that favors local and textual inferencing mechanisms can help students to move from a holistic approach to an analytical one, to finally shift to a synthesis phase where they can appreciate the communicative functions of local metaphors as fundamental means of textual cohesion.

5. Conclusions

Metaphors mostly originate from the need of expanding the boundaries of words to express "new semantic situations" (Ricoeur, 1973; p. 107). Under this view, not only is metaphor an established way of understanding and talking about a more abstract concept in terms of a more concrete one, but also artful creation which may eventually give rise to linguistic conventionalities. What is ultimately universal about metaphors, then, is the (pre)conceptual creativity that drives novel and conventional linguistic usage.

Conceivably, it is going beyond the systematicity of metaphors to delve into the dynamics of creativity that we can give account of metaphor as both linguistic and conceptual (Cameron and Deignan, 2006). If conventional metaphors are residual creativity stemming from the common behaviors of a linguistic/cultural community, novel ones represent a self-propelled mechanism of linguistic change (Maturana and Varela, 1991), rather than mere deviations from the norm.

Since translator students are challenged by conflictual metaphors, both locally and textually, well-established cognitive-oriented strategies should be combined with conceptual conflict models (Prandi, 2017; Rizzato, 2021) to raise awareness of the pragmatical interconnections of metaphors in discourse. As a starting point, metaphor translation competence could be put into the limelight of Translation Pedagogy by exploiting the metalinguistic power of puns. Ambiguity and conflictual meanings are not an essence of words, like polysemy, but a relation in discourse (Ricoeur, 1973). For their poetic and interpersonal function (Koller, 2003), puns can be a stimulating task that forces students to put themselves in the audience's place and to look at the interaction of meanings. Moreover, translator students should learn to feel comfortable at departing from the source text and leaving implicit meanings "between the lines." To help them in such endeavor, guided inferencing mechanisms should corroborate the development of strategic competence as a prerequisite for the textual one.

Although future studies could probably operationalize conflict-based paradigms in the vein of the one here proposed and corroborate it with more in-depth online interviews, this study has yielded important findings on the relevance of explicit training for translation creativity. Puns, as linguistic games, are the epitome of the creativity underlying conceptual conflicts by means of preserving polysemy at the word level, and generating ambiguity, at the discourse one. They can thus function as a metalinguistic laboratory where students can explore the creative possibilities the source language exploits and the ones the target one has to offer.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcomm.2023.1177658/full#supplementary-material

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Exploring pandemic metaphors in educational contexts: a survey on the language of teachers and educators in Reggio Emilia, Italy

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This study aimed to explore how metaphors were used to interpret the pandemic and to address its challenges in primary and secondary schools in Reggio Emilia, Italy. A questionnaire was administered to educators and teachers to understand how languages, images, and metaphors were used by themselves and their students to talk about the pandemic and their experiences of living with it. The goal of the questionnaire was to guide critical reflection and encourage more informed language choices. While the existing literature points out the alleged overuse of war metaphors and military frames in public discourse, our findings show that war metaphors are relatively frequent, with other metaphorical frames widely used by teachers and educators to foster resilient attitudes in students. Moreover, in their professional contexts, teachers and educators mostly use metaphorical frames involving resilient attitudes. Our interpretation of the results supports the hypothesis that the purposeful use and deliberate production of metaphors support the choice of metaphors with positive, constructive implications. Finally, some implications of these findings on the theory of metaphor and the methodology of the research are discussed.

KEYWORDS

war metaphors, language in education, pandemic (COVID-19), metaphor theory, creative metaphors, pragmatic implications

Introduction

Metaphors have been considered powerful devices in such areas as medicine and healthcare communication, with scholars investigating their role as cognitive tools to acquire knowledge, share illness experiences, and promote healthy behaviors (Gibbs and Franks, 2002; Nie et al., 2016; Semino, 2018; Macagno and Rossi, 2019; Hauser and Schwarz, 2020). This topic has also found resonance in the public and cultural debate, especially regarding the issue of the "war on cancer" (Sample, 2019). The best-known reference in the debate on the use of metaphors to discuss illnesses is the essays by Susan Sontag (1978, 1989), who had led more generally (as noted in Piazza, 2022) a critical discussion of the consequences of language choices on the experience of the sick person.

Beginning in 2019, with the spread of the Coronavirus pandemic, the use of the metaphor of war has been the focus of widespread discussion for many months. Numerous interventions, critical of the "war on the virus" metaphor, have been published in newspapers and journals (i.e., Craig, 2020; Tisdall, 2020, in Italy, Battistelli, 2020; Costa, 2020; Lingiardi and Giovanardi, 2020; Semino, 2020; Solidoro, 2020; Sturloni, 2020; Testa, 2020).

The primary focus of studies on the potential dangers of using war metaphors to discuss the pandemic has been on public communication. The need to apply emergency measures with a serious impact on the community has increased the importance of public communication, and scholars have noted extensive use of military metaphors by institutions and politicians.

> «Esta guerra porque de uma verdadeira guerra se trata dura há um mês, começou depois dos vizinhos europeus, e, também por isso, pôde demorar mais tempo a atingir os picos da sua expressão» (Marcelo Rebelo de Sousa, 18 March 2020).
>
> « Nous sommes en guerre […] J'appelle tous les Français à s'inscrire dans cette union nationale […]. Nous sommes en guerre, oui. […] Hissons nous, individuellement et collectivement, à la hauteur du moment» (Emmanuel Macron, 12 March 2020).
>
> «Every generation of Americans has been called to make shared sacrifices for the good of the nation. To this day, nobody has ever seen what they were able to do during World War II.
>
> Now it's our time. We must sacrifice together because we are all in this together, and we will. Come through together. It is an invisible enemy. That is always the toughest enemy, invisible.
>
> enemy» (Donald Trump, 18 March 2020).

Scientific studies, preceding the pandemic, have already documented the widespread use of war metaphors in public discourse (Karlberg and Buell, 2005; Flusberg et al., 2018). In recent years, new studies have discussed the pervasiveness of the war metaphor for discussing the pandemic in public discourse (Benziman, 2020; Gillis, 2020; Castro Seixas, 2021). Additionally, Wicke and Bolognesi (2020) recorded its application in the language used in social networks, where the war framework was the most commonly utilized option among the figurative frames. Several studies have provided support for the critical stance toward the use of this metaphor, for several reasons. The metaphorical frame was judged to be inappropriate and reductive to the complexity of the pandemic. In other cases, it is regarded as the cause of cognitive misunderstandings, as it shifts the focus away from aspects that are important for understanding the reasons for the phenomenon and its prevention (Farruggia, 2020). Other scholars believe that it is not effective in reinforcing positive (empathetic, supportive) reactions and attitudes, and that other metaphors "that make social cohesion and solidarity salient" should be preferred (Schnepf and Christmann, 2022). Some authors go to unconditional criticism: Bates (2020), for example, accuses the war metaphor of provoking a "rhetorical incoherence and undermine policy response to SARS-CoV-2" and calls for the rejection of war as a metaphor for understanding COVID-19 (for a review of motivations in the literature, see Olza et al., 2021; Panzeri et al., 2021).

The arguments for rejecting the metaphor of war seem to share deterministic assumptions. Such a presupposition may be derived from a radical cognitivist interpretation of Lakoff and Johnson's studies, according to which metaphoric mapping is grounded in predetermined conceptual structures and has the effects of rigid and unambiguous selection in the receiver's beliefs. Bates (2020), for example, understands Lakoff and Johnson (1980) and Lakoff (2004) to argue that metaphor acts as a "strong frame" because "the very structure of cognition *may cause* speaker and auditor to view the entailments of the metaphors as being true" (my emphasis).

Contrarily, the idea of deterministic framing of metaphors, and war metaphor in particular, has been discussed and reviewed in both theoretical and empirical studies. An important reference is Flusberg et al. (2018), who partially corrected some previous studies and proposed a contextual perspective, according to which the meaning and consequences of war metaphors are intimately tied to the context in which they are used. Thus, the authors warn against the blanket statements about the war frame since they are misguided or overly constraining: "the fear evoked by war metaphors can be de-motivating, but the war metaphor may also be useful in encouraging preventative behaviors" (Flusberg et al., 2018, p. 7; *cf.* Piazza, 2022). Recent studies in sociology, philosophy, psychology, and semiotics have followed the same lines. For example Marino (2021), calls for acknowledging that war metaphors often do not evoke concepts or images of the literal domain of war and do not stimulate real projections or interactions between concepts (*cf.* Bolognesi, 2021). The author calls for practicing "interpretive charity" toward this linguistic use, questioning the prevalence of the war metaphor without risking presupposing its reasons and consequences. In the field of empirical studies, Panzeri et al. (2021) argued experimentally that the willingness to accept war-congruent claims about the pandemic is not directly influenced by war metaphoric framing *per se*, and is favored by socio-political individual variables and sources of information (Panzeri et al., 2021, p. 11). Analyzing various empirical studies, Benzi and Novarese (2022) concluded that the current evidence does not support the claim that the use of metaphor can lead citizens to accept limited civil liberties and authoritarian policies. Among the studies reviewed, they mention the study on Twitter communication by Wicke and Bolognesi, which attests that war framing is indeed often used to talk about specific topics, such as the treatment of the virus, but not others, such as the effects of social estrangement on the population. The use of the frame thus seems consistent with limitations that, according to critical scholars, are always on the point of being ignored and exceeded in linguistic practice. Benzi and Novarese consequently agree with Flusberg et al. (2018) about the importance to not assume "a preconceived attitude on the use of the metaphor," thus assigning misleading power to the frame: they consider the unconditional criticism of the use of the war metaphor unfounded and choose other options than rejection of the metaphor itself.

However, some of these studies, critical of the deterministic action of frames, remain aligned with some of the premises of the Conceptual Metaphor Theory. For instance, Panzeri et al. (2021) accept that war functions as a "structural metaphor" in Lakoff and Johnson's (1980) terms, since there are several correspondences between the cluster of notions of the source domain "war" and the notions that might be associated with the target domain "pandemic": e.g., "the virus and an enemy; health professionals and an army…eliminate the virus and victory" (Semino, 2020).

The current study aimed to explore the metaphorical language used to talk about the experience of living with the pandemic in primary and secondary schools in Reggio Emilia (Italy). The framework of this study partially adjusts the CMT perspective with the concept of interaction, which was firstly defined and developed by Black (1955, 1977) and more recently resumed and enhanced in studies on multimodal metaphors by Forceville (1998, 2016), transdisciplinary studies on metaphor in communication (i.e., Gola and Ervas, 2016) and philosophical studies on metaphors and creativity (Contini, 2018). According to Black's perspective,

metaphorical expression does not merely reflect and express linguistically a structural correspondence between the concepts involved in the projection, but rather helps to establish, to enable correspondence. As Ricoeur wrote (1975), "resemblance," in the sense of appearing similar, is (also) a product of metaphor: a human being, for example, does not have the same features as a wolf, except for metaphorical transposition, and resemblance is an act, a process enacted with the resources of the imagination. According to the interaction view, there is no reason to argue *a priori* that the use of war words ("soldiers," "alert," "front of war") determines the framing of the pandemic as "war," or is indicative of the implementation of a military conceptual structure. Instead, it can be argued that the use of a metaphor is effective based on analogy and underlying conceptual correspondences, but that the implications and meanings produced depend on the context of use. Thus, metaphors of war (i.e., "the need for everyone to mobilize and do their part on the home front"), can work to effectively communicate the need for "taking social distancing orders and hand washing recommendations seriously" (Levenson, 2020) without this usage disposing a structured and unambiguous framing of the pandemic domain.

Based on this perspective, it becomes important to value the role of the receiver as the interlocutor in a communication (Piazza, 2020; Steen, 2008) and to devote adequate attention to the "emphasis" function of metaphor (*cf.* again Black, 1977, pp. 440–441) and its capacity, of Aristotelian memory, to present, to "put before the eyes" and "make seen" (Ricoeur, 1975, Aristotle, Rhetoric 1410b: 32–34). The interactive view calls us to remember that the cognitive function of effective metaphors, capable of making a concept thinkable and significant, depends on an "insight" that is a function of imagination. "Good" metaphors are endowed with emphasis as well as resonance (they support a high degree of implicative elaboration) (Black, 1977, pp. 439–440). Among them, strong metaphors are also "necessary" metaphors: they respond to the need to embody an insight that is not otherwise expressible (Black, 1977, p. 448, Giuliani, 2023). It follows that in order not to reduce metaphor to the expression of an underlying conceptual structure, it is important to shift the focus from understanding to producing metaphors: to ask what it means, for the producer, to see one thing as another and (to have to) think of something as something else (Black, 1977, p. 446).

Empirical research on metaphors used to discuss the pandemic thus seems more reliable and relevant when considering the variables of context and relationship between interlocutors (i.e., Chen et al., 2021, with the focus on people with disabilities; for the contextual theory, Kövecses, 2005; Gibbs, 2017). However, few studies have examined the use of metaphors for pandemics in educational contexts. Świątkiewicz-Mośny et al. (2022) conducted a study in the field of health literacy (HL) and analyzed 247 educational materials from different countries dedicated to children (and also adolescents, and their carers) explaining the pandemic. Attention was also paid to the nomenclature and metaphors applied to describe the virus and the situation resulting from its spread ("war," "struggle," "monster," "players," "heroes"). Similar to our study, other scholars have analyzed the metaphors used and produced by teachers to better understand their experience of the pandemic, especially focusing on distance learning. Among Italian studies, the research by Troina et al. (2021) similarly dealt with the ways teachers experienced the condition of distance teaching, and metaphors were analyzed to better understand the feelings described by participants. The documented results show that "many participants felt that this change was non-reversible, as future scenarios will always have to come to terms with what happened during the pandemic period." In Turkey, Sipahioglu (2022) identified and classified the metaphors produced by a sample group of teachers to understand their perceptions of distance education during the COVID-19 pandemic, and to suggest better policies to implement during emergencies. Working with a different and proactive approach, in the USA, Anderson et al. (2021) focused on "the role of metaphor in creative teaching and learning, especially in making sense of and managing the stress of crises and uncertainty." Teachers were supported by metaphoric and narrative resources ("metaphors cards") and other training and materials designed to innovate creative learning routines. The authors found that "creative self-efficacy in teaching is related to teacher buoyancy in the face of setbacks, such as distance learning."

However, research on the use of metaphors in education finds ample space in cognitive studies in science education. Recent studies argue that teachers' conscious use of metaphors and students' analysis of conceptual metaphors are important in science learning (Lancor, 2012, 2015; Amin, 2015). This exhortation is based on a conception of abstract concepts as an integration among many elements, also including iconic representations by imaginative simulation (Amin, 2015, p. 6). Referring also to Carey (2009) on conceptual development, Amin argues that scientific understanding is not the sequential correction of errors and misconceptions, but rather a process of conceptual change through which conceptual networks, prior to exposure to instruction, are transformed into conceptual structures consistent with the knowledge of the "expert" scientist (Amin, 2015, p. 8).

In learning thought as conceptual change, metaphors become important for two main reasons: on the one hand, metaphor is the propositional tool that activates the schema-images necessary for understanding concepts; on the other hand, conceptual metaphors based on sensorimotor schema-images are effective devices for integration that enable the formation of concepts (Amin, 2015, pp. 8–9). Consequently, identifying the metaphors used by students is useful for analyzing and breaking down the concepts they use and recognizing misconceptions, while the critical use of metaphors by teachers is important for consciously guiding the processes of conceptual change, including the use of imagination. Lancor, for his part, highlights that every scientific concept undergoes metaphorical mapping, and conceptual metaphors understood by our society at large have a significance that depends on the particular context in which they are employed. For example, many metaphors for energy represent different conceptualizations of energy created in a given social context. However, his conception goes further: metaphors are not just heuristic tools for understanding a concept or framing devices for different aspects of a knowledge object. According to Lancor, following the notion of creative metaphor in the philosophy of science (Black, 1962; Hesse, 1966), there is often not a single, overarching concept (such as a concept of energy) in science that is explicated using multiple metaphors. Rather, the definition of the concept emerges as a result of negotiation that occurs in diverse contexts of situated cognition. The absence of a comprehensive, all-encompassing definition of the concept is thus not a limitation of our understanding, but a constitutive aspect of scientific concepts for which "a functional, context-dependent and metaphorical understanding is the best we can do." Recent studies by scholars from the research centre "Metaphor

and Narrative in Science" of University of Modena and Reggio Emilia, in line with previous statements from philosophical and pedagogical studies (Ervas et al., 2017; Egan, 1990, 2019), argue that the processes of understanding and producing metaphors, along with storytelling, allow for the exercise of "imaginative rationality" which is a fundamental resource of learning as relationship building (Fuchs et al., 2018; Contini, 2020; Giuliani and Manera, 2022).

Materials and methods

Design of the study

The use of language in educational contexts during the pandemic was the topic of the project "The language of the pandemic in educational contexts," which between November 2020 and March 2021 involved about 200 teachers, educators, and pedagogists from Reggio Emilia. The project was conducted by a research group from the Department of Education and Human Sciences, together with Maria Grazia Rossi (Universidade Nova de Lisboa) and with the collaboration of Officina Educativa, an institution that coordinates municipal educational services for the 6–14 age group of Reggio Emilia. A questionnaire was the research tool used to explore the language of the pandemic in local educational settings. Queries were posed to collect data on the vocabulary employed by teachers, educators, and students in reference to their encounter with the pandemic. Specific attention was devoted to the deliberate and non-deliberate use of metaphors (implicit choices were also considered; for example, by asking what images were associated with the pandemic, some non-deliberate metaphorical uses were linked). The further purpose was to suggest critical reflections useful for enriching participants with new resources to deal with the pandemic in their professional context. Simultaneously, the questionnaire was designed to encourage critical reflection on language use.

The questionnaire includes 6 sections, each with its own objective:

A. Describe the sample: Demographic information (age, gender, educational qualification, role, teaching subject/subjects, years of experience in the same role, school grade).
B. Encourage reflection regarding their own experience of the pandemic: Collection of words and images that participants associate with the pandemic and that they have used and heard during daily activities with children/youth.
C. Survey educational initiatives: Collection of educational initiatives designed specifically for pupils and aimed at discussing the pandemic experience.
D. Analyzing the use of metaphors in the educational context and encouraging metaphorical associations: Proposing multiple-choice options to collect metaphorical expressions used during educational activities to discuss specific aspects of the pandemic (pandemic as general situation, COVID-19, the contagion, measures to limit the contagion, other people, doctors and health care workers, the vaccine, the end of the pandemic).
E. Encourage critical reflection on language choices: Collection of reflections on the meaning of some words (e.g., distancing, care, relationship, space) that gained relevance and resonance during the pandemic.
F. Encourage critical evaluation of metaphors and identification of preferred metaphors for future use, comparing previous answers: collection of comments on the metaphors proposed in the questionnaire (negative, interesting and/or creative, and educationally effective metaphors).

Classification of metaphors

In Section D, participants were asked to select the three metaphors used most often and/or most prominent to discuss the following aspects of the pandemic: the pandemic as an overall situation; COVID-19; the spread of the contagion, measures to contain the contagion, others during the pandemic, physicians and healthcare personnel active in COVID-19 care; the vaccine as a product of scientific research, and the end of the pandemic.

Participants were able to choose a maximum of three options from a set of metaphorical expressions. In the test construction phase, the first metaphors to be proposed were chosen based on the following criteria:

- Relevant Presence in Press Communication, Online Articles, and Social Networks. In particular, very frequent or problematic metaphors are subject to journalistic or scientific discussion.
- Original metaphors: unconventional associations.

The first metaphors chosen as response options were present in institutional communication on the pandemic issue and had become the subject of critical discussion: the war against the virus and the need to win the battle. Therefore, some frames were selected as counterexamples from the database of the #Reframecovid project (Olza et al., 2021), others from formal and informal communication contexts, and clarified them by articulating their conceptual features and possible pragmatic implications. In contrast to the conflict frame, some examples were identified based on the obstacle, problem, or game frame, whereas conflict-frame implies win/lose options and evokes the need to prevail by force, and the problem or obstacle frame foregrounds knowledge and strategy. In the former case, I have to defend myself and counterattack against a deliberately hostile action; in the latter case, the difficulty depends on my own limitations, which can be overcome by knowledge.

Some countertrends were found in scientific communication about the pandemic, where the virus was not referred to as an enemy to be defeated, but rather as a "*symptom*" of a broader ecological problem and imbalance, analogous to what happens with the symptom of a disease. Consequently, the metaphor of the virus as a *messenger* was introduced, intended as an *alarm* that must shift our attention and change our attitude.

To give expression to an entirely different pragmatic attitude of skepticism and distrust, some conceptual frames of the polemic narrative regarding political measures, such as lockdown, were chosen: constraint in the nuances of prison and dictatorship (with the metaphor, often not used as such, of sanitary dictatorship). Alongside this framework, which evokes a human-like exercise of power, the idea of a destructive but impersonal action, linked to the force of nature, was proposed: the category therefore of natural disaster, as an

irreversible and destructive event but one that can at least be contained, limited, or finally neutralized by appropriate means and resources.

Alternatively, some options were also proposed based on the frameworks of madness, darkness, and nightmares, which appear to be united by the need to express an experience of totalizing negation: the idea of something fundamental failing, breaking down, an absolute negation with no apparent solution, and no precise agent.

Following a recursive procedure relying on subsequent adaptations, a variety of answer options for each of the pandemic features were defined for Section D. Moreover, some synonyms, experience, or pragmatic implications to clarify the meaning of the metaphor were added next to each option, in parenthesis. For example, for "monster": "unseen, looming, scary"; for "fire," it was clarified that it could be understood as an event "to be contained, whose damage is to be reduced."

Listed below are all the options proposed for each feature-question:

Pandemic as an overall situation:

- storm (with ship at the mercy of waves, boat in danger of sinking),
- war (to fight, in which to eliminate the enemy…),
- match (to be won, in which to compete…),
- game (with rules, finding solutions, strategies…),
- night, darkness, nightmare (which must end, to be brightened…),
- madness (chaos, imbalance),
- revolution, transformation (opportunity for change),
- dictatorship (compromised freedoms, abuse of power, control),
- fire (spreading, compromising, destroying).

COVID-19 as:

- enemy, conqueror (to defend against, to react against),
- mountain (obstacle to overcome),
- alarm/messenger (waking us up, warning of global problems),
- blow/hammer/shock (that shakes, that knocks down, destabilizes),
- monster, ghost (unseen, looming, scary),
- opponent (in a game that has its own goal, on which we must prevail),
- flame (which seeks fuel, burns) / rain (which accumulates, finds cracks, infiltrates),
- explosive device (to be defused, rendered harmless).

The spread of contagion:

- fire (to be contained, whose damage to be reduced),
- military attack, military campaign (broad, spread over several fronts, with organized troops),
- avalanche, tsunami-flood (overwhelming, unpredictable, uncontainable…),
- train derailing (event to be prevented, depending on mistakes),
- domino, chain reaction, word of mouth (to be broken, disrupted),
- earthquake (which shakes ground underfoot, takes away stability, creates insecurity),
- colonization (of parasites, aliens…),
- river breaking banks (event to be prevented, dependent on mistakes).

Measures to contain contagion:

- pause, suspension, parenthesis (from the ordinary to reflect, return to self),
- seclusion, asceticism (revealing hidden, previously invisible things),
- role-playing/group work (collaboration),
- counterattack, resistance (to oppose, not to be annihilated, defeated),
- abyss, tunnel (absence of light, no exit in sight),
- shelter (in which to be safe),
- collective experiment (we are not sure of the results, we go by trial and error),
- prison (helplessness, absence of freedom, physical constraint).

Others during the pandemic:

- lead actors (everyone has mission, important role),
- threat/hunters/spies (someone to be wary of),
- allies (in the conflict against the virus),
- masks/aliens (we do not see their faces),
- companions (of adventure, travel, in the same boat),
- missing people (whom we have lost track of, whom we cannot meet),
- support, source of energy (to move forward, face difficulties, and start again),
- pawns (to be placed, organized in a strategy),
- puppets, marionettes (at the mercy of others' decisions).

Doctors and medical staff active in the care of COVID-19:

- guides (who explore, lead us to the way out…),
- angels (who guard, protect…),
- machines (tireless, working tirelessly),
- victims (they sacrifice themselves for the collective good),
- new protagonists (who were in the shadows, who came to the foreground over other characters),
- heroes, superheroes (with above-average talent, capable of measuring themselves against abnormal events),
- judges (they decide life/death),
- stars (who love notoriety, who seek prominence),
- agents/special agents (dictated by the new power of medicine and science),
- soldiers (in the war on the virus).

The vaccine as a product of scientific research:

- counterattack weapon (against the attack of the virus to overcome its "troops"),
- trainer (to instruct our body to react),
- gatekeeper – filter (preventing the virus from hitting us, making it wait),
- way out, "esc" key (from the virus' range of action),
- strategy, trick (to boycott the virus, weaken it),
- turning point (in the path of change initiated by the pandemic),
- neutralizer, tamer (which makes the virus less dangerous and allows people to live with it).

The end of the pandemic:

- liberation (from an invasion, occupation),

- salvation/victory (finding escape),
- return of light, miracle,
- oasis/mirage (which could be an illusion),
- rebirth, renewal,
- restart (after overcoming an obstacle),
- regaining freedom.

In the identification process of metaphors, the generic definition of metaphor as "understanding and experiencing one kind of thing in terms of another" (Lakoff and Johnson, 1980, p. 5) was adopted. For a more technical definition, it was preferred the idea of interaction between systems of implications and cross-domain mapping between the two conceptual domains (*cf.* Steen et al., 2010, p. 47). For the identification of metaphors in Sections B and F, some principles of the identification method developed by the research group of the University of Amsterdam were adopted. In particular, the following metaphors were considered:

a. words used metaphorically, whose meaning is the indirect meaning of the word arising "from the contrast between the contextual meaning of a lexical unit and its more basic meaning, the latter being absent from the actual context but observable in others" (Steen et al., 2010, pp. 768–771).
b. words expressing a conceptual domain that functions as a source domain in a mapping provided as some form of comparison (*cf.* Steen et al., 2010,, pp. 768–771).

To organize the data, a procedure was followed in several stages using a mixed (qualitative and quantitative) research design. Both the selected and produced metaphors were organized on the basis of different "categories of experience": "experience" was intended as present experience, but also including attitudes and future-oriented experience. In describing these categories, the subject attitude (as a patient, agent, spectator, etc.) and the way the pandemic was experienced as an actor itself (indifferent, hostile, collaborative…) were considered. In doing so, six categories were obtained, including several frameworks that share similar pragmatic implications. Categories were distinguished by the type of experience and pragmatic projection. They can be arranged on a quantitative scale, based on the degree of negativity and indeterminacy, ranging from the experience of annihilation and indeterminate terror (NEGG), to that of positive interaction that prompts determinate innovation (TO).

The first category has been assigned the label NEGG.[1] The frames include the concepts of nightmares, darkness, earthquake-shattering, and madness. The experience they are associated with is the feeling of being annihilated and completely lost. The pragmatic implication is the absence of any positive attitude, hopelessness, waiting for the end of the world, or life, as known before; however, the awareness of being dragged into something totally indeterminate.

The second category was assigned the label AROUND. The frames included in this category are the concepts of force of nature, disaster, and natural or supernatural catastrophe: they are all devastating, expanding events that are completely unpredictable and uncontrollable. The experience of the subject involved is a sense of being surrounded and isolated, resisting something, and oscillating between hopelessness and the attempt at containment and reconnection.

The third category is labeled ON, and marks the experience of oppression, coercion, and terror. Pragmatic projection is the search for an escape for liberation. The frames that have been included in this category are the concepts of jailer, chain, monster, and tyrant: some quite unknown agent, not completely determined from which we are willing to escape, or free ourselves.

The fourth category, labeled VS, includes frames of war, military strategy, and weapons. The subject's experience is feeling attacked and forced to confront an enemy, an opponent with opposing violent purposes. The resulting principal attitude is an attempt to fight, prevail, and defend oneself.

The fifth category was identified using the FRONT label. In this case, the frames are the obstacle, mountain, problem, game, and match. The experience implied by these frames is the urgence to understand and solve a problem, to take part in some role-play, to collaborate, to solve some puzzling-strategic game, and to face an obstacle that is to be overcome. The attitude of the subject is a commitment to understanding, solving, and taking on a challenge.

The last category, the sixth category, was identified by the label TURN. The frames included in this category are concepts of signals, messages, and alarms. The pandemic is seen and experienced as a part of human history, as a consequence of human actions, preparing humanity for something new. The experience they make sense of is that of taking part in a story, taking a different direction on a path/journey, and getting involved in a mission. The suggested attitude is the action of listening, embracing, responding, and changing one's attitude or perspective.

In the following table (Table 1) I have organized the response options into the aforementioned categories.

Results

The questionnaire, digitized and offered anonymously, took participants up to 30 min to complete. A total of 122 answered. The majority of participants (55%) belonged to the 18–39 age group, 41% were between 40 and 59 years old, and the remainder were over 60 years old. Only 10 participants were men; it results a large proportion of women, which reflects the ordinary composition of personnel in educational services. Approximately 77% of the participants were educators in school integration services or territorial educational services, while teachers accounted for 23% of the total. About 70% of the respondents worked with elementary school children, while the remaining 30% worked in secondary schools.

1 The meaning of the label names is clarified as follows: NEGG, with the double "G," is the name for a strongly negative attitude; AROUND is the label for the idea of being surrounded by a wide-ranging phenomenon; ON is the label for the experience of a force, a power hanging and acting from above our level of control; *VS* is the label for the active conflict; the FRONT label refers to the experience of facing and trying to overcome an obstacle, an objective problem that is, precisely, in front of the subject; finally, the label named TURN is meant to indicate the experience of a turning point, of a change to a new condition.

TABLE 1 Classification of metaphors in multiple-choice questions (Section D of the questionnaire).

	NEGG	AROUND	ON	VS	FRONT	TURN
The pandemic as overall situation	Night, darkness, nightmare madness	Storm fire	Dictatorship	War	Game match	Revolution transformation
The COVID-19	Blow/hammer/ shock	Flame rain	Monster, ghost	Enemy, conqueror opponent explosive device	Mountain	Alert/messenger
The spread of contagion	Earthquake	Earthquake fire avalanche, tsunami-flood	Colonization	Military attack, military campaign	Domino chain reaction word of mouth	Train derailing river breaking banks
The measures to contain contagion	Abyss, tunnel	Shelter	Prison	Counterattack, resistance	Role-playing, group work collective experiment	Pause-suspension, parenthesis asceticism, seclusion
The others during the pandemic	Masks/aliens	Missing people	Puppets, marionettes	Threat/hunters/spies allies	Pawns support, source of energy	Lead actors companions
Physicians and health personnel	Angels sacrificial victims	Heroes, superheroes	Special agents judges star	Soldiers	Machines guides	(new) Protagonists
The vaccine	Way out, "esc" key	Neutralizer, tamer	[NONE]	Counterattack weapon	Trainer gatekeeper, filter strategy, trick	Turning point
The end	Return of light, miracle oasis/ mirage	Salvation, victory	Liberation regaining freedom	Liberation salvation, victory	Restart salvation, victory	Rebirth, renewal

Section D: multiple choice questions

In the multiple-choice questions in Section D, the first finding that stands out is that war metaphors (VS category) are never among the first two options. In general, for each question, the two most frequent answers belonged to categories other than VS. However, metaphors in the VS category rank well in almost all categories. They are the third option of questions on the following aspects of the pandemic: the vaccine, thought of as a "weapon of counterattack" (chosen by 35); the end of the pandemic as "regaining freedom" (by 45);[2] the others as "allies" in the conflict against the virus, used by 50 of the participants. If we also interpret "refuge" as an option related to the war domain, we can say that the metaphor also has a main position in the question on measures to contain the contagion.

Among the aspects frequently described by war metaphors, we can also add Covid-19 (understood as the disease, the virus), since the metaphor of the enemy-conqueror is in the fifth position, but the numerical difference from previous positions is minimal. Something similar applies to the question about measures to contain the contagion, where 29 respondents chose "counterattack." The questions in which the war frame option is relatively infrequent concern the pandemic as an overall situation (25), the spread of contagion (13), and doctors (23).

In both questions, where the war frame is frequently used and where war metaphors are chosen by a small number of respondents, the first two positions in the ranking are occupied by metaphors included in the TURN and/or FRONT experience categories, which evoke the positive and active attitudes of collaboration-sharing and projection toward the future. Among these, metaphors related to the frame of the game (FRONT) are very attractive: we find them in the first two positions to describe the pandemic as an overall situation (game), COVID-19 (opponent), and the spread of contagion (dominoes). The game option has a particularly strong appeal for describing measures to contain contagion, in which case it is the prevalent option (it is chosen by 83 respondents, 68% of the total number of participants, and the second option by numerosity stops at 45%).

Moreover, if the responses given by individual respondents are compared, it results that preferring the war frame for some features of the pandemic does not correlate with the choice of the same frame for the pandemic as an overall situation. For example, 21 chose to describe COVID-19 as the enemy, but not the pandemic as war. 36 respondents also considered the ally metaphor "suitable" for talking about others in the pandemic without describing the pandemic as an overall war situation. Also, in general, in the singular choice "war" goes along with the choice of different conceptual frames, both in the answer to the same question and in answers to other questions. The multiple-choice options were all accompanied by implications and attributes that clarified their conceptual meanings. Thus, it can be ruled out the possibility that this inconsistency may be owing to a misunderstanding or different interpretation of the proposed options. Instead, in our view, the variety of choices should be interpreted as indicating that metaphors are not necessarily a reflection of an overlying structural correspondence between the concepts involved. Conversely, if war is chosen for the option "Pandemic as an overall situation," the option tends to be chosen for other aspects as well, but it does not prevent other options close to very different categories from being chosen for the same aspect.

In conclusion, the choice of the war metaphor is relatively frequent, but it is neither prevalent over the description frames, nor does it seem to constrain options and limit the variety and plurality of answers.

2 This metaphor is classified in the category of oppression-coercion, ON, but we took into account that it could also be interpreted by respondents in VS.

Sections B and F: implicit metaphors

Other interesting results can be obtained looking at the responses to the open-ended questions in Sections B and F. Let us start with Section F. Those who selected the war option in the multiple choice, when asked for a further selection of metaphors to be used in the professional context,[3] did not choose metaphors that could be placed in the VS category. In general, the metaphors proposed here are far from the frame of war (which is taken up by only a few respondents): the most mentioned metaphor here is again play/game; it is followed by the frame of change, revolution, and rebirth, a series of expressions that refer to the concept of union, sharing, and travel. Thus, the proposal of alternatives seems to stimulate further deviations from the frame of violent confrontation (see Table 2).

Additionally, the responses to the question in section B, asking generally for an image associated with a pandemic (without indication of professional use), show low appeal for the war frame among respondents that produce metaphors (Figure 1). Only four respondents chose metaphorical images adhering to the war frame. Images that can be linked to other frames prevail: 25 metaphorical images (about 20% of respondents; 37.5% of metaphorical images) can be linked to frames from the category named NEGG, which recalls the idea of negation as annihilation, radical subversion ("desert," "bomb," "madness"); 30 respondents propose metaphorical images that have a frame from the category named ON, which corresponds to the concept of limitation, constraint and partial deprivation. Even when respondents are questioned without referring to their work context and, thus, disregarding educational purposes, the frame of war and confrontation remains in the background. Furthermore, the prevailing frames of metaphoric images here are those of the ON category, which recall an idea of deprivation, limitation, and constraint rather than a constructive reaction and a horizon of change, as in the case of multiple choice; therefore, the request for free association seems to direct the imagination to the most negative aspects; they are nevertheless filtered through frames other than that of war.

Among the images in section B, the most "original" metaphorical images seem to be related to constructive and resilient reactions, among which many are true metaphors:

- Desert with small oases: "A place of loneliness where you find yourself alone and you have to find a way to survive and find small hidden oases where you can quench your thirst with energy."
- The back of the turtle: "it gives me the idea of being strong, brave, and calm like a turtle."
- Magnifying glass: "symbolizes research…scientific research, relational research, research of the other…symbolizes the change of perspective, seeing the issues around us in an amplified way."
- People distant from each other but positioned in a circle: "while respecting the distances, I believe that collaboration and sharing between people is indispensable to overcome the bad period."

TABLE 2 "Among the metaphors proposed in this questionnaire, is there one or are there any that you find interesting and would like to use in educational activities?" (Section F).

Metaphorical words	Number of occurrences	Category
Game	17	FRONT
Change	9	TURN
Reborn	9	TURN
Trip	9	FRONT
Mountain	7	FRONT
Match	6	FRONT
Strategies	6	FRONT, VS
Revolution	5	TURN
Transformation	5	TURN
Win	5	FRONT
Restart	4	FRONT
Overcoming	4	FRONT
Alliance	3	VS
Boat	3	FRONT
Collaboration	3	FRONT
Mates	3	FRONT
Heroes	3	AROUND
Protagonists	3	FRONT
Renewal	3	TURN
Earthquake	3	AROUND

Counting of metaphorical words (more than three in number) in answers.

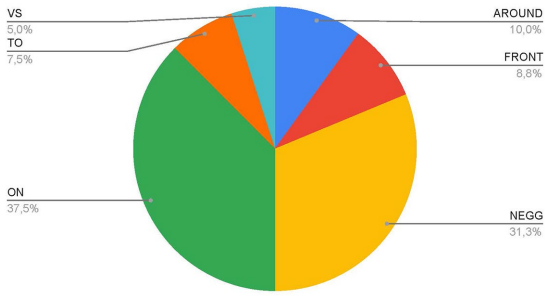

FIGURE 1
"What image comes to mind to describe the pandemic?" (Section B). Graph of percentages of answers for each category out of total metaphorical answers.

- Puzzle:
- "like a puzzle, one thing, which is the class group, finds itself divided and more fragile."
- A bubble:
- "you inside the bubble can see what is going on outside, but you find it hard to hear and be heard."
- A chest of drawers, an object with various compartments: "pandemic is a container-word, which contains within it different aspects of contingent reality."
- Mountain: "I see the pandemic as a big obstacle to overcome."

3 The question: "Among the metaphors proposed in this questionnaire, is there one or are there any that seem interesting to you and that you would like to use in teaching activities?"

- The darkest moment of the night [with clarification in the next answer:] for it is succeeded by the dawn, with its light revealing what the darkness hides.

Effectiveness and limitations of methodological choices

- Our choice to associate conceptual options with their pragmatic implications has limitations and advantages. The association may influence choices, but it clarifies the meaning of the options to be chosen. Additionally, the implications we have specified can create rigidities that may not always be explanatory.
- The overall questionnaire was very extensive and articulated; it was supposed to facilitate the exercise of critical reflection, but it made it more onerous and laborious to complete, partly because of redundancies.
- Reliability of categories: unlike other studies (Gök and Kara, 2022; Sipahioglu, 2022), no further experts were contacted for the reliability test of metaphoric categories.
- The classification of options could be improved with regard to: ambiguities (e.g., the correspondence of one option to several categories); incoherence of some associated implications in brackets; genericity of the FRONT category (it should be divided into two categories, namely one to name the experience that finds expression in the metaphor of "play," and thus implies collaboration, role assignment, sharing, rules; the other labeling the experience of dealing with a problem, an obstacle to be overcome); the absence of options for the ON category in the vaccine metaphors question.

Discussion

Based on the analysis described above, below is a summary of the findings of the study:

- The overall metaphorical imagery that arises from the responses in section B differs from the imagery of conflict, despite being predominantly focused on the negative and pessimistic aspects of the pandemic.
- In the questions in section B asking for associations between words and images, the most original/creative metaphors provided correspond to positive and conscious attitudes rather than pure mirroring and representation. Positive attitudes were elicited more by images than by words.
- In questions about metaphors in educational language (section D), the choice of the war metaphor was neither prevalent nor exclusive, and choices oriented toward sharing and resilience were more frequent.
- There is a difference between spontaneous associations, expressions of experience in the first two answers, and metaphorical associations in the educational situation (multiple-choice options). In an educational context, the weight of the most negative/destructive options decreases.
- When choosing a single metaphor for an educational activity (in section F), this metaphor deviates completely from the war frame. Hypothesis: Once exposed to more alternatives through multiple choice options, the war frame is removed.

The general finding resulting from the analysis is that the war metaphor is not prevalent among the associations describing educators and teachers' experiences, even where the experience is mainly negative. Based on the collected responses, it also appears that metaphors expressing resilient concepts and attitudes are mostly used in educational situations. Original metaphors are mostly correlated with the need to adopt a resilient attitude. Furthermore, the process of completing the questionnaire within the effort to understand and select a variety of metaphors seems to have pushed the most negative conflict frames further away.

The results provided support for the following hypotheses:

- The massive presence of the war metaphor in media communication and public discourse does not determine *per se* the preference for the war frame over other frames in expressing the experience of pandemic.
- The negative features of the pandemic experience are not necessarily correlated with the use of war frames. The frame does not appear to be the most frequent way to express negative feelings, and its choice does not depend directly on negative attitudes. Consequently, there seems to be no reason to argue that avoiding war metaphors should conversely favor a positive attitude.
- The choice of war metaphors for some pandemic features is not related to the exclusion of different metaphors. This result seems to be consistent with the findings of the aforementioned theoretical and empirical studies: The sensibility of the war frame does not imply that language use is homogeneous with the war frame. Thus, the chosen options cannot be explained as the declination of an unambiguous conceptual structure based on the network of implications of a single conceptual frame. This does not prove the lack of a coherent conceptualization of experience. Instead, it may support the idea that the pandemic, as an object of experience, is not a framed concept from which a network of implications branches, but a node of a plurality of projections and articulations.
- Growing awareness of the plurality and variety of metaphorical options for the features of the pandemic encouraged a critical and unassumed use of war metaphors, further obviating the potential persuasive power of the frame. In this regard, the study is in step with Wicke and Bolognesi (2020) when they write that… "a plethora of framing options—or a metaphor menu—may facilitate the communication of various aspects involved in the COVID-19-related discourse on the social media, and thus support civilians in the expression of their feelings, opinions and beliefs during the current pandemic." It may apply to the war metaphor what applies to the use of "doubt" in arguments concerning the scientific aspects of the pandemic: doubt does not necessarily carry with it conspiracy ideology; removing doubt does not eliminate the risk of conspiratorial closure; instead, defending doubt can be useful precisely for building trust (Mohammed and Rossi, 2022).

Conclusion

Predicated upon these specific findings, some possible and more general theoretical hypotheses can be advanced. The availability of a plurality of metaphorical options and the opportunity for a critical exercise on the conditions and implications of their situated use, contributed to the flexible use and conscious choice of metaphors. They seem to have been used as cognitive and imaginative resources, rather than as linguistic manifestations of rigid conceptual framing or as tools of their ideological construction. These results offer support for the theoretical hypothesis that a rigid framing effect, and thus the construction of a closed and uniform conceptual network such as pandemic = war, is a limiting rather than an ordinary condition. This can occur if there are several concomitant conditions: strong automatisms in the use of language, deliberate use for framing construction, absence of autonomous expressive and communicative needs of the recipients (owing to lack of knowledge of the object), and absence of caring or accountability relationships between the parties. Conversely, the need to express one's experience effectively and the educational pragmatic purpose, together with the availability of a variety of options and exercises in the conscious use of language, support flexibility in the conceptual framing of experience and a tension toward the search for appropriate epistemic and pragmatic solutions.

Furthermore, the production of original metaphors by teachers and educators appears to correspond to the need to express, represent, and refer to something for which there is no predetermined definition. On this basis, it has been proposed the hypothesis that the original metaphor is used because it is necessary. This hypothesis is supported by Black's seminal theory. Black argues that creative metaphors help to constitute the aspects of reality that "enable us to see" (Black, 1977, p. 454). Black compares creative metaphors to theoretical models, which allow scientists to understand an almost unknown object by attributing independent properties and unedited categories. Black argues that both creative metaphors and theoretical models operate in the identification between the object to be known and the medium, rather than a comparison based on analogical correspondences. The language adequate to the model is used for the new domain, so that inferences are not ruled by analogy but proceed "through and by means of an underlying analogy" (Black, 1962, pp. 228–229). Creative metaphors also generate unpredictable implications (Black, 1977, pp. 439–440) since interaction is not reducible to the comparison of terms in play; strong and active metaphors lead to an innovation of meanings that can be interpreted as the creation of new objects of knowledge and experience. Black argues that metaphorical thinking is the "embodiment" of a peculiar insight (Black, 1977, p. 448): through metaphorical identification it becomes possible to establish a "name" for and make sense of our experience.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1192653/full#supplementary-material

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Comparing COVID-19 metaphors in Chinese and English social media with critical metaphor analysis

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Metaphors extracted from COVID-19-related online texts offer a unique lens for examining how individuals perceive the pandemic. Users from distinct linguistic backgrounds may select varying source domains to discuss COVID-19, with these choices influenced by multiple factors. Utilizing Critical Metaphor Analysis (CMA) theory and employing the Metaphor Identification Procedure VU (MIPVU), this study conducts a comparative analysis of Chinese and English COVID-19-related metaphors derived from social media platforms, specifically Twitter and Weibo. The findings reveal both commonalities and distinctions between the metaphors employed in Chinese and English texts. Commonalities encompass the widespread use of war and disaster metaphors in both sets of texts. Distinctions are characterized by a higher prevalence of zombie metaphors in English texts and classroom metaphors in Chinese texts. These similarities and differences can be attributed to varying socio-historical factors, as well as the active choices of users to express their values and judgments.

KEYWORDS

CMA, MIPVU, metaphors, social media, COVID-19

Introduction

Since the inception of the COVID-19 pandemic, individuals worldwide have become increasingly familiar with various emerging concepts related to the novel coronavirus, such as the pandemic itself, pandemic prevention and control measures, pandemic development, and the lifestyles adopted under COVID-19. These concepts have gradually permeated people's daily lives, primarily through metaphors, particularly conceptual metaphors. Numerous researchers have investigated COVID-19-related metaphors present in government-issued official documents, concentrating on the distributional characteristics of these metaphors and the rationale behind the selection of their source domains.

Social media users tend to use metaphors to express their emotions, experiences, and opinions, while governmental reports tend to use metaphors to inform policy decisions and guide public health responses. Both types of discourse play important roles in shaping public perceptions of the pandemic, and the metaphors used in each can have significant effects on how people understand and respond to the crisis. Nonetheless, it has been observed that there is a relative dearth of research focusing on COVID-19-related metaphors employed in online social platforms where internet users more actively express their understanding of the pandemic. Language usage in social media texts significantly differs from that in official documents. Farzindar and Inkpen (2018) posit that in the social media context, every user has their

metaphorical "microphone" and communicates using individualized language, consequently creating a unique communication pattern. Previous studies on metaphors in social media texts have demonstrated that their source domains tend to be more culture-oriented or history-oriented (Ellis and Ryan, 2003; Guo et al., 2013; Gómez-Adorno et al., 2016; Törnberg and Törnberg, 2016; Best and Shelley, 2018).

The primary objective of this paper is to conduct a comparative analysis of COVID-19-related metaphors utilizing texts acquired from both Chinese and English social media platforms to discern the differences and commonalities between them. Firstly, textual materials are extracted from Twitter and Weibo, which are, respectively, among the most prominent social media platforms within the English and Chinese-speaking communities. Secondly, this study endeavors to identify metaphors in the collected textual materials based on the Metaphor Identification Procedure VU (MIPVU; Steen et al., 2010). In the third segment, this investigation compares the metaphors originating from both platforms in terms of differences and similarities, employing Critical Metaphor Analysis (CMA) to ascertain the underlying reasons for the metaphors' usage. Examining COVID-19-related metaphors in social media texts enables a deeper exploration of the metaphors employed by users of both languages, as well as the cultural and historical context that informs their usage.

Literature review

Conceptual metaphor theory and critical metaphor analysis

Conceptual Metaphor Theory (CMT), introduced by Lakoff and Johnson (1980), posits that the core of metaphorical understanding lies in cognitive processes where one concept is comprehended through another. This entails understanding a target domain, which may be abstract, elusive, or difficult to grasp, through the source domain, which is familiar, concrete, and easily understood (Evans and Melanie, 2006). Lakoff (1993) further argue that metaphors are not just rhetorical devices, but they are essential to how we think and reason. They provide examples of how we talk about abstract concepts such as time, argument, and ideas using metaphors that draw on more concrete experiences. For instance, the metaphor "ARGUMENT IS WAR" informs the way we talk about disagreements and debates, as we use expressions such as "attack his position" or "defend my argument." CMT has been used to explain a variety of phenomena, including emotion, morality, and politics. Some researchers apply CMT to emotion metaphors, arguing that emotions are conceptualized through metaphors such as "love is a journey" or "happiness is up" and that emotion metaphors are widely used in the context of the pandemic (Hendricks et al., 2018; de Saint et al., 2021). Similarly, researchers use CMT to explore the moral concepts that underlie political discourse, arguing that metaphors such as "the nation is a family" and "the market is a natural force" shape our understanding of political issues (Shimko, 1994; Paris, 2002; Musolff, 2016).

Critical Metaphor Analysis (CMA) is a research methodology that combines the analysis of metaphors with critical discourse analysis (Charteris-Black, 2004). CMA originates in the early 1990s, when scholars in various fields begin to question the ways in which metaphors are being used to represent and interpret social and political issues (Musolff, 2016, 2022). This leads to the development of a framework for analyzing the way that metaphors are used in political discourse, media representations, and everyday communication. According to Charteris-Black (2019), CMA is concerned with the analysis of the ways in which metaphors are used to construct meaning in discourse. The focus is on the linguistic form and social context of metaphors, as well as their underlying conceptual mappings. CMA involves a critical examination of the ideological implications of metaphors, with a particular focus on the ways in which they serve to legitimize or challenge power relations (Musolff, 2016, 2022). CMA contends that metaphor is a highly influential form of discourse. Some researchers argue that certain metaphors are deliberately chosen to impact patterns of thought and understanding among people and consequently, metaphors are frequently employed as a means to exercise power or influence (Semino et al., 2017, 2018; Charteris-Black, 2019; Semino, 2021).

The application of CMA has been demonstrated in a number of studies. For instance, Semino et al. (2018) use CMA to analyze the metaphors used in media representations of the Iraq War, and find that the use of war metaphors served to legitimize the war and delegitimize dissenting voices. Another application of CMA has been in the analysis of medical discourse, particularly in relation to illness and disease. For example, Deignan (2010) analyze the metaphors used in media representations of the SARS outbreak, and find that the use of disease metaphors served to construct a sense of threat and danger, as well as to reinforce existing cultural stereotypes about Asian people.

Mio (1997) highlights the prevalence of metaphors in political discussions, while Bougher (2012) observes that metaphors can shape public perception and judgment in the context of political events. For instance, during the U.S. presidential election, Donald Trump likened Hillary Clinton to a criminal and vehemently exclaimed, "Lock her up." This potent metaphor swiftly gains traction and spread. Various researchers have applied CMA to examine the metaphorical construction of China's image in the U.S. mainstream media. They conclude that these media outlets predominantly portray China as an adversary and competitor by carefully selecting source domains for their metaphors (Liu and Li, 2022).

Researchers (Foust and Murphy, 2009; Arminen and Auvinen, 2013) employ CMA to investigate ecological discourse metaphors within a self-compiled corpus and posit that the underlying expectation of these metaphors is to establish a balanced and harmonious relationship between economic development and the construction of an ecological civilization. By scrutinizing the utilization of metaphors in discourse, CMA sheds light on the ideological underpinnings and power dynamics embedded in various forms of communication.

Previous studies on Covid-19 related metaphors

The application of metaphor studies in the analysis of COVID-19-related texts has seen a considerable expansion in recent years. Researchers have primarily concentrated on various media sources disseminating COVID-19 information, which are released by the governments of various countries. These sources include national documentaries showcasing the battle against COVID-19, white papers, and news reports. Some findings indicate that the Chinese government predominantly employed war metaphors, organism metaphors, and architectural metaphors in its campaign against the

pandemic (Gui, 2021). Moreover, some scholars have scrutinized the metaphorical discourse surrounding the novel coronavirus in Western media from the perspective of CMA (Durgun et al., 2022; Alkhammash, 2023; Liu and Li, 2023).

A significant area of debate among researchers is the appropriateness of employing war metaphors extensively. Some contend that the misuse of war metaphors has led to the disregard of elements of shared concern and mutual assistance in epidemic prevention and control measures (Sabucedo et al., 2020; Isaacs and Priesz, 2021). In contrast, others justify the use of war metaphors, asserting that they neither evoke negative feelings nor effects. These proponents argue that, as integral components of social culture, war metaphors facilitate comprehension and expression of the concepts concerning the pandemic in everyday communication (Castro Seixas, 2020; Panzeri et al., 2021).

Aside from the war metaphor, researchers have also explored alternative source domains in COVID-19-related metaphors, such as ecological metaphors and the "COVID-19 IS FIRE" metaphor (Augé, 2021). Semino (2021) posits that the "COVID-19 IS FIRE" metaphor employed in COVID-19-related texts is more conducive to effective communication and discussion than the war metaphor. This burgeoning field of study underscores the importance of understanding the various ways metaphors shape public perception and discourse during unprecedented global events, such as the COVID-19 pandemic. In accordance with the findings of Belli and Alonso (2021), it has been observed that the emotional state of individuals in light of the COVID-19 pandemic can be categorized into three distinct stages. The initial stage is characterized by a sense of "indifference and curiosity," followed by a period of "sadness" and, ultimately, a phase of "suspended mourning." In response to these emotions and the accompanying demands for expression, netizens have resorted to utilizing metaphors on social media platforms as a coping mechanism.

The present study

Critical Metaphor Analysis (CMA) posits that the selection of source domains in metaphors is not entirely passive. Instead, it is influenced by the values of the authors. By employing metaphors, authors aim to express and propagate specific viewpoints. The metaphors used in social media platform texts also serve as a reflection of netizens' understanding and values. Despite its significance, few previous study has systematically analyzed the COVID-19-related metaphors utilized in social media platforms. This research seeks to bridge this gap by comparing the metaphors employed by Chinese-speaking and English-speaking netizens.

Such a comparison not only facilitates the exploration of the similarities and differences in the cognitive patterns of the two groups but also aids in understanding the culture-cognition mechanisms underlying the perception of COVID-19 by the two netizen cohorts. This is achieved by analyzing the rationale behind the selection of source domains in the metaphors. Consequently, this paper aims to address the following research questions:

1. What are the similarities and differences in COVID-19-related metaphors employed by Chinese-speaking and English-speaking netizens on social media platforms?
2. What factors contribute to the selection of source domains in the metaphors used by these two groups of netizens?
3. How do the identified metaphors provide insights into the culture-cognition mechanisms that shape the perception of COVID-19 by Chinese-speaking and English-speaking netizens?

By addressing these research questions, the study aims to contribute to the understanding of the role of metaphors in shaping public discourse and perceptions during a global crisis, such as the COVID-19 pandemic.

Methodology

Data

In addressing research questions 1 and 2, this paper employs Python web scraping codes to collect textual data from Twitter containing the hashtag "#COVID19" during the period of February 7, 2022 to February 13, 2022. A total of approximately 70,000 tweets are gathered, encompassing around 1,200,000 words. Upon completion of data collection, an initial data cleansing and filtering process was executed, which involved the removal of emojis, hashtags, mentions, and user IDs. Subsequently, non-English texts, such as those in Spanish and German, are eliminated. Lastly, tweets with fewer than five English words are also discarded, primarily due to the difficulty in discerning clear metaphorical expressions within such brief texts. The final dataset retains 37,834 tweets, with a total of 600,576 words. Concurrently, this paper collects Weibo textual data containing the hashtag "#epidemic" during the same timeframe, yielding roughly 13,400 Weibo posts, with a cumulative 1,510,842 Chinese characters. Following text cleaning and segmentation, the final Weibo dataset retains 9,400 posts, with an aggregate of 609,730 Chinese characters.

Metaphor identification

In light of the comprehensive corpus amassed, the present study employs the Metaphor Identification Procedure (MIPVU), as articulated by Steen et al. (2010), as an analytical method to scrutinize the linguistic data. MIPVU, a sophisticated metaphor recognition technique meticulously devised by Steen and his associates, encompasses six methodical steps designed to facilitate the identification and classification of metaphorical expressions: (1) assiduously perusing the text to uncover metaphor-related lexemes, (2) ascertaining the foundational lexical units within the text, (3) meticulously determining the contextual meanings of these lexical units, (4) delineating the essential meanings of the lexical units, (5) judiciously differentiating between the contextual meanings of the lexical units and their intrinsic meanings, marking them as metaphorical lexemes should disparities exist, and (6) evaluating whether the contextual word classes of the lexical units deviate from the word classes of their intrinsic meanings, and if so, judiciously categorizing them into direct metaphors, indirect metaphors, and the like, contingent upon the particular circumstances. This nuanced metaphor recognition methodology has garnered widespread

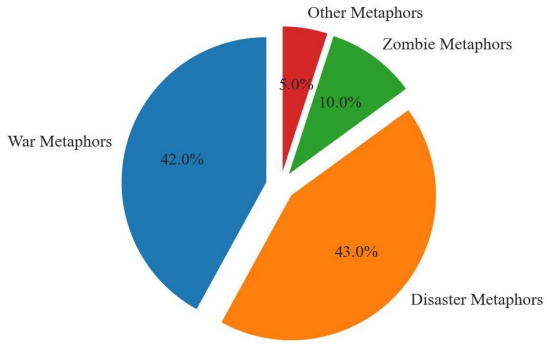

FIGURE 1
Metaphors used in English texts.

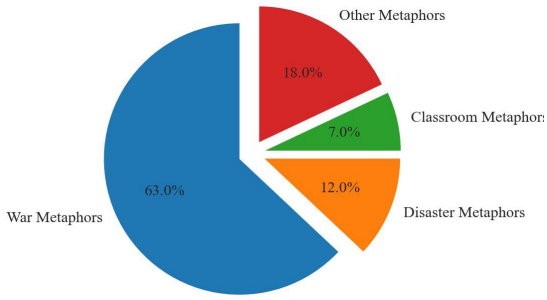

FIGURE 2
Metaphors used in Chinese texts.

adoption within the realm of scientific research. Furthermore, a multitude of researchers have undertaken copious validity assessments of the MIPVU approach, with the outcomes of these diverse validity tests consistently yielding favorable results (Steen et al., 2010).

Results

Following the application of the MIPVU metaphor identification process, this study identified 13,234 English texts containing metaphorical descriptions, with a total word count of 212,105, and 3,400 Chinese texts, encompassing 220,540 Chinese characters. Concurrently, the research findings reveal that within the custom-built corpus, the metaphors commonly occurring in both Chinese and English texts pertaining to the COVID-19 pandemic primarily comprise "war metaphors" (accounting for approximately 42% of English texts and 63% of Chinese texts) and "disaster metaphors" (constituting around 43% of English texts and 12% of Chinese texts). Notably, the metaphors unique to and prominently distributed in the English texts are predominantly "zombie metaphors" (10%), whereas the metaphors exclusive to and relatively conspicuous in the Chinese texts are primarily "classroom metaphors" (7%), among others. Both the English and Chinese texts feature a smaller number of additional metaphors, which will not be discussed in this paper (5% in English texts and 18% in Chinese texts). These statistics are represented in the following two figures (Figures 1, 2).

War metaphors

In an examination of the conceptual metaphors from an academic perspective, the "war metaphor" can be characterized as an ontological metaphor, wherein the source domain of war is predominantly employed to map adversarial target domains. Lakoff has previously posited the notion that "ARGUMENT IS WAR" (Lakoff and Johnson, 1980), which suggests that through the mechanism of conceptual metaphor, the characteristics of war are mapped from the source domain to the target domain of "argument," thereby facilitating a more comprehensive understanding of the concept of "argument."

The similarities between Chinese and English texts regarding the employment of war metaphors are primarily manifested in the relatively high frequency of their appearance and the close proximity of the concrete imagery chosen, such as "front line," "weapon," "declaration of war," and "tactics," among others. Four underlying reasons can be attributed to this phenomenon: firstly, both war and the COVID-19 pandemic share the outcome of death, secondly, a conspicuous adversarial nature is exhibited in both war and the pandemic, thirdly, the ubiquity of war memories in the collective human genetic makeup constitutes a crucial philosophical and cultural foundation for the widespread existence of war metaphors, and fourthly, media and government discourses have played a substantial guiding role in the application of war metaphors, as governments across the globe have extensively utilized war metaphors for social mobilization in official texts, with mainstream media also adopting war metaphors in their reportage.

Nonetheless, there are discernible distinctions in the utilization of war metaphors between the two types of texts: in the source domain of Chinese texts, a plethora of historical elements can be observed, such as expressions akin to "defensive war," "annihilation war," "sniper war," "white armor," and "donning armor for battle," among others. The first three are mostly used to describe the battles in the People's War of Liberation and the last two are mostly used to describe heroes like Mulan who will fight for the people and the country. These historical elements serve to explicate the proactive attitude and approach adopted by the Chinese government in combating the pandemic and to depict proactive efforts in combating the pandemic.

In the self-compiled corpus, a total of 17 key terms related to Chinese war metaphors are identified, with the top 10 most frequent terms being: "fight against the pandemic," "resistance against the pandemic," "front line," "white armor," "weapons," "donning armor for battle," "sniper war," "annihilation war," "defensive war," and "combat." Among these, terms such as "white armor" and "donning armor for battle" are representative of elements in ancient Chinese warfare history, while "sniper war" and "annihilation war" are emblematic of modern warfare history. These source domains are rich in connotations, evoking a multitude of associations and imaginations for the reader. Textual examples are provided below:

> Text 1: 病毒内部变异出了叛徒，疫情真的有望过去了。
>
> Translation: The virus has mutated and produced a traitor within, suggesting that the epidemic may be nearing its end.
>
> Text 2: 此次瘟疫大战中，中国人的灵活机动完胜"联合国军"的人海战术。

> Translation: In this great battle against the plague, the Chinese people's flexible and mobile strategy has decisively outperformed the human wave tactics of the "United Nations Army."
>
> Text 3 :一个个核酸检测采样点被迅速搭建，战役的不眠守护者筑起堡垒。
>
> Translation: Nucleic acid testing sites were rapidly established, with the sleepless guardians of the battle constructing fortresses.

In Text 1, the Omicron variant is metaphorically portrayed as the "traitor" of the novel coronavirus. The term "traitor" frequently appears in Chinese warfare historical records, and the employment of this metaphor greatly facilitates the general public's comprehension of the term. In Text 2, the "United Nations Army" is mentioned, a term derived from the Korean War, during which China achieved significant victories. This reference serves as an embodiment of the superiority of China's anti-pandemic model. Text 3 posits that nucleic acid testing sites function as fortresses in the battle against the epidemic. The term "fortress" was extensively employed in the Sino-Japanese War and the People's War of Liberation, holding significant importance in these conflicts. By likening nucleic acid testing sites to "fortresses," the critical role they play is underscored.

Conversely, the employment of war metaphors in English texts is primarily grounded in factual descriptions, utilizing war metaphors to depict the current state of containment efforts in the context of the pandemic. Predominant examples include expressions such as "Your home is your fortress," "medics are soldiers," and "vaccines are stored in the arsenal." English texts predominantly employ war metaphors for factual descriptions. In the self-compiled corpus, a total of 46 key terms related to English war metaphors were identified, with the top 10 most frequent terms being: "fight," "shield," "war," "combat," "arsenal," "Blitz," "front line," "military," "traitor." These terms are primarily descriptive nouns and are less imbued with emotional significance. Textual examples are provided below:

> Text 1: Your home is your fortress, so stay safe at home
>
> Text 2: The un-jabbed are the ones getting sick and dying. Sort of a poetic justice. The traitors in this war against Covid19 are dying off..lol
>
> Text 3: COVID19 best war tactic is to present itself as mild, while increasing it's toll.
>
> Text 4: In this war staged against humanity (Covid19), let the health guidelines take the frontline as we follow in safeguarding our health. Make masks, soap and sanitizer your weapons as well as social distancing a war tactic.

In Texts 1–4, we also observe the recurring usage of key elements within the framework of warfare, such as "allies," "fortresses," "traitors," "war tactics," and "weapons." For example, Text 1 likens "home" to a "fortress," encouraging residents to guard their fortress like soldiers and not to leave without proper authorization. In Text 2, individuals who have not received the vaccine are metaphorically depicted as "traitors" who have betrayed humanity's side and joined the side of the virus. Texts 3 and 4 liken social distancing to a "war tactic" and masks, soap, and sanitizer to "weapons."

Disaster metaphors

In terms of disaster metaphors, both Chinese and English texts share the use of the concept of "fire." However, the difference lies in the fact that English texts have more cases of using "forest fire" to metaphorically describe the COVID-19 pandemic. This metaphor captures the infectiousness of the COVID-19 pandemic, where even a small spark can trigger a large-scale fire. Moreover, using "forest fires" as a metaphor for the COVID-19 pandemic also has a certain basis of recognition, just as people feel the heat and high temperature in a forest fire, COVID-19 patients also experience the torture of high body temperature (Semino, 2021). At the same time, other types of disaster metaphors appear in English texts, such as "tsunami metaphors" and "storm metaphors," which aim to awaken people's awareness of the severity of the COVID-19 epidemic.

English texts have more disaster metaphors than Chinese texts, and there are two main reasons for this. First, compared to English-speaking countries such as the United States and the United Kingdom, the frequency of disasters such as typhoons, tsunamis, and forest fires in China is not high, and using these metaphors may not fully evoke people's awareness of the seriousness of the COVID-19 pandemic. Second, in the "tsunami metaphor" and "storm metaphor," the patients or viruses are compared to the "tsunami" or "storm," while the human body or medical and health institutions are compared to the suffering side. During the time period of our sample in the self-built corpus, China did not experience large-scale epidemic outbreaks or a large influx of patients into hospitals.

Textual examples are provided below:

> Text 1: If no mask or mitigation, then FL is headed towards a burn through. That's like a forest fire that fizzles out when it runs out of wood/bushes/grass to burn.
>
> Text 2: Charging a price for covid19 tests is like charging firefighters for water in bushfire season.
>
> Text 3: Cases with unknown source could be "a smoldering forest fire".

In Text 1, the Florida COVID-19 situation is likened to a forest fire that will burn through if people do not wear masks or take mitigation measures. The fire will fizzle out only when it runs out of wood, bushes, and grass to burn, which represents the three uninfected human populations. In Text 2, the COVID-19 tests are metaphorically compared to water for firefighters in the bushfire season, emphasizing the need for free testing. In Text 3, the cases of unknown sources of infection are compared to "smoldering forest fires."

In Chinese texts, the disaster metaphor primarily revolves around the concept of fire. While the metaphor of "pandemic fire" is present, it occurs relatively infrequently. In Chinese texts, the COVID-19 pandemic is mainly compared to a fire, such as "rekindling the fire of the epidemic," "tempering the iron army in the fire of the epidemic," and "the fire of the epidemic has burned to our doorstep, but we are still not leaving." However, there are not many metaphorical references

to "forest fire" in Chinese texts, nor are there any extensions of this metaphor to concepts such as firefighters or firefighting equipment. Furthermore, disaster metaphors like "storm metaphors" or "tsunami metaphors" appear also less frequently in Chinese texts, with the closest being "a wave of the pandemic" which likens the pandemic to flood and similar uses. For example, in the text "They talk about wave after wave after wave. The words that are used to me are that it's a continuous tsunami.," the COVID-19 epidemic is compared to waves of tsunami-like waves of patients; and in "I think we are in the eye of the COVID19 Hurricane," the current situation of the pandemic is likened to the eye of a typhoon, a momentary calm before the storm; and in "Another one calls the current phase: storm of infections," patients are also compared to a storm that is hitting hospitals and other medical facilities.

Therefore, while the use of the disaster metaphor of "fire" is a commonality between Chinese and English texts, the difference lies in the frequency and variety of metaphorical references. English texts use a more extensive range of disaster metaphors to describe the pandemic, while Chinese texts primarily stick to the "fire metaphor." The reason for this difference could be attributed to the lower frequency of natural disasters such as forest fires, tsunamis, and hurricanes in China, resulting in a lack of familiarity and resonance with these disaster metaphors in Chinese culture.

Source domains chosen by users

In addition to war and disaster metaphors, English and Chinese texts use a large number of zombie apocalypse and classroom metaphors, respectively, to describe the COVID-19 pandemic. The zombie apocalypse metaphor reflects the helplessness and frustration of netizens in the face of the pandemic, while the classroom metaphor represents the pride and sense of achievement of the Chinese netizen community in the effectiveness of anti-epidemic policies.

Zombie apocalypse metaphor

In the English text, the zombie apocalypse metaphor is used extensively. The term "zombie" comes from the French word "zombi," referring to an undead body that has risen from the dead. With the increasing use of "zombie" elements in electronic games, television, and movies, a new concept of "zombie apocalypse" has emerged, referring to the gradual decline and collapse of human civilization with the influx of zombies, in which only a few surviving individuals remain. In some versions of the "zombie apocalypse," it is caused by infection from viruses or parasites, and zombies sweep through key institutions of contemporary society such as law enforcement agencies, military organizations, and health organizations. Basic social services come to a standstill, and survivors can only scavenge for food, weapons, and basic supplies, and can only live in so-called safe zones. In the English-speaking world, with the popularity of cultural and entertainment products featuring this theme, "zombies" and the "zombie apocalypse" abound.

At the same time, there are obvious differences between "zombies" and the Chinese cultural concept of "僵尸(Jiangshi)." "Jiangshi" generally refers to resurrected corpses that are already dead, with stiff bodies, especially in Hong Kong films. However, zombies are different. In zombie films, living people may also be infected and become zombies. This is similar to the living environment of people during a viral outbreak. Faced with the COVID-19 pandemic, many people compared the world they faced to a zombie apocalypse, and this metaphor appeared more frequently in English texts than in Chinese texts.

> Text 1: Anti-maskers keep spreading COVID19 like a zombie apocalypse.
>
> Text 2: If COVID19 has taught us anything it's that at least 1/3 the population is selfish AF and would hide infected bites in a real zombie apocalypse.
>
> Text 3: I think what this Covid19 pandemic has proven is that humans would never win against a zombie apocalypse, people's egos and pure stupidity would kill us all.

Within the aforementioned three texts, each has employed the concept of a "zombie apocalypse," yet each text utilizes this concept as a metaphor for different things. In Text 1, those who oppose wearing masks are compared to zombies, while in Text 2, individuals who have been infected with the COVID-19 virus but refuse to seek treatment are compared to zombies. Finally, Text 3 compares the entirety of the COVID-19 pandemic to a zombie apocalypse. This metaphor is employed to convey a sense of hopelessness and despair felt by individuals who perceive the situation as bleak and dire. It serves as a powerful rhetorical tool to convey the gravity of the situation and the severity of the threat posed by the virus. Moreover, it allows individuals to express their fears and anxieties in a more accessible and relatable manner. However, it is important to note that the zombie apocalypse metaphor is not without its limitations. Its use may lead to the oversimplification of a complex issue and can potentially result in the propagation of misinformation. Additionally, it may trivialize the experiences of those who have been impacted by the pandemic, reducing their suffering to a mere pop culture reference. Thus, while the "zombie apocalypse" metaphor can be a powerful tool to convey meaning, its usage should be considered carefully and thoughtfully to avoid misrepresenting or trivializing the experiences of those impacted by the pandemic.

Metaphor of "copying homework"

In Chinese texts, the metaphor of "copying homework" is frequently used to describe epidemic prevention and control. "Copying homework" refers to imitating successful pandemic prevention policies and practices of another government. However, this metaphor appears very rarely in English texts. In the following two Chinese texts, the metaphor of "copying homework" is used, in which one text criticizes South Korea's failure in epidemic prevention, while the other text raises questions about Hong Kong's epidemic prevention measures. This "copying homework" metaphor contains a semantic frame of classroom teaching. First of all, homework is generally a task assigned by the teacher to students after class, and "copying homework" is a process in which a student who cannot complete the task independently takes shortcuts and copies the results of another student with or without permission. The student

who copies homework is generally a poor student, while the student whose homework is copied is generally a good student, and their homework is not usually publicly available for other students to copy. In our self-built corpus, we found that the subject of "copying homework" is generally a foreign government, while the object being copied is generally the government or city of China. This reflects the recognition of netizens of China's achievements in epidemic prevention and control, as well as their concerns about the situation in other countries.

> Text 1: 韩国能不能学点好，疫情防控抄作业都能抄个零分。
>
> Translation: Can't South Korea learn something useful for once? Even in pandemic prevention and control, they would fail miserably at copying the good practices of other countries.
>
> Text 2: 大家说，香港这个疫情可以跟当时武汉抄作业。问题是，该怎么抄啊?土地面积差不多是武汉的1/8，日新增已经远超过武汉当时疫情的峰值，还有那么多不配合的人，而且变异毒株明显传染性远高于之前的病毒。
>
> Translation: Everyone is saying that Hong Kong can learn from Wuhan's experience in epidemic prevention and control. The problem is, how can we learn from it? The land area of Hong Kong is only about 1/8 of Wuhan's, and the daily increase in cases has far exceeded the peak of the epidemic in Wuhan at that time. In addition, there are so many uncooperative people, and the mutated strains of the virus have obviously higher transmissibility than the previous ones.

This "copying homework" metaphor contains a semantic frame of classroom teaching. First of all, homework is generally a task assigned by the teacher to students after class, and "copying homework" is a process in which a student who cannot complete the task independently takes shortcuts and copies the results of another student with or without permission. The student who copies homework is generally a poor student, while the student whose homework is copied is generally a good student, and their homework is not usually publicly available for other students to copy. In our self-built corpus, we found that the subject of "copying homework" is generally a foreign government, while the object being copied is generally the government or city of China. This reflects the recognition of netizens of China's achievements in epidemic prevention and control, as well as their concerns about the situation in other countries.

Discussion

The selection of source domains in metaphorical expressions is influenced by various factors such as social, historical, and cultural contexts. In our self-constructed corpus, both English and Chinese texts employ a plethora of war and disaster metaphors, indicating that both groups of netizens share a similar understanding of the COVID-19 pandemic. However, the specific selection of source domains differs significantly between the two groups. English-speaking netizens tend to use concepts from popular entertainment as source domains for metaphors, such as zombie metaphors, while Chinese-speaking netizens prefer to draw from historical elements, such as the "warriors in white" metaphor, which is used quite often to refer to young and versatile knights in Chinese folklores. Guan Yu, an important character from *Romance of the Three Kingdoms*, is an important example of "warrior in white." Coincidentally, the medics combatting COVID-19 are also mostly dressed in white and they are also called metaphorically "warriors in white." Even within the same source domain of war metaphors, the two groups exhibit significant differences in their selection. English-speaking netizens employ "blitz" metaphors extensively, a strategy used by Germany during World War II to quickly occupy multiple Western countries. In contrast, Chinese-speaking netizens frequently use metaphors such as "sniper war," "defensive war," and "annihilation war," which were essential tactics used by the Chinese Communist Party during the Anti-Japanese War and the Liberation War.

The selection of a source domain in a metaphorical expression conveys a purpose and expresses a demand. In English texts, there are many reflective discourses on war metaphors, and even several academic papers that discuss the legitimacy and legality of using war metaphors (Semino et al., 2017, 2018; Panzeri et al., 2021). This indicates that people are not simply accepting the metaphors assigned by social, historical, and cultural factors, but rather actively selecting metaphors that reflect their own experiences. To some extent, the metaphors we rely on for survival have become the metaphors we choose to live by. Some metaphors survive this selection and become content at different levels of metaphors (Kovecses, 2010; Kövecses, 2013, 2017, 2020), while others are actively rejected. For example, the zombie metaphor is prevalent in English texts, but it has not been widely adopted in Chinese texts. In contrast, the classroom metaphor is widely used in Chinese texts, but has not gained widespread acceptance in English texts.

The different metaphors in English and Chinese texts illustrate the shared cognitive mechanisms and differences in cognitive mechanisms behind metaphors. The selection of source domains in metaphors is both passive and intentional. Passive selection is based on the collective memory of a group, while active selection is based on current values and judgments. Exploring the cognitive strategies, thinking patterns, and selection mechanisms behind metaphors not only helps us better understand metaphors, but also provides insights into the relationship between language, thought, and human values.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Turning metaphor on its head: a "target-to-source transformation" approach in statistics education

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Many practical applications of metaphors are based on the idea that they are static TARGET IS SOURCE structures that support unidirectional meaning transfer for various purposes. Examples include healthcare and education where metaphors build cognitive and communicative bridges between the abstract and concrete. However, real-world metaphor use is often more dynamic than static, raising the question of how practical applications could benefit from a more correspondingly dynamic perspective. Drawing upon learning models that view learner output as creative transformations of input, this article introduces a "target-to-source transformation" approach that (i) initially frames concepts unfamiliar to novice learners as metaphorical targets as per received wisdom, but after some time, and (ii) invites learners to transform these targets into source domains for new target domains of their choosing. A pilot implementation is reported in the context of a statistics course, in particular the concept of regression analysis, for humanities students. Examples of transformed metaphors include different aspects of regression as sources for creative targets like "arranging a meeting time for friends," "finding a life partner," and "fortune-telling." Analysis of these examples suggests that the approach creates a sense of pedagogical consistency, allows students to exercise creativity, and gives teachers novel insights into their level of understanding. Points for critical reflection will also be raised for future development of the approach, including the need to consider oft-overlooked metalinguistic attitudes held by laypersons toward metaphors.

KEYWORDS

metaphor, pedagogy, statistics education, regression analysis, target-to-source transformation

1. Introduction

Three of the most prominent constructs in contemporary metaphor research are the source, target, and mappings between the two. The highly influential Conceptual Metaphor Theory (Lakoff, 1993), for example, defines "conceptual metaphors" as systematic unidirectional mappings from source to target domains. Expressed in the form TARGET IS SOURCE, conceptual metaphors have become fundamental units of analysis and provide a dominant theoretical frame for metaphor research and application. Examples include descriptions of conceptual metaphors in different languages (Yu, 1998; Kövecses, 2005) and non-linguistic modes (Forceville and Urios-Aparisi, 2009) and experimental studies of their psychological reality (Gibbs, 1994; Boroditsky, 2001; Glucksberg, 2003), as well as the functions and implications of source-to-target metaphorical inferencing in contexts such as politics (Musolff and Zinken, 2009), healthcare (Tay, 2013; Demjén et al., 2019), and marketing (Burgers et al., 2015). For instance, in mental healthcare contexts, clients' conceptualizations of their issues are typically framed as target domains that can be better

communicated, understood, or even replaced with source domains that are deemed more "adaptive" (Kopp and Craw, 1998; Stott et al., 2010). Many education researchers and practitioners hold a similar view of metaphors as cognitive bridges that help learners connect a body of "source knowledge" that is more familiar, vivid, or concrete, with new "target" knowledge that is less so (Duit, 1991). Metaphors are deemed to be especially useful when learners have minimal knowledge (Donnelly and McDaniel, 2000), or when the target knowledge is itself still in its formative stages (Boyd, 1993; Holyoak and Thagard, 1995). This philosophy of distinctively framing and transferring inferences from sources to targets has been evident in both the sciences (Gentner and Gentner, 1983; Tabor-Morris et al., 2009) and humanities (Cameron, 2003; Littlemore, 2009).

The above treatments of metaphor as a static source–target structure have not gone unchallenged. For example, from observing the "complex dynamics of real-world language use in social situations" (Cameron et al., 2009; p. 64), Cameron and associates offer an alternative view of metaphor as a fluid process rather than a static structure. Real-world metaphor is better described as constantly shifting source and target fragments infused with semantic and pragmatic features that emerge from the context of use (Cameron and Deignan, 2006; Cameron and Maslen, 2010). Similar observations of the dynamic behaviors of metaphor have been made in contexts ranging from scientific to business and healthcare discourse, each of which may occur at different time scales. While fundamental conceptual metaphors used to frame important social issues like climate change may undergo subtle changes over a long period (Nerlich and Jaspal, 2012), the strategic interplay between sources and targets may occur over short interactional spans in contexts like psychotherapy (Tay, 2014b; Tay and Jordan, 2015). A specific example relevant to this article is Tay (2014b) analysis of metaphors used by earthquake victims to relate their traumatic experiences. Descriptions of bodily experiences (e.g., *the ground was still moving and we were in the dark*), which would have been treated as target domains as per the conventional psychotherapy technique described above, turn out to be creatively utilized as source domains for other issues as the interaction unfolded (e.g., *we were in the dark and we didn't know where the future was going*) because of their "embodied" nature as theorized in CMT (Lakoff and Johnson, 1999). What then emerges is an interesting "chaining" dynamic where topics are transformed from targets into sources. The notion of "topic-triggered metaphors" first observed in business discourse (Koller, 2004) is in the same vein, as certain source domains are pragmatically motivated by the topic at hand rather than some ostensible static conceptual metaphorical structure.

The static vs. dynamic perspectives on metaphor raise the question of whether applications in fields such as psychological counseling and education, which have leaned mostly on the static perspective, could benefit by considering the dynamic. With the chaining of metaphor described above as a point-of-departure, this article describes an approach where concepts unfamiliar to novice learners, which are first introduced as target domains in typical pedagogical metaphors, are subsequently transformed by learners into source domains for a new target domain of their choosing. This learner-led process of (re)mapping a transformed source onto new targets, which we call "target-to-source transformation," has the potential to serve as a creative exercise that furthermore provides insight into the extent of learners' conceptual mastery. As general theoretical motivation, consider the fact that contemporary theoretical models of learning tend to highlight some trajectory where input knowledge undergoes a gradual transformation process that leads to learners realizing its relevance for new situations. An example is Hattie and Donoghue (2016) three-phase model of learning, reproduced in a simplified form as Figure 1.

In this model, various inputs to learning are summarily related to the learner's skill (i.e., prior achievements), will (mental dispositions toward learning), and thrill (motivations held). They are also deemed as ideal outputs in that increased skill is "as valuable as enhancing the dispositions toward learning and … inviting students to reinvest more into their mastery of learning" (Hattie and Donoghue, 2016; p. 2). The learner then experiences "surface" and "deep learning," both of which involve sub-phases of acquisition and consolidation. Surface learning refers to rote learning without conscious reflection on purpose or strategy, which may be consolidated by rehearsing the material to facilitate longer-term retention. On the other hand, deep learning is attested by seeking meaning, looking for patterns and principles, and relating and extending ideas across aspects of knowledge. The consolidation of deep learning occurs through critical self-questioning, monitoring, collaboration, problem-solving, and so on. Surface and deep learning may occur simultaneously for learners with strong metacognition and may also form a continuous cycle. Lastly, successful learning is marked by learners' willingness to transfer knowledge from one situation to another, which requires them to realize that the second situation resembles (or is perceived to resemble) the first situation. The conceptual connection between transfer and metaphor is clear, with metaphor being an obvious mechanism for transferring learned knowledge onto something new. Importantly, as we will see later, transfer does not require strong objective similarity or identity but can be motivated by more opportunistic perceptions of (di)similarities between the two things (Marton, 2006).

Relating this model more closely to metaphor, we can say that a typical pedagogical metaphor is well-chosen if (i) the source domain resonates with learners' existing knowledge and is able to engage their interest (i.e., skill, will, and thrill), (ii) complements the surface acquisition and consolidation of target knowledge, and (iii) facilitates deep learning by helping learners grasp the patterns, principles, and inferential logic underlying the target concept(s). The stage of the transfer, where these target concept(s) seek new grounds of application, is when the present proposal to initiate target-to-source transformation comes in. From the pedagogical perspective, this proposal aims to extend the ambit of metaphor as a teaching-and-learning tool where concepts are not just seen as static targets, but a creative source of conceptualization and reasoning especially at a stage where learners are expected to have developed some competence. Despite this creative expression, the approach can also foster a sense of pedagogical consistency when learners appreciate that the same tool (i.e., metaphor) used to impart the target concept(s) is redeployed for a different but related purpose of stretching their understanding. Several points of interest also arise from the perspective of metaphor theory, particularly the nature of metaphor chaining in an educational

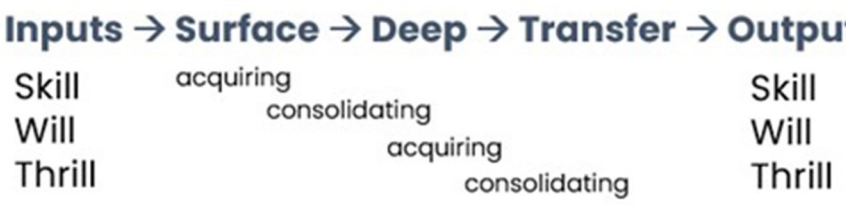

FIGURE 1
Three-phased model of learning.

context. For example, it would be interesting to see how the original metaphor *given to* learners relates to the new metaphor *produced by* learners, which aspects are "carried over," and how these are discursively constructed. This article reports a pilot implementation of our proposal in the context of basic statistics education, specifically the concept of regression analysis. The participants and method, including details of the original pedagogical metaphor and how the transformed metaphors are elicited, will be explained next. This is followed by analyzing three aspects of transformed metaphors and their theoretical and pedagogical implications: (ii) how transformed metaphors rely on their original sources, and (iii) misrepresentation as a diagnostic of students' conceptual understanding. Given the preliminary nature of the present findings, some future research directions are suggested in the concluding section.

2. Participants and method

This study took place in an undergraduate course (N = 50) in a language and communication degree program. The course introduced basic statistical knowledge for future careers in teaching, sales and marketing, and the media. All students were considered novice learners as they had no prior systematic training in statistics. After 2 weeks of basic descriptive statistics and an introduction to hypothesis testing, the next few sessions focused on the following concepts of linear regression analysis.

- Ordinary least-square regression applied to one predictor and one outcome variable.
- The total sum of squares (SST), regression sum of squares (SSR), and error sum of squares (SSE), and their relationship (SST = SSR + SSE).
- Manual calculation of SST, SSR, and SSE.
- The coefficient of determination R2 as a measure of model fit.

Students were first exposed to the standard regression instructional diagram shown in Figure 2 to gain a general understanding of the above bullet points. As part of another study that compared the effect of different metaphors on assessment outcomes (Tay, 2022a), they were then randomly assigned and exposed to one of two pedagogical metaphors: REGRESSION ANALYSIS IS DOTS AND LINES IN PHYSICAL SPACE, or REGRESSION ANALYSIS IS A RADIO STATION BROADCASTING A SIGNAL (Martin, 2003). These metaphors are conveyed to the students in the following form.

2.1. Regression analysis is dots and lines in physical space

It is helpful to visualize *regression analysis* in terms of dots and lines in physical space. Each dot on the scatterplot represents a *student*. The distance between the dots, therefore, represents *how different their score and study hours are*. The further the distance between dots, the greater the *variability among students*. The horizontal line is the mean line. It represents the *mean exam scores* and divides the territory between the *above and below average students*. The total distance between the dots and the line is the *total variability in exam scores*. If the dots are close to the line, there is *less variability*, and the scores are easier to predict. However, if the dots are scattered far apart, there is *more variability*, and the scores are harder to predict. The straight regression line represents our regression *model*. Each point on the line represents the *predicted performance score* based on the number of study hours. The vertical distance between each dot and its corresponding point on the line represents the *error or residual*. The smaller the distance between the line and the dots, the *more accurate the prediction* is. From another perspective, we can also say that the total distance between points on the regression line and the mean line represents the *variability explained by the model*. In general, we want to minimize prediction errors and maximize the explained variability. In real life, it is almost impossible to have a model with absolutely no error, because there is always some unknown variability that cannot be explained.

2.2. Regression analysis is a radio station broadcasting a signal

It is helpful to visualize regression analysis in terms of a radio station broadcasting a signal. Imagine that I am listening to this broadcast from a long distance away. What I hear will not be identical to the original signal, because of some form of interference or signal degradation which we call "noise" in general. In other words, the signal I hear is actually made up of the original signal from the station plus this noise. Engineers will use different techniques and tools to make the signal I hear as close as possible

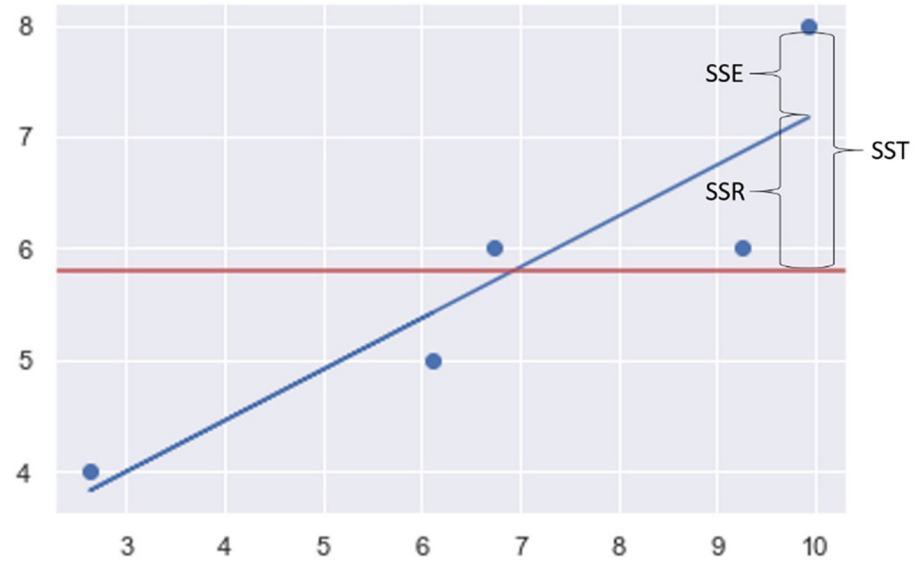

FIGURE 2
Standard regression instructional diagram.

to the original signal, or to reduce the noise. However, it is very difficult to achieve zero noise. Regression analysis follows the same principle. We are given data on the exam performance and number of study hours for a sample of students, and we want to see if there is a relationship between them, so that we can predict exam performance based on study hours for students not in the sample. This prediction will not be perfectly accurate because there is also "noise" in our data. The number of study hours may partly explain differences in performance, but there are other factors that we did not measure or expect. Just as engineers use different techniques and tools to reduce noise in the radio signal, regression analysts use different techniques and tools to optimize the predictions using the data available. Moreover, just as achieving zero signal loss is very difficult, in most situations it is almost impossible for predictions to have absolutely no error. This is because there is always some unknown variability that cannot be explained.

In addition to the source domains, the key difference between the two metaphors lies in their discursive construction. In the physical space metaphor, source elements (i.e., spatial descriptions) are emboldened and target elements (i.e., aspects of regression) are italicized to show their systematic juxtaposition, highlighting point-to-point correspondences rather than some overarching similarity between source and target (Gentner, 1983; Duit, 1991). This has been described as a "correspondence model" (Wee, 2005; Tay, 2022a). The radio station metaphor works the opposite way by not emphasizing point-by-point correspondences, but highlighting the overarching objective of both source and target (Glucksberg and McGlone, 1999) as reducing "noise" (emboldened). This has been described as a "class inclusion model" where the so-called overarching objective subsumes both source and target (Wee, 2005; Tay, 2022a). The effects of discursive construction on subsequent performance measures like calculation exercises and short conceptual essays were reported in Tay (2022a). For the present study, however, the two variant constructions simply served as different starting points for the next phase where students' transformed metaphors were elicited.

The critical phase of eliciting students' transformed metaphors took place at the end of the sessions on regression analysis. The instructor invited volunteers ($N = 7$) to an informal session to share their experiences of the course up to that point. Care was taken to ensure that both original pedagogical metaphors were "represented," in that there would be at least one student exposed to either metaphor taking part in the sharing session. It was explained that the objective of the session was to collect feedback and that students' responses will be used for pedagogical research. After a preliminary discussion of their experiences, the prompt below was used to elicit their transformed metaphors. For students exposed to the radio station metaphor, "dots and lines in physical space" was replaced by "a radio station broadcasting a signal." Students' responses were transcribed and minimally edited for grammatical errors.

> We saw in the lectures that regression analysis can be compared to (dots and lines in physical space/a radio station broadcasting a signal). So, we used (dots and lines in physical space/a radio station broadcasting a signal) as a tool to understand regression better. Now that you have a basic understanding of regression, shall we try to flip things around and use regression as a tool to understand something else? What is this "something else" that regression can be compared to?

There are two important points to be made about the prompt. The first is the deliberate avoidance of technical terms like "metaphor" or "analogy," and the second is the attempt to carefully deconstruct what is meant by metaphor. We can see that the prompt was designed to remind students about the nature, function, and form of the pedagogical metaphors they previously

experienced. Their nature was to setup systematic comparisons between target and source to perform the function of enhancing conceptual understanding, and their formal structure X IS Y can be "flipped around" to produce Z IS X, where X is the original target, Y is the original source, and Z is the new target. Researchers in applied contexts like education (Wan, 2011) and psychotherapy (Tay, 2022b) have highlighted the important question of how to best elicit, or draw attention to, the presence and intended use of metaphors. This is especially important for layperson audiences who are unlikely to share the researcher's understanding despite the ostensible pervasiveness of metaphors, and who might resist or even display negative attitudes toward them (Tay, 2020). The present study, therefore, opts for a more careful approach that does not assume prior understanding of metaphor or attitudes toward it.

3. Results and discussion: three illustrative target-to-source transformations

The seven responses predictably varied in quality and content. Two students demonstrated difficulties with understanding the prompt, one appeared to question the usefulness of the activity, while the other provided semi-coherent answers requiring extensive follow-up prompts. Three other students offered thoughtful responses that will be analyzed below to illustrate the pedagogical plausibility of eliciting target-to-source transformations. Importantly, the varying quality of responses that arose from even a limited sample suggests the need for future work to consider how metalinguistic awareness and attitudes toward metaphor may impact pedagogical effectiveness. Consider, for example, the following (extracts of) less-than-ideal responses.

> Sorry I don't totally understand what you mean by using regression as a tool. I thought we use regression to predict values for data, so what do you mean by using it to compare with something else?
>
> Why do we need to talk about or understand something else? I think the course is about statistics and regression.
>
> I think regression is a tool to understand data, like how an outcome is related to some variables. So the "something else" can be any social data, maybe not just the radio station example you said.

The first response illustrates what could happen when the desire to not assume a prior understanding of "metaphor" is met by a seeming case of inadequate metalinguistic awareness of it. The student has a correct understanding of the purpose of regression analysis, which demonstrates the effectiveness of originally framing it as a target domain. However, they appear unwilling and/or unable to perceive the underlying mechanism (of metaphor) that was used to enable this understanding, much less participate in further extensions of this mechanism. The second response is more explicitly resistive and questions the need to "talk about or understand something else," suggesting a common pragmatic attitude toward learning where it is "enough" to just understand the target topic. The third response may appear semi-coherent from an idealistic metaphor-theoretical point of view, as the student seems to not understand "something else" as a counterpart conceptual structure in the same tidy way as many metaphor researchers do.

As mentioned above, such less-than-ideal responses highlight limitations to metaphor-related pedagogies and provide important food for thought we will revisit in the conclusion. For now, we return to the productive responses below and analyze them for their implications for metaphor theory and (statistics) pedagogy.

Example 1: "Arranging a time for friends to meet"

> What I can think of is that when I am trying to arrange a time for my friends to meet, that is something like regression. You know that diagram with the dots and lines you showed us, I think maybe different people can be like all the dots or data points, who are all at different places and far away from each other, and when I arrange a meeting time I am trying to draw a line to connect everyone or make it as close as possible to everyone. Maybe the nearer the friends are to the line, that means those people will not be late for the meeting and there is less error like in regression. And those people on the line are those who can meet at the correct time. I think it's something like that, am I correct?

The student in Example 1 was exposed to the REGRESSION ANALYSIS IS DOTS AND LINES IN PHYSICAL SPACE metaphor, which they explicitly recall early on ("that diagram with the dots and lines…"). The target of the transformed metaphor is "arranging a time for friends to meet," the main point being that finding the best time for an appointment between friends is like fitting a regression line of best fit for a set of data points. Each friend is likened to a data point occupying different spatial locations. The notion of error or residuals is also recruited to represent the extent of lateness for the appointment. Fairly characteristic of novice learners, they express some uncertainty about the "correctness" of the response at the end.

Example 2: "Finding a life partner"

> I think the regression analysis reminds me of someone who wants to find a life partner, like a husband or wife. I don't know, so maybe marriage is something like a regression for me. I think the regression model you talked about is maybe like a set of criteria that you have for a husband. The different people you meet in your life are like the data points and they are all different because like the data points with different values they have different qualities or characters. Then maybe using the model or my criteria I can try to predict whether a new person I meet can fulfill the criteria I have? And if he is suitable that means he will be on the line, and if not suitable then there will be like an error. But my idea is not very clear I think.

The student in Example 2 was likewise exposed to the REGRESSION ANALYSIS IS DOTS AND LINES IN PHYSICAL SPACE metaphor, though this was not explicitly referenced. The target of the transformed metaphor is "finding a life partner" where different potential partners are likened to data points and the "set of criteria" for a life partner is likened to the regression line of best fit. The notion of error was likewise used to represent the extent of potential partners' suitability, just like

in Example 1. Additionally, missing from Example 1 but present here, the important notion of predicting outcomes for future data was also recruited to express the idea of judging if "a new person" would be suitable. Throughout the response, the student likewise expressed uncertainty, perhaps even more so than in Example 1.

Example 3: "Fortune-telling"

> We learnt that the most important use for regression is prediction, and making the predictions as accurate as possible like that radio signal example you gave. I think another thing that involves prediction and is maybe also a bit like regression is like fortune-telling, fortune-tellers that try to predict your future. Usually, they will also ask for your data and personal information like date of birth, occupation, and so on, and then try to tell you a story about your future. But still, I think the two things are actually very different. I don't think the personal information can be considered as data for regression because they are all taken from the same person and on different aspects, but for regression each data point is from different people and on the same aspect. Also of course fortune-telling is not scientific and is more like guessing, but regression is a very systematic thing and is about finding patterns in a lot of data.

The student in Example 3 was exposed to the REGRESSION ANALYSIS IS A RADIO STATION BROADCASTING A SIGNAL metaphor, as explicitly referenced early on ("like that radio signal example"). The target of the transformed metaphor is "fortune-telling," as the response focuses on explaining how the overarching feature of prediction applies to both activities. A salient difference between Example 3 and the previous two examples is the attention to the dissimilarities between fortune-telling and regression, with the explicit disclaimer that "the two things are actually very different." In other words, the transformed metaphor is sanctioned by the overarching relevance of "prediction," but subsequently self-challenged by specifying a series of mismatches between target and source.

3.1. Discursive construction of transformed metaphors

We now make some collective observations from the three transformed metaphors and discuss what they imply for metaphor theory as well as (statistics) pedagogy. Referring back to the three-phase learning model in Figure 1, these transformed metaphors can be seen as preliminary evidence of student learning outputs, to be further developed as part of more complete teaching and learning activities designed in the future. We begin with what is apparent from the surface—the discursive elements that construct the transformed metaphors, which may provide clues on how students understand and convey important source–target relationships (cf. Tay, 2010). The first observation is that the structure of the students' metaphors appears to mirror what they were initially exposed to—described above as either a correspondence (REGRESSION ANALYSIS IS DOTS AND LINES IN PHYSICAL SPACE) or class inclusion structure (REGRESSION ANALYSIS IS A RADIO STATION BROADCASTING A SIGNAL). In correspondence structures, source and target elements are systematically juxtaposed to highlight point-to-point correspondences, ostensibly in order to guide recipients to make these important connections. We catch glimpses of this systematicity in Examples 1 and 2 despite their spontaneous nature. For example, consider the following short snippets from the original pedagogical metaphor, Example 1 and Example 2, respectively. Like in the original metaphor, source elements are emboldened and target elements are italicized to show this systematicity.

3.2. Original metaphor

It is helpful to visualize *regression analysis* in terms of dots and lines in physical space. Each dot on the scatterplot represents a *student*. The distance between the dots, therefore, represents *how different their score and study hours are*. The further the distance between dots, the greater the *variability among students*…

Example 1

> You know that diagram with the dots and lines you showed us, I think maybe *different people* can be like all the dots or data points, who are all *at different places and far away from each other*, and when I *arrange a meeting time* I am trying to draw a line to connect everyone or make it as close as possible to everyone…

Example 2

> I think the regression model you talked about is maybe *like a set of criteria that you have for a husband*. The *different people you meet in your life* are like the data points and they are all different because like the data points with different values they *have different qualities or characters*...

It is evident from both Examples 1 and 2 that the general expository-style structure of intermittent source element–target element (or vice versa) pairs seem to have been preserved from the original metaphor. The same can be observed for the class inclusion structure experienced by the student in Example 3, as seen from the snippets below. Recall that the class inclusion structure does not emphasize point-by-point correspondences, but summarily highlights an overarching point that subsumes both source and target. This overarching point is emboldened in the snippets.

Original metaphor

> ... The number of study hours may partly explain differences in performance, but there are other factors that we did not measure or expect. Just as engineers use different techniques and tools to reduce noise in the radio signal, regression analysts use different techniques and tools to optimize the predictions using the data available.

Example 3

> We learnt that the most important use for regression is prediction, and making the predictions as accurate as possible like that radio signal example you gave. I think another thing that involves prediction and is also a bit like regression is like fortune-telling, fortune-tellers that try to predict your future…

Similarly, just as the original metaphor delivers the overarching point after some (not necessarily intermittent) explanation of the source and target, the student in Example 3 emphasizes the common feature of "prediction" in both regression and fortune-telling in lieu of explicating systematic correspondences between the two. This initial observation of structural consistency between what was received (i.e., the original metaphor) and created (i.e., the transformed metaphor) may suggest that, despite the creative exercise of transferring knowledge to new situations via metaphor, the present students still seem to be guided (or constrained, depending on one's pedagogical perspective) by an implicit template that shaped the original teaching material. Recall that these "templates," or correspondence vs. class inclusion structures, were designed to be maximally contrastive for experimental purposes. It is an open question whether such discursive behaviors are observable in other learner populations, and if so, to what extent they are helpful.

The second observation on discursive construction is the salient expression of uncertainty across all three examples. This includes typical hedging expressions like *maybe, I think, I don't know,* as well as more explicit disclaimers like *am I correct?* (Example 1) and *but my idea is not very clear* (Example 2). It is of course unsurprising for novice learners to express doubt about the "correctness" of their answers, which in this case may relate to their understanding of regression and/or self-perceived quality of their transformed metaphors. However, at a more subtle level, the expression of uncertainty could involve questioning the validity/purpose of using the metaphor itself. Similar to extended metaphors used by therapists and clients in psychotherapy (Tay, 2011), the preliminary samples indicate that hedging expressions tend to preface the introduction of source/target elements or statements of cross-domain mappings. This is apparent in the following extracts from Examples 1 and 2 (hedging expressions are emboldened).

Example 1

> You know that diagram with the dots and lines you showed us, I think maybe different people can be like all the dots or data points… Maybe the nearer the friends are to the line, that means those people will not be late…

Example 2

> I think the regression analysis reminds me of someone who wants to find a life partner, like a husband or wife. I don't know, so maybe marriage is something like a regression for me…The different people you meet in your life are like the data points and they are all different because like the data points with different values they have different qualities or characters. Then maybe using the model or my criteria I can try to predict whether a new person…

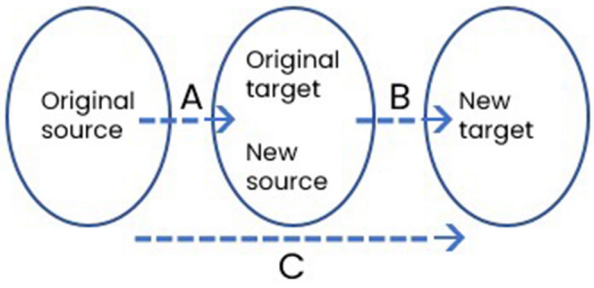

FIGURE 3
Schematic representation of a metaphor chain.

When produced by institutional "advice-givers" like therapists and teachers, such hedges may be intended to communicate the inherently approximate nature of metaphors, and the importance of distancing them from relevant literal facts (Tay, 2014a). However, when produced by counterparts like learners at key locations like sources/targets/mappings, hedges are equally likely to express doubts about whether such metaphors are "correct" as ostensible representations of technical concepts. This is again related to the aforementioned importance of not making naïve assumptions about layperson attitudes to metaphors, across the many contexts of applied metaphor research.

3.3. Metaphor chaining: reliance on the original source

Moving from discursive construction to conceptual representation, the next observation relates to the nature of what we called metaphor chaining, where original topics turn from targets into sources for new topics. There are perceptible differences between the present examples and metaphor chains in the previously mentioned descriptions of earthquake experiences, as schematically captured in Figure 3.

In earthquake descriptions like *we were in the dark, we didn't know where the future was going*, the original target of being (literally) in the dark could have been described with a source but did not rely strongly on one as it was already "embodied" in the cognitive linguistic sense (Tay, 2014b). This corresponds to a weak mapping set A in Figure 3. However, mapping set B is strong as the speaker turns "being in the dark" into a new source for the new target of uncertainty about the future. There is also no obvious direct conceptual link between the original source and the new target, meaning mapping set C is also weak.

In present examples, however, mapping sets A to C all appear to be strong, resulting in a more integrated metaphor-chaining dynamic. In Examples 1 and 3, the students explicitly recall original sources—*you know that diagram with the dots and lines you showed us*, and *like that radio signal example you gave*—when presenting their new targets. More importantly, the inferential structure defining A seems to have been strongly preserved in B, which is equivalent to a strengthened C. In Examples 1 and 2 below, the dots

and lines in the original source that represented analytical units in the regression were directly invoked to construe the new targets.

> … that diagram with the dots and lines you showed us, I think maybe different people can be like all the dots or data points…
>
> … different people you meet in your life are like the data points and they are all different because like the data points with different values…

As for Example 3, partly due to its class inclusion structure discussed above, all three domains—the original radio station source, regression, and the new fortune-telling target—were closely juxtaposed and linked to the overarching feature of 'prediction'. Although this appeal to superordinate attributes has the effect of blurring the distinction between sources and targets (Wee, 2005), the sense of metaphor chaining or mutual reference between past taught contents and students' present creation is still clear.

> …the most important use for regression is prediction, and making the predictions as accurate as possible like that radio signal example you gave. I think another thing that involves prediction and is also maybe a bit like regression is like fortune-telling…

The strong degree of reliance shown above echoes a point made in the previous section—that while students are able to creatively invent new targets that are *substantively* different, these targets are still *structurally* dependent on original sources, which is likely to create an impression of consistency throughout the learning phases. From a theoretical perspective, these initial observations lend support to the view that structural similarity might be a more important driver than substantive similarity in analogy creation and perception (Blanchette and Dunbar, 2000; Tay, 2021). Pedagogically, the spontaneous balance between creativity and pedagogical consistency can be interpreted as a point in favor of the present approach.

3.4. Misrepresentation as a diagnostic of conceptual understanding

The first two observations above are more descriptive, focusing on how students construe and communicate their transformed metaphors. Our final observation is more critical and pedagogically oriented in that we consider how these metaphors reflect students' (in)correct understanding of regression analysis. In other words, the misrepresentation of concepts via metaphor is a diagnostic of conceptual understanding. An examination of the described relationship between regression and each new target reveals various levels of understanding from Examples 1 to 3.

In Example 1, the metaphor of "arranging a time for friends to meet" reflected the student's recall and understanding of basic conceptual points about regression analysis. These include data points as mutually independent (*different people can be like all the dots or data points…*), occupying different positions (*who are all at different places…*), and the general idea of trying to minimize residuals when fitting a regression line (*the nearer the friends are to the line, that means those people will not be late for the meeting and there is less error…*). However, several critical elements appear to be misconstrued. The first is that there is no target domain counterpart of the predictors, or variables, that defined the position of the dots/friends in the first place. Second, the target domain also fails to capture the main idea of predicting future values, which is the purpose of the regression line. Instead, the regression line in the student's metaphor seems to be stipulating one singular time point for friends to meet, which is an incorrect analog of a different predicted value for each data point. It seems that the student has either incorrectly understood the above concepts or has chosen to paint a "looser" picture, aiming more at producing a coherent metaphor than a conceptually perfect one.

In Example 2, the metaphor of "finding a life partner" was likewise able to reflect the same basic conceptual points using a very different target (e.g., *the different people you meet in your life are like the data points… if not suitable then there will be like an error*). However, Example 2 may reflect a higher level of understanding because, at first, the concept of variables that defines the spatial location of the dots/persons was captured in the target domain (*like the data points with different values they have different qualities or characters*). Second, the concept of prediction was also captured by the notion of judging whether a new person (i.e., a new data point) falls on the line. Notwithstanding, just like in Example 1, it is apparent from the metaphor that some concepts have been misconstrued. Construing the regression model as a *set of criteria* that people should "strive toward," rather than a mere description of how data points are connected, is technically incorrect. This may reflect the common misunderstanding that a statistical "model" represents an ideal rather than an empirical approximation of reality—something also seen in Example 1. Another subtle error is the construal of predictions (i.e., whether someone is suitable) as a yes/no categorical outcome rather than continuous values. Just like in Example 1, we have to consider the possibility that students are more focused on producing a coherent rather than a "correct" transformed metaphor.

In this regard, Example 3 appears to demonstrate the most mature understanding of regression analysis. Disclaimer statements like *I think the two things are actually very different* and *fortune-telling is not scientific and is more like guessing, but regression is a very systematic thing* are particularly telling. Not only does their elaboration reveal the sound understanding of specific technical points about regression (e.g., data taken from the same person vs. data taken from different people), but the act of disclaiming also suggests an awareness of the need to compromise between a coherent and technically correct metaphor.

4. Conclusion

This article introduced a teaching-and-learning approach that goes beyond representing new target concepts with metaphors to encourage novice learners to creatively transform these targets into sources after acquiring some basic competence. The approach was inspired by perceived gaps in applying a more dynamic perspective on metaphor to pedagogy, in accordance with learning models that advocate the student-led transfer of knowledge to new situations. Findings from a pilot implementation of this "target-to-source

transformation" exercise in an undergraduate statistics course were reported. Examples of students' transformed metaphors were discussed in three aspects, ranging from their surface discourse construction to the construed conceptual relationships between the original source, the concept of regression analysis, and the new target.

The preliminary examples are neither representative of the present population of learners, nor generalizable to other populations. Their main value is to illustrate how the "target-to-source transformation" exercise could give students an opportunity to exercise creativity on a subject matter not normally associated with it. At the same time, a sense of pedagogical consistency was evident in student responses through the perceptible influence of the original metaphors on the transformed ones. The exercise also has the potential to give teachers novel insight into the extent of students' conceptual understanding. Nevertheless, these examples also raise some issues of concern. The fact that some students seem unable and/or unwilling to provide a coherent transformed metaphor, coupled with expressions of doubt about the validity of some responses, echoes the point observed elsewhere that laypersons' abilities, awareness, and attitudes about metaphor need to be critically considered before we prematurely assume that they "work."

Given the constructive nature of the available responses, it is worth further developing and investigating the present proposal in several ways. The most obvious next step is to move from the research setting of sharing sessions back into the classroom and design the exercise more concretely, ideally as part of a class activity for individuals or groups. This would allow for a more systematic assessment of the effectiveness of "target-to-source transformation" for learning, for example by comparing understandings of regression between intervention and control groups. It should also provide more critical examples and insights into when, how, and why the approach does not work, how this might relate to attitudes and understanding toward metaphor, and contributing learner characteristics and factors. More optimistically, if transformed metaphors indeed reveal the extent of students' understanding, ways to factor them into assessment plans should be considered. The transformed metaphors could take on different creative forms, including visual or multimodal creations that would at the same time provide rich data for further research on the nature of metaphor chaining.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the Hong Kong Polytechnic University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The roots of metaphor: the essence of thought

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The essence of metaphor's reliance on two domains, a source and a target, is argued as stemming from a fundamental characteristic of higher cognition—that of conceptualizing more than one cognitive/embodied domain at the same time. This cognitive duality is argued to underlie a plethora of conceptual activities including comparison, contrast, categorization, as well as metaphorizing. Why "two" domains seems the emergent and optimal means of such meta-cognition, rather than a higher number of domains, which might confer some advantages, is argued to arise from a grand compromise between an extreme necessity of humans to create and rely-upon shared complex meanings, and the complexities in enabling such shared meaning across multiple domains.

KEYWORDS

figurative language, metaphor, conceptual domains, cognitive duality, source domain, target domain

Highlights

- Deconstructs metaphorical structures to demonstrate the profound possibilities of dual cognitive schematic activation.
- Argues for a deeper understanding of metaphor beyond mere source and target domains.
- Emphasizes that dual activation is not in itself sufficient for metaphor to occur.
- Points to a wealth of other similar situations where the presence of a duality, as in metaphor, can be a tipping point in the ensuing magnitude of complexity.

Introduction

> "Are not gross bodies and light convertible into one another, and may not bodies receive much of their activity from the particles of light which enter their composition?"
>
> "Truth is ever to be found in the simplicity, and not in the multiplicity and confusion of things."
>
> — Isaac Newton,
>
> Opticks, 1704
>
> http://www.rarebookroom.org/Control/nwtopt/index.html

Metaphor has long been recognized as involving two things, frequently labeled domains—a *target domain* people are seeking to understand, and a *source domain* used to help with that understanding. Whether the connection between these domains allows for one-way or two-way

traffic, is a matter of much discussion. And what those domains actually are, as some kind of conceptual structures or something else, is also a slippery issue (Gibbs, 2017). But *that* metaphor involves two of these things, is a well-received idea (although some accounts allow for a third *thing*, an emergent blend of targets and sources, Fauconnier and Turner, 2008).

Moreover, recent research has noted that most forms of figurative language, including metaphor, also invoke exactly two of these "domains," albeit they do somewhat different things with them than metaphor (a smaller set of figures invokes only one domain, and one figure or at least figurativesque form—puns, can at times invoke more than two domains), (Colston, in press; Colston and Rasse, submitted). So it seems as if *two* is a magic number of some sort, at least in metaphor and figurative language (Colston, 2019). Why might this be the case?

The argument to-be presented in the present paper is that it is not so much that metaphor just *happens* to involve two domains. But rather that cognition itself, in a general sense, seems to involve representation and activation (whether in an information processing, an embodied cognition, or in some other sense), of domain-like things—activating them at times to do cognitive work (e.g., a predator animal coming upon the scent of a ground-dwelling prey, activating the domain of "food," or "hunt," or "vole," etc., and acting accordingly). But once cognition moves from dealing with one domain at a time to two—and especially with both domains being active in some particular way at the same time, something very special is enabled. Having the neural machinery to hold one conceptual domain in mind, while invoking a second one, allows for a wide variety of cognitive, or perhaps meta-cognitive processes, including metaphorical thought.[1] Animals equipped with such neural machinery can *compare* the two things (which is bigger?), *contrast* them (which is better?), *substitute* them (a long stick STANDS FOR a long arm), as well as *metaphorize* the two domains (positive affect IS warm sunshine). So such an ability seems to bridge the very earliest possibilities in thought about more than one thing at a time, leading all the way up to the most profound and meaningful multimodal poetic metaphors. The latter, also enable realization of similarities between two things (roses and love, sunshine and happiness, etc.), yet also open up a universe of meaningful possibilities (Rasse, 2022).

So the metaphorical move, going from one concept to two, is actually a move from a single conceptual domain into a seeming infinity of understanding, much the same way that a point in a geometrical sense, is singular and infinitesimally small, yet two points together define an infinitely long line. Metaphor thus seems to reside where advanced cognition begins, but it does not seem to have any reasonable end.[2]

The power of two in cognition

As a means of demonstrating the usefulness of this notion of "two" in cognition, please consider the following brief anecdote:

> When in middle school in the United States in the 1980s, the author was invited to partake in a class exercise, one commonly used in North American middle schools at the time, to make a point. The students in the class were invited to each select a lemon from a large bowl, to then study the lemon for a moment, and to then place it into a large covered basket. The returned lemons were then all arrayed randomly on a long table, and students were invited again, this time to search among the array of lemons to find the particular one they'd held before.
>
> The task appeared ludicrous at first, how could we tell our lemon from all the others? Certainly the lemons weren't identical, but their differences seemed utterly trivial—enough so to make the task seemingly fruitless. We were all surprised to learn, however, that though subtle, those minor differences among the lemons allowed us all to successfully and rather easily select which lemon was ours. And it required relatively little time to accomplish. We then made lemonade.

This exercise was intended as more of a social lesson that a perceptual and/or cognitive one. It was used at the time to demonstrate to a group of budding adults, that things which appear essentially alike on the surface, nonetheless have discernable differences that matter. After the exercise was over and we were drinking our lemonade, we were invited again to apply this lesson to ourselves and to our classmates, and by extension, to all people. The exercise was a means of allowing us to understand two seemingly contradictory things—firstly that people belong to a single category by virtue of having the characteristics that put us into that category, essentially our humanity. Which suggests that people are in general largely *alike* or very *similar* to one another. Yet at the same time, those same "unitary" people bear remarkable differences that afford the ability to identify individuals quite readily by their unique configurations of human characteristics, even within a large and similar crowd, suggesting extensive *differences* or *dissimilarities* among people.

In essence, people can seem very different in all of the capacities that make us human, yet we nonetheless by virtue *of* those very humane characteristics are also united into a single category. We are different, *and* we are similar. We are all unique, *and* yet we all belong to a unified category. All seemingly contradictory, yet also all true. It was a valuable exercise.

But what can this middle-school lesson about lemon's and people's similarities and differences tell us about metaphor and human cognition, or any presumed connection between the two? It turns out that the lesson reveals a fundamental underpinning of both higher human cognition and metaphor, and why you cannot have all of the former without the latter. In order for the middle school students in

1 The psychological concept of "association," as in associative learning, may be considered a parallel, analog, or possibly a precursor to a dual consideration (where a neural system "learns" that two things go together [e.g. sun and warmth]). But in metaphorical cognition, the association concerns broader cross-domain resemblances or similarities, rather than just mere co-occurrences or other relations (e.g., causal).

2 This is not to argue that metaphor opens up a genuine and literal infinity of possible meaning, who are we to know what such a thing even is? But the extent of metaphorical meaning does seem to have a fair degree of astounding open-endedness, in that we have certainly not reached an end to the extent of metaphorical meaning/understanding, nor does one seem in sight.

the example to succeed at their selection task, they must assemble and maintain two related but different things at the same time. They must use their sensory systems to assemble a percept of a particular lemon they hold in their hand, noting any distinguishing characteristics or features, discerning any patterns, etc., essentially forming a representation of that particular lemon in their mind. They must also have retained some form of similar representation from the original lemon they'd held earlier—to which they can now compare the live-held lemon. If the representations reasonably match, the student can determine that they have found their original lemon. If the representations reasonably mismatch, the student knows they have not found their original piece of fruit, and must continue searching.

This capacity to hold more than one representation in mind somehow *at the same time* (in the present case, one actively generated sensorily and another held in memory), is the very basis of the concept of *comparison*.[3] Abundant theories are available to explain how these related but differing processes specifically take place, but their working together to afford comparison gives birth to a seeming infinity of conceptual possibilities including, *sameness*, *difference*, *resemblance* of varying strengths and sorts, *opposition*, *identicality*, along with various relations like *member-category*, *initial-secondary*, *cause-effect*, *concrete-abstract*, etc. One could thus argue that this ability to manage more than one representation at a time is the very birth of higher-order cognition (with the ability to form only individual solo representations serving as a precursor). And, as this article will argue, it also seems to be the birthplace of metaphor.

How else is cognition done?

Before arguing that higher-order cognition based on cognitive parallelism is the basis of metaphor, lets first consider briefly how cognition operates in other ways, at least in generalities. As a starting point, let us consider the notion of *representation*. Representation has been a dominant metaphor for thinking about cognition for millennia, if not longer.[4] The idea that the brain/mind somehow holds, has, maintains, makes, and uses ideas, thoughts, notions, or representations of various sorts, of things in our conceivable existence (and even outside of that existence), is an old one. In more modern cognitive science, we also have various notions about how things, be they concrete and material or more abstract concepts or ideas, are represented in the mind. These take many forms including recurring patterns of neural activation related to concepts, schemata, scripts, frameworks, domains, embodied simulations, mentalese, nodes in semantic networks, and many others.

There are also approaches that attempt to avoid the concept of "representation" altogether, instead arguing for emergent patterns of semi-chaotic neural activity in the form of dynamical systems, and others (Gibbs and Colston, 2012). But even these views hold that those dynamic activities are not completely random, but rather pattern according to things encountered outside the neural system, *by* the neural system, perhaps sometimes as a cascade from other neural patterns themselves, but also responsive in semi-regular ways to things external to the system. All told, our entire mental/experiential capacity seems to ebb and flow in accordance with our environment (i.e., we experience hunger when we need nutrients, we feel fear at a charging animal, we think "magpie" when we visually or auditorially encounter a particular bird species, or "unfair," in response to a particular judgment about something).

We also seem to build complexity and nuance into this general idea of representation in the form of broader cognitive structures. So we think about component parts that make up larger wholes (e.g., the eraser, metal band, wooden shaft, encased graphite core, pointed end, etc., of a pencil). We think extensively about categorization, always struggling over whether a given thing belongs to this or that category (e.g., is a pencil a tool, a utensil, an instrument, a household-or workplace-or school-or other type of item?). We often connect categories in the form of modal, or tree-like, or nested, or other kinds of networks (e.g., mammoths were a branch of proboscideans that went extinct, the U.S. Air Force used to be part of the U.S. Army, but was then made separate after the second world war, etc.).

We also increasingly must cobble together new representations for things that appear or are invented in our environment. So we have "solar shingles" for roofing materials that can collect and transfer solar energy, or "fobs" which originated as straps to hold pocket watches but now refer to electronic remote-control keys for locking/unlocking things, etc. And of course many of these are based on resemblances of many kinds with pre-existing, pre-represented things (e.g., a computer mouse).

From these sorts of resemblance-based new representations we can begin to talk about analogies. Or, a sort of representation where the form, pattern, or function/structure of one representation is extended to that of another thing. So we might say that a car fob is the modern analog of a car key. Or we might say the CPU of a computer is analogous to the brain of an animal, or the headquarters of a complex organization. This is all not so much an act of constructing a representation from scratch, but rather in a *transferring* of something from a representation of one thing onto another.

And finally from there we can morph into the full-on leap-of-faith of the world of metaphor where representations do not involve things just being analogous to other things, but rather when things are purported to *be* those other things. So we drop the scaffolding or pretense around a *comparison* or *resemblance* (functionally or otherwise) of A to B, and just state, show, act, think, etc., that A *is* a B. The particular means of this metaphorizing between two things varies of course across language (as well as languages), image, sound or any other way we can encounter/sense things, but they all posit the

3 Of course comparison can also take place between two sensorily-active representations, as in comparing two things within sensory access at the same time (which would still likely involve some memory components albeit ones of shorter storage durations), and it can involve two representations derived essentially from memory. And comparison needn't be held to just two things. But a necessary and sufficient condition of comparison seems to be that two things are held at the same time somehow as representations in a nervous or other comparable cognitive system.

4 Indeed, one could argue that representation as a process might have historically and evolutionarily preceded humans' representation of "representation" as an entity. Although one wonders what a non-human member of a highly-social animal group experiences when an alpha-member leads a protest against a potential intruder—whether or not a vague notion is in place of another individual representing "me," or the group.

relationships between A and B quite boldly, in a way imposing B-ness onto A.[5,6]

Indeed, one might *demonstrate* some of the very representation-building processes *discussed* above in our very attempt to understand what metaphor is. We might argue for instance that metaphor is a bit of categorization grafted onto analogy—we apply the structure or function of B to that of A (analogy), by saying that A is a member of the category B (categorization). Indeed, this seems the very approach adopted by the Categorization account of metaphor (Glucksberg, 2001).

But even in all of the above ways in which we make and have representations, we are still always hovering around the notion or quantity of "twoness." We build representations in our minds/bodies (1) of things in our environment (2)—with, as a caveat, our minds/bodies being fair game as part of that environment. Or we represent the entirety of a thing (1) as made up of component parts (2). We also make dichotomous decisions often as to whether a given representation (1) belongs or does not belong to a given category (2).[7] When we assemble categories into broader structures we are often doing so via a bit of metaphorizing, as when we apply the shape of a tree (1) to an assemblage of categories of animals (2), or when we borrow the structure of an actual mesh net, as in a fishing net (1), and apply it to a an array of categories of things, as in a semantic network (2). Our constructions of new representations of new things (1) as mentioned, usually borrow from pre-existing representations of older things (2), as in a computer port, borrowed from the idea of a shipping port. Analogies *borrow* a structure of one domain (1) and apply it to another (2), as in, rainforests are the lungs of the planet. And metaphors *impose* something from source domains (1) onto target domains (2).[8]

Of course one might simply view all of these related ways in which we assemble representations as involving "two" or twoness, as simply what results once we expand beyond the singularity of just having a single thing—it might be seen as just the inevitable result of the building of complexity. You begin with nothing. Then you have something. Then for any degree of differentiation to be achieved, that something must be discerned into different somethings, so we move from having just one thing, to having another thing, such that we end up, at least at first, with "two."

But there are a huge number of ways in which our complex worlds and our complex minds operate with many levels greater than two. Just going back to the notion of wholes and parts, we are very comfortable with the idea of wholes requiring large numbers of parts. We also readily operate with a plethora of differing categories, and categories with many members. So we have the category of vehicles as well as lots of kinds of vehicles. Among the category of two-wheeled vehicles we have bicycles, motorcycles, pull-carts, push-carts, chariots, trailers, rickshaws, etc.

But once we move to the level of analogies or metaphor, we seem constrained more by this notion of twoness. We very typically talk about analogies in terms of targets (1) and vehicles (2), (e.g., final editing of a paper is like a final polishing a shiny surface—careful vigilant actions to remove all the remaining imperfections [i.e., "smudges" or "typos"]). And metaphors as mentioned at the beginning of this article involve source (1) and target (2) domains.

So perhaps there is just something germane to metaphors and analogies that likes the use of only two domains. But the question remains as to what this "something" actually *is*. Are there reasons that we do not usually go beyond two domains—something about three or more that is detrimental? Or is the meaningful move from dealing with just one thing to a pair of things all that can be achieved? Or is there some characteristic of two domains that emerges as being most beneficial. Or is some combination of these possibilities the answer? To further our understanding of this issue, let us move away from metaphor for a moment and briefly consider other forms of figurativity or figurativesqueness that also make use of domains.

Other implicit invocations of domains in figurativity/figurativesqueness

Metaphor is not the only way that we use domains in our creations of representations. We also craft metaphors both linguistically and within many other kinds of media. But we'll confine the discussion here to forms of figurativity/figurativesqueness that are conducted via language.

Colston (in press) and Colston and Rasse (submitted), provided an analysis and deconstruction of 15 types of figurative language, or at least figurativesque language.[9] The forms discussed were; *rhetorical question, asyndeton, metonymy, hyperbole, tautology, antimetabole, metaphor, verbal irony, idioms, proverbs, simile, oxymoron, onomatopoeia, allegory,* and *puns*. This deconstruction involved looking at the generic structure of the figurative/figurativesque forms and determining, (1) how many domains were invoked, (2) what those domains were, (3) what is done with those domains, and (4) what doing things with those domains accomplishes for interlocutors using the figurative/figurativesque forms.

This analysis was achieved in part by consideration of generic depictions of the structures of the figures, presented in graphical images. Rather than reprint the set of graphics of those figures' structures here, five new graphics, for the figures or figuresque forms of *caesura, pleonasm, metanoia, antonomasia*, and *pastiche*, are presented instead (see Figures 1–5). These may serve as further examples of the range of figure/figuresque types discussed in Colston (in press) and Colston and Rasse (submitted). They can also represent

5 Or of course, blending A and B together to a degree and then imposing that emergent new thing that is both A and B and more, onto A (with maybe some spillage also onto B) as conceptual integration would argue.

6 Though the specific nature of this "B-ness" transferred to "A" is undergoing significant debate. Traditionally, it was the relative concreteness that seemed to predict when such a projection would occur. Other accounts have based transfer likelihood upon relative frequency (Winter and Srinivasan, 2022), or "simulatability" (Colston, 2019) of source versus target domains.

7 And we are often uncomfortable if something does not neatly belong or not, or if something can belong to more than one category. We prefer the neatness of one or the other.

8 With of course the additional nuance brought to this pairing, which varies across differing accounts of metaphor.

9 Some figures were discussed in both publications, other figures appeared in one or the other publication, but the overall discussion encompassed the 15 unique forms mentioned here.

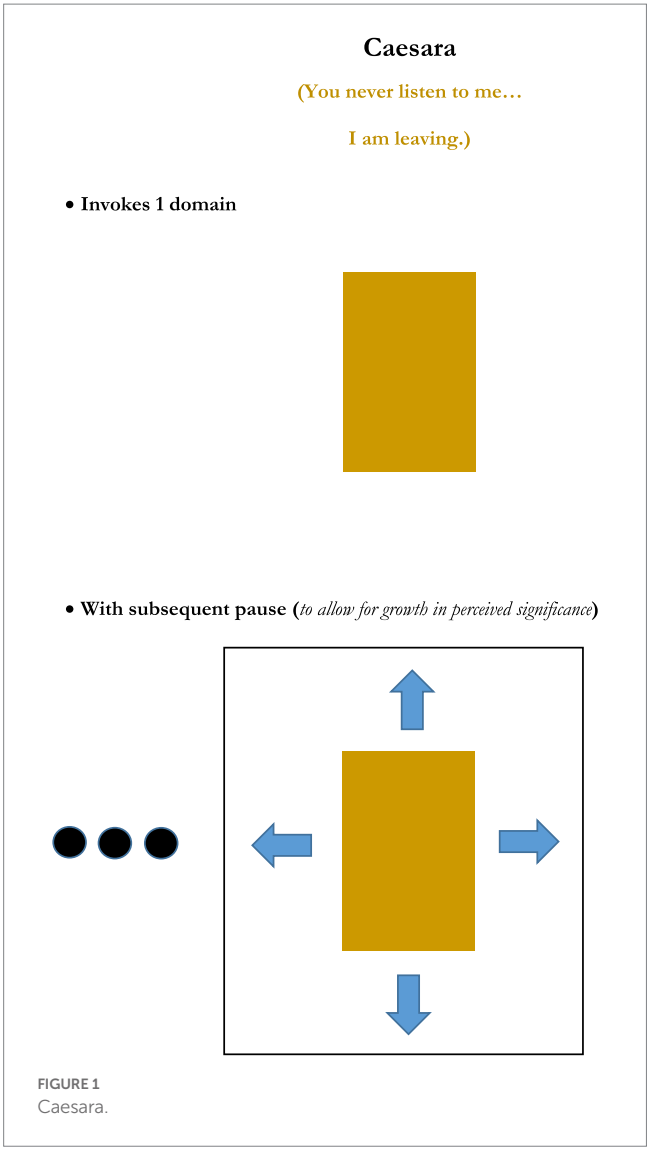

FIGURE 1
Caesara.

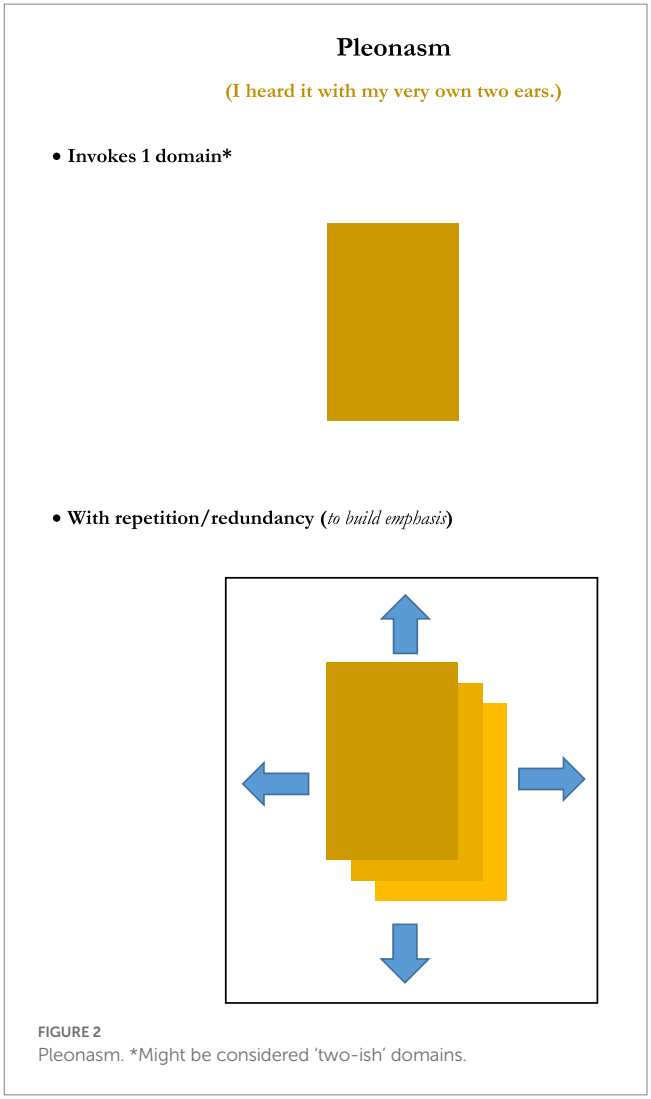

FIGURE 2
Pleonasm. *Might be considered 'two-ish' domains.

the primary outcomes of those analyses. The upshot of that analysis is it revealed and afforded new insights into, why we have the range of figures we do, why some figures are more prominent than others, and why a very few of those figures seem to be the most prominent in terms of frequency of appearance and usage (e.g., metaphor, irony and perhaps metonymy).[10]

The five particular figurative/figurativesque forms presented here were selected to demonstrate one of the main emergent characteristics of the analysis provided in Colston (in press) and Colston and Rasse (submitted) on the 15 original figures—that most figures invoke only one or two domains[11], but that some types might invoke "2-ish" domains in that only one actual domain is being used, but it is repeated, or used but then inverted, or in some other way invoked more than just one time. But the main point is that the majority of figures invoke two domains, just like metaphor and analogy do.

Caesara

This figurativesque form is not so much an actual linguistic construction, excepting in the form of punctuation occasionally used to indicate its usage in text[12], but it nonetheless involves a delivery characteristic in speech that behaves like figurativity. This characteristic can have a figurative effect of sorts on the comprehension of the domain being invoked—lending it a degree of seriousness, profundity, weightiness or significance. Caesara is effectively the same idea as a dramatic pause—holding the speech stream for a moment after a domain is invoked by an utterance, to allow lengthier consideration of the invoked domain, which can frame it in a more pronounced way.

10 "Frequency" must admittedly be based on speculation, for it is notoriously difficulty to determine the actual preponderance of different figures in the enormous and intractable population of human communication (Colston, 2019). But they do appear most prominent in terms of the attention given them by figurativity scholars.

11 Puns were the one exception, invoking potentially more than two domains. But even puns usually invoke only two domains.

12 The punctuation symbol || is used on occasion in written scripts and other textual forms of spoken language, to indicate the caesura or dramatic pause, as in, "To be, or not to be ||, that is the question" (Shakespeare, 1988).

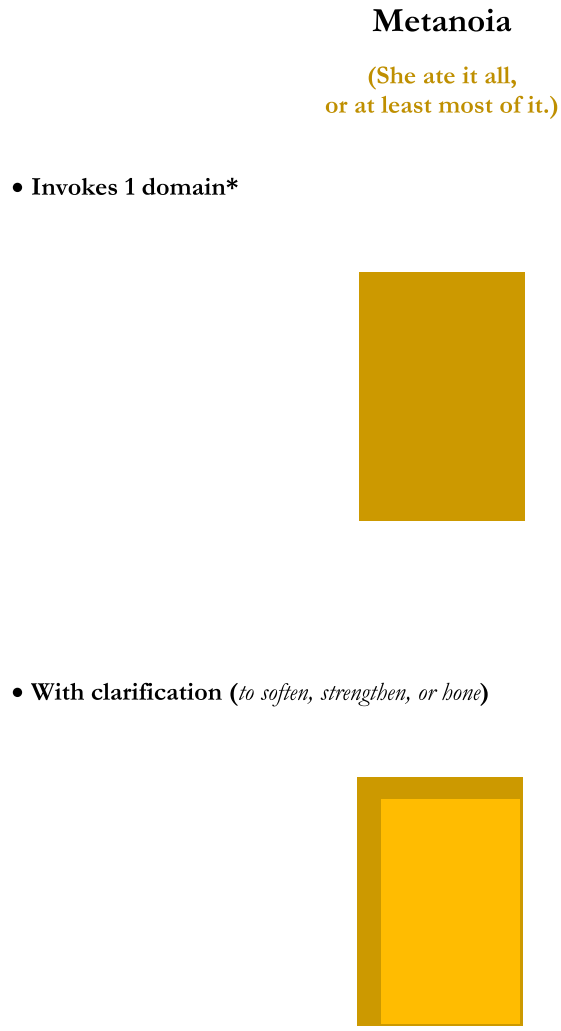

FIGURE 3
Metanoia. *Might be considered 'two-ish' domains.

This profundity might ensue by allowing time for whatever embodied simulations the utterance might conjure to blossom, or to invite greater incorporation of the invoked domain within its background context (depending on one's preferred processing model). But either way, it ultimately makes the domain from the preceding utterance more heady in the perception of the interlocutors.

Pleonasm

Pleonasm also invokes only a single domain, but here pleonasm is considered a "2-ish" figurativesque form in that it invokes that domain more than one time. Its use of restatement, redundancy, or other similar forms of repetition, as in ("I cannot believe I ate the whole, entire, complete thing!"), where the same essential domain, in the case of the example, the eating of the *entirety of something*, is repeated for emphasis. The repetition, in the example of varying terms for "entirety," seems to emphasize or especially highlight that particular characteristic of the invoked domain, the entirety of a thing eaten. Otherwise the redundancy seems unnecessary since one such term should suffice to convey the essential meaning.

Metanoia

Metanoia is another "two-ish" figure (or figuresque form), in that it also invokes only a single domain, but metanoia then re-invokes the domain a second time, immediately after the first, with greater specificity. For instance, a speaker might say, "this is a form of figurative language, or at least figurativesque language" to first orient the hearer/reader to the general domain being invoked, perhaps because that general domain is more recognizable or familiar. But then the speaker qualifies the referenced domain in a subsequent adjacent construction that softens, strengthens, or somehow hones the referent domain with greater precision. Such a technique might simply reflect how people talk in normal causal conversation, where an initial idea comes to mind at first, is then uttered, but then is qualified upon further contemplation. But it could also serve to demonstrate the speakers recognition of the resemblance of the more specific description with the initial broader one, to note the subtle distinction between the two, but to not give the distinction great credence. All in all it seems to suggest the broader description is generally apt, yet to also acknowledge subtle details at play.

Antonomasia

And finally we have two examples of more genuinely 2-domain figures, which each operate a lot like metaphor in that they invoke two separate domains and invite correspondences between them. But each figure differs slightly in the nuance of those invited correspondences. For antonomasia, as in saying, "Hey, it's the Formula One Racer!" to refer to a person who had recently exhibited great driving skills in chauffeuring several passengers up a windy mountain road, a speaker is invoking two domains. One is the actual referent, a person/driver in this case. The other, the source domain, is a member of a class of individuals known for some exceptional characteristic—Formula One Racers, who are distinguished by superior driving abilities.

Antonomasia feels a lot like a metaphor—using a source domain (Formula One Racers) to highlight something about a target domain (an individual person's driving ability). But it seems also a little different as a cross-domain mapping in that the individual in question already has something from the source domain—driving skills. The mapping in this case thus concerns the *quality* of those skills, not so much their mere presence. Other metaphors seem more involved in imposing characteristics from a source domain onto a target domain that are less-obviously already present. So antonomasia seems to have some components of hyperbole in its operation, in inflating a characteristic of a domain to draw attention to it (Colston, 2019). Or even that of metonymy, in that a characteristic of a target is used to refer to that target in its entirety, in a seeming form of substitution. So antonomasia resembles metaphor, but has interesting hints of hyperbole and metonymy present as well, possibly allowing for its differing designation.

Pastiche

And lastly we have pastiche, which also resembles metaphor in the use of a source and target domain. Although pastiche seems a bit like allegory in that it can apply quite broadly and often is not contained only in a particular linguistic utterance or other smallish meaningful construction. For allegory, that broad application is usually for some lesson, moral or other characteristic from a source domain, to apply to a relatively open class of target domains in the world of human events (e.g., "The Boy who Cried Wolf" can apply as a lesson to many

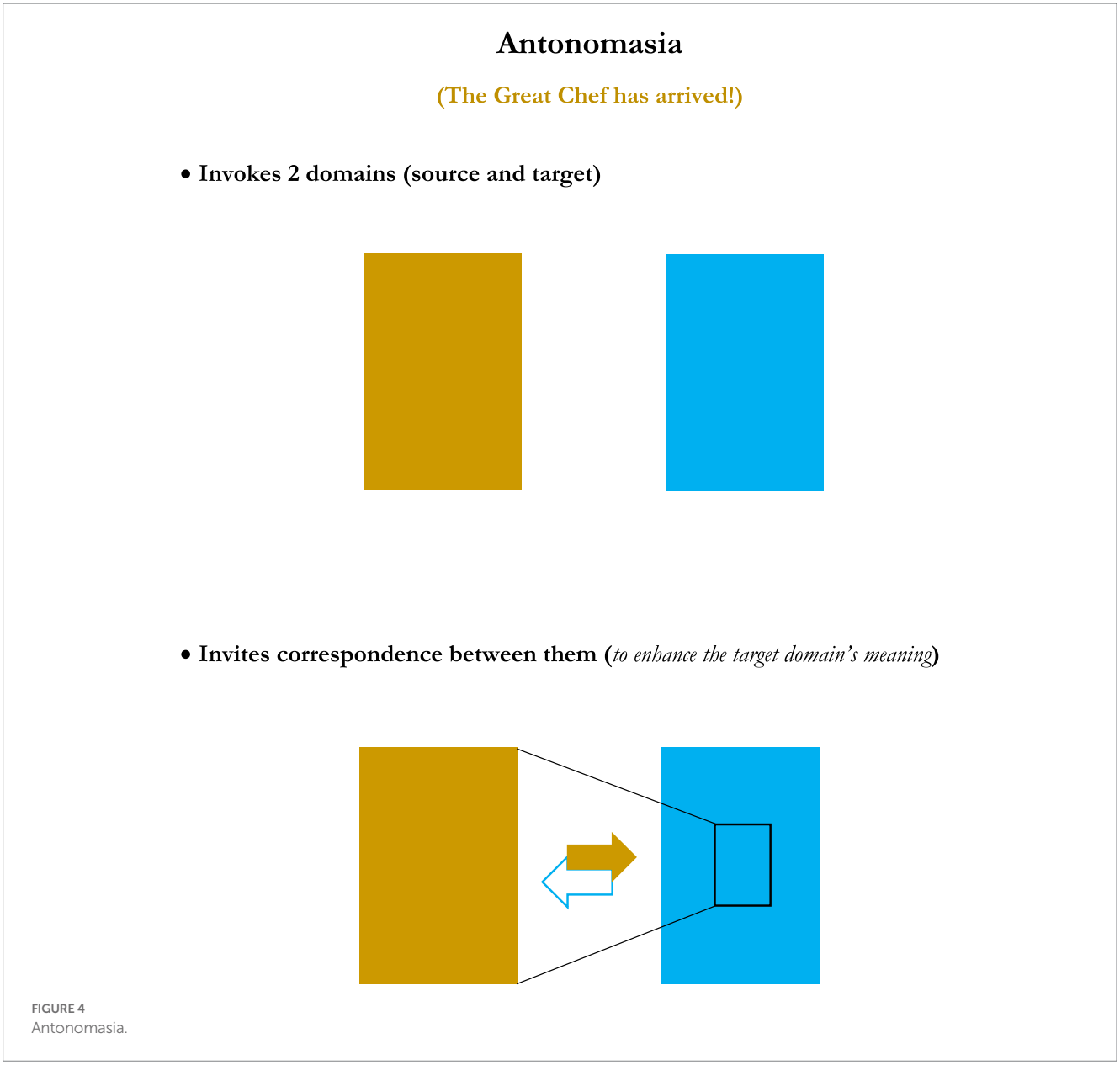

FIGURE 4
Antonomasia.

human situations). For pastiche, though, the broadness lies more with what can be shared or similar between the source and target domains. And with pastiche the direction of meaning enhancement seems more nuanced. An instance of pastiche usually draws correspondences between a source and target domain, but often more for an honorary nod, or respectful, albeit often humorous, acknowledgement of the source domain from which a characteristic originally resided. But it can also lend a boost of understanding to the target domain, as is usually the main function of metaphor.

For instance, in the classic American television/internet comedy shows Mystery Science Theater 3,000, and RiffTrax, among many, many others, some aspect of a particular target situation, will often be highlighted with some characteristic from a different source domain situation. A comment from an instance of riffing (comedic commentary about some scene in a movie, usually one of poor quality), or a skit involving play-acting with some motif or theme from that movie, can thus borrow content from a source domain, applying it to the target domain. So if a movie scene involves a chase where one car rapidly leaves another car behind, a commentator might mimic the classic "Beep, Beep" call of the Road Runner character from classic American Warner Brothers cartoons in the mid 1900s. The mimicry both highlights a characteristic of the target domain (one thing soundly defeating another thing in terms of their relative speed of motion), by tying it to a well-known cultural meme from another source (the Road Runner cartoons) where that characteristic is caricatured. But the mimicry also gives homage to that source domain content itself.

Pastiche resembles parody in that the latter often uses a source domain content or framework to belittle (humorously or not) a target domain, occasionally making fun of both the target and source domains in the process. But pastiche is more honorary in its use of a source domain to lend a humorous take on a target domain. For instance, many musicians will uses instances of melody in a song to give both a light-hearted lilt to the composition being performed, yet tip-their-hat in an honorary nod to the source domain from where the content was borrowed.

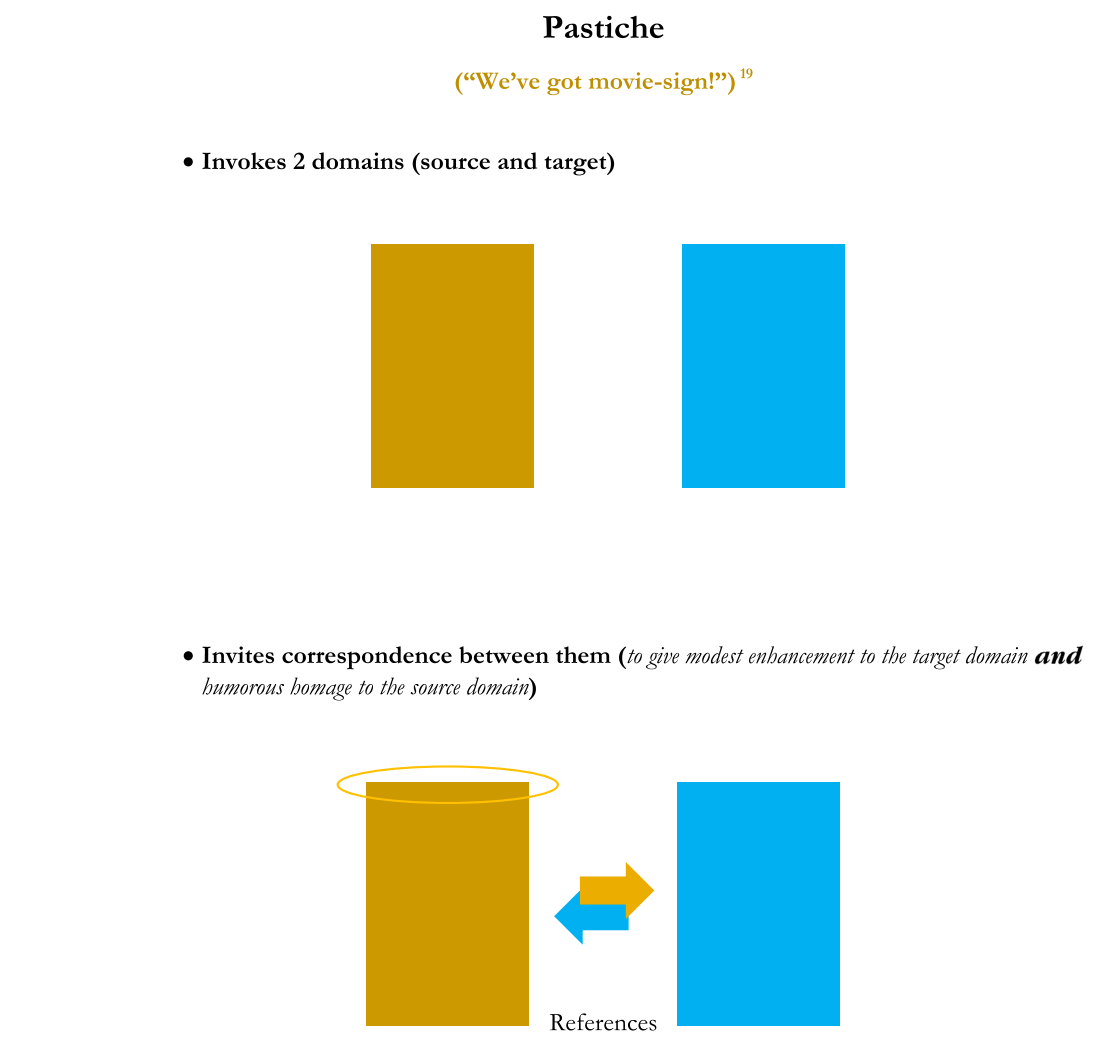

FIGURE 5
Pastiche.

In these five cases (bolded in Table 1), as in the 15 reviewed in Colston (in press) and Colston and Rasse (submitted), we have the same emergent findings. Most domains use one or two domains, but the majority use two, or at least two-ish. Only puns, which typically involve two domains, can on occasion use more than two domains:

We can see that most of the Table 1 figures/figurativesque forms involve using two domains to invite correspondences between them, in subtly differing ways (e.g., *metaphor, idioms, proverbs, simile, allegory, antonomasia*, and *pastiche*). A smaller group use two domains more for contrast, nullification, substitution, and the like (e.g., *verbal irony, oxymora, metonymy*).

We see also that the figures invoke these domains and do fairly straightforward things with them. Of the five figures reviewed here, they inflate the domains in a way to increase their importance (*caesura* and *pleonasm*), they use a domain in a general sense first to draw attention to it, but then to clarify its invocation (*metanoia*), or as mentioned they draw correspondences between two domains (*antonomasia* and *pastiche*).

And all of this domain invocation and manipulation ultimately gives rise to pragmatic effects and figurative meaning nuance. And all of this is in the service of enabling the construction of mental representations—of meaning-making. Which brings us back to the question of why the invocation of two or two-ish domains, which seems predominant in this form of meaning-making. We return to this question now.

TABLE 1 Figurative/figurativesque forms and their numbers of domains.

One domain	Two-ish domains	Two domains	Two-plus domains
Rhetorical questions	Metonymy	Metaphor	Puns
Asyndeton	Hyperbole	Verbal irony	
Caesara	Tautology	Idiom	
	Antimetabole	Proverb	
	Pleonasm	Simile	
	Metanoia	Oxymoron	
		Onomotopeia	
		Allegory	
		Antonomasia	
		Pastiche	

What is significant about *two*?

There are three parts to the argument attempting to explain the significance of "two" in this form of meaning-making. The first involves the quintessential human characteristic of a need-for-meaning, with an emphasis on the word "need." The second is the importance of recognizing that a need-for-meaning is fundamentally a need-for-*shared*-meaning. The shared or social aspect of meaning-making, by figurativity and metaphor and all the rest, is key to understanding the importance of "two." And the third part of the argument addresses the specific question about what makes "two" seem special. It turns out it may all involve a grand compromise.

The need for meaning

Part of what makes "two" special is not so much a wondrous quality of twoness *per se*—some exceptional quality about "two" that sets it apart and above any other technique of, or blueprint for, meaning-making. Rather, the utility of "two" arises from how it so neatly fills a particularly strong *need* in people—that of supplying meaning.

People do not just use pairs of domains to craft new representations because we can, or because doing so is nifty, or interestingly creative, etc. (although it can be). Rather, we use pairs of domains to craft new representations because we *must*. Humans and human minds have gone out onto a limb, evolutionarily, in that we have committed our survival to our ability to use our minds and bodies to make ever-growing sense of the world and to then act on those understandings. Now all animals and other life forms with sensory systems to survey their environments, and action-plans derived from DNA or learning systems, make use of such "meaning" (i.e., stored or derived representations, of a sort, of the world). Sun-loving plants will grow toward the sun, but not toward shade. Animals will engage in stalking behavior when they have detected prey, but not when they have not. Squirrels will store nuts when the temperature drops, but not before, etc. And these actions which are necessary for survival, as said, are encased in a way within the lifeforms via DNA-encoding or through learning and retention by nervous systems from observation or experience (Colston, 2019).[13]

But these forms of useful "meaning" are relatively simple in comparison to what humans do. Other lifeforms can rely on their DNA endowment and modest learning to survive. But we are much more dependent on *extensive* learning—on acquiring, developing, maintaining and expanding our learned representations of the world for our survival. An average modern person spends years of their lives in focused study and learning of skills, trades, abilities, knowledge-sets, expertise, etc., to function in the world. And increasingly, we must continue that learning throughout our lifespans since the knowledge required to maintain our survival changes and expands rapidly.

But even all this carefully crafted and retained knowledge is not enough to ensure our survival. We also must *share* that knowledge with others, and them with us. Our collectively shared knowledge, culture if you will, is our primary means of survival. And language, it can be argued, is the primary means by which all this knowledge-sharing takes place.

So humans have evolutionarily committed themselves to deriving, creating, building, sharing and using collective "meaning," in order to survive. This need for understanding puts enormous pressure in us to get and to have meaning. We are uncomfortable if we do not have it. We strive to achieve it. We clamor to have more of it. We are devastated if it is taken from us. We are extremely happy to achieve it. We like it when it is fresh, new, more encompassing. We build entire cultures, institutions, societies, etc., around it, etc. This meaning/understanding involves the "anatomy" of our worlds (its component parts and their arrangements). These often take the form of parts, associations, relations, connections, comparisons, categorizations, hierarchical and network arrangements, etc. And meaning also involves getting the "physiology" of the world to understand how all that anatomy works together to function. All of this requires meta-representational thinking in the form of two things together making a third thing, or two things with another thing between, across, among, shared by, them, etc. And one major form that this understanding takes is the understanding of one thing, in terms of another thing—the birth of metaphor.

So all told, we greatly need meaning, metaphorical and other kinds, causing us to create and share/borrow it extensively, and of finding means of expanding it however we can onto the myriad of things that remain unknown. So metaphor is not merely a clever way to say something. Nor is it just a structure of sorts in the mind/body.[14] *It is more fulsomely a fundamental human individual and social requirement, one key part in our desperate attempt to fulfill our need for meaning, upon which our survival depends.*

The need for *shared* meaning

Part of what makes "two" useful for building representations to fulfill our need for meaning is the fluency with which *meaning-built-from-"two"* can be shared. For something like metaphorical meaning to bridge two people means that the people must already share something about the individual component parts of the metaphor (i.e., the source and target domains). If, for example, the conceptual metaphor, KNOWLEDGE is FOOD is invoked in the linguistic metaphor, "they ate it up" in response to a question about how an audience received a new idea, people must already have some individual grasp of both knowledge and food. One could argue that this explains why so many metaphors are based on either embodiment or culture (or both), in that a pair of interlocutors, in the case of successful metaphor understanding, are likely to share those things. They would share similar embodied experiences by virtue of having a similar human mind and body. And they would share a culture by virtue of overlapping on a set of beliefs, understandings, values, etc. So "two" works well on this point since it aids, expands, and shares something pre-existing in pairs, or more, of people. Yet it does not reach too far. Should a representation demand shared understanding of three or more domains, then the likelihood of adequate sharedness would diminish—the more things people must share for understanding, the less likely understanding will be. Metaphor, as such, quits while it is ahead.

13 "Nervous" system not being restricted the neurons, but also possibly including fungal threads or hyphae as used by mycelia.

14 Not to belittle the insight behind this realization, which arguably rejuvenated the modern understanding of metaphor (Lakoff and Johnson, 1980).

A related advantage of building representations out of two domains is that the potential meaning can be pretty far-reaching. Conceptualizing something *positive* from a human's experience, in terms of physical *upwardness*, can encompass an enormity of content. We have a lot of things we might consider positive experiences. And we have a myriad of ways of referring to upwardness. Each of these domains can have a lot of variability within themselves [e.g., a skyscraper and a cloud have a lot of differences (e.g., one is a human-built material structure, the other is a gaseous weather phenomenon, etc.)]. But they share, *upwardness*. The same holds for positive experiences (e.g., feelings of relief and orgasms—one can come from crossing items off a to-do list and the other is a raw sexual phenomenon). But a metaphor that uses one thing in common from one domain (positive polarity) in connection with one thing shared by the other domain (upwardness), aligns all those things together in a common relationship (e.g., good things are up). This is a lot of meaningfulness lifted with a very small lever.

And finally, the nature of a metaphorical linkage between two domains (e.g., knowledge IS food), being based a claim of on *oneness*, or *being the same thing*, might be particularly useful in achieving shared meaning. Were a speaker to posit a mere *resemblance* or *modest overlap* between two disparate things (e.g., saying, "a piano is like a bird"), they invite a consideration of what the things have in common (e.g., making musical sounds). But the comparison allows for a lot of variability to remain (e.g., birds are alive and pianos are not), which can itself vary across comprehenders (e.g., another person thinks birds are light and pianos are heavy). The typical metaphorical construction, however, pressures comprehenders to more thoroughly align on the relationship between the two things, emphasizing and enhancing that sharedness—both the sharedness between the aligned domains and that between the interlocutors.

The grand compromise

Related to the above ideas about metaphor expanding and enriching meaning but not going too far (e.g., "quitting while it is ahead")—leveraging a connection between two things likely already possessed by interlocutors, and that leveraging being powerful (aligning a lot of content), yet limited, is the idea of a grand compromise. Metaphor, being built on two domains, might land upon the ideal degree of meaning-making. It might maximize the meaning shared between people but also minimize any hindrances in achieving that shared meaning.

Colston (2019), illustrated this compromise through a comparison with sexual reproduction in biology. Species need to change in order to adapt to changing environments. Mixing genetic material from different individuals in reproduction, aids in this diversification—an offspring of two different individuals will differ somewhat from each of those parents. But as a logical conclusion, why did not reproduction in general[15] then combine genetic material from more than two parents? Why not three or more parents, which might increase an offspring's fit with an environment by sampling and averaging from a greater pool of individuals (akin to better representation being found with larger sample sizes, in different kinds of research)? One reason might simply be the advantage of coordination of reproduction when only two parties are involved, versus more than two. Anyone who has tried to plan a meeting time with busy people likely understands this issue—it is much easier to coordinate with just two attendees, versus more than two. So the need for genetic variability over time might be best met all around by the compromise of combining genetic material from two individual parents rather than three or more. Maximizing diversification, while minimizing coordination complexity and difficulty. "Two" is where those constraints seem to be met optimally[16].

A similar situation might hold for *expanding* meaning possibilities, while also ensuring the *sharedness* of any new meaning representations. Understanding one domain in terms of a second domain, might enable a nuanced or altogether novel understanding of the target domain, while still guaranteeing that the new understanding is within the shared reach of different individuals. Meaning expansion coupled with meaning sharedness. "Two," again appears to be a useful compromise.

Conclusion

The fact that metaphor is built on the primary idea of one thing being structured in terms of another thing, all for the purposes of creating new meaningful mental representations, was argued to have a degree of special import, resting on the notion of "two" as the number of domains used. A sizeable set of similar figurative and figurativesque forms was reviewed to show their similar gravitation toward the usage of two domains. Most of those forms use two domains or something very similar to two domains, in their differing yet comparable processes for leveraging new meaning and pragmatic effects.

An argument was also presented that the usage of two domains for meaning-making stems ultimately from a major early-cognitive step of meta-representation where more than one conceptual domain can be considered at a time. Such a step enables comparison, categorization, and ultimately metaphoricity.[17]

15 Some such experimentation did indeed take place in biological history on Earth, as did tinkering with varying forms of symmetricity. But a great many animal lifeforms gravitated toward sexual reproduction, as well as bilateral symmetricity, at least in part (e.g., locomotion, sensory systems, etc.).

16 A similar form of optimization might also be found with metaphor, and beyond simply that of the involvement of two primary entities. The *extent of semantic reach* across two domains invoked in metaphorical communication (and other uses of metaphor) also seems to strive toward a form of optimality. In this case, the compromise is between the expansion and novelty of meaning brought by larger reaches, and the comprehensibility concomitant with smaller ones (e.g., "optimal innovation," Giora et al., 2004).

17 The notion and utility of using two domains to create new metaphorical meaning is not necessarily new, it has been discussed in various guises regarding competing metaphor theories (e.g., Conceptual Metaphor versus Conceptual Integration). But the noting of this usage of "twoness" across an entire array of differing figures is a more novel development.

The need for metaphorical representations to be shared by interlocutors, arising from a baser need-for-meaning, endemic of the human evolutionary trend on relying on mental representations for survival, was also emphasized. The reliance of two domains for such shared meaning was presented as arising from both the advantages of what pairs of domains enables, as well as challenges if the number of domains for meaning-making expands beyond two.

And finally, this tendency toward "two" for meaning-making was presented as resembling the biological compromise of relying largely on two sources of genetic material for reproduction—optimizing the diversification of individuals in response to adaptation pressures, with the realities of reproductive coordination.

Our understanding of metaphor began as a tool for meaning-enhancement in language. It then moved to serving as a predominant way in which we mentally organize cognitive and embodied experiences, in language and beyond. Now it is being seen as a fundamental characteristic of shared cognitive/embodied meaning-making necessitated by a species that is extremely dependent on assembled meaningfulness for survival—to predict, navigate, and increasingly to manipulate its environment. This has been a lengthy progression.

A subtle comparison was made earlier between nervous systems based on neurons versus ones based on fungal threads or hyphae as used by mycelia. Such a comparison might also hold insights for the history and evolution of thinking about metaphor. Our original idea was that metaphors were essentially interesting "fruits" found only in language. This might be akin to our older thinking that mushrooms and other fungi were also simply a form of plants with roots that fed on dying plant matter. We now know that mushrooms are merely the flowers of a much more extensive and extremely complex and arguably "intelligent" lifeform known as mycelia, warranting its own taxonomic category alongside plants and animals, and more closely resembling the latter. And also being necessary for the very existence of many other forms of life. So, as we once underestimated mushrooms, we may have also underestimated metaphors—they were once relegated to fanciful language forms, then upgraded to having prominent presence in everyday speech. They have since been understood to reside in all forms of human thought and creative activity. Now they might be realized as fundamental to the very earliest bases of representational cognition.[18]

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

18 "Representational," again, is meant to encompass accounts based both on the explicit notion of "representativeness," where the mind somehow represents something in the world (which of course, includes that mind) as well as accounts that attempt to do away with the metaphor of representation—basing cognition on some other processes of mind/world alignment. But in either case, the bridging of oneness to twoness, seems to be one of the essences of higher-order cognition.

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To each their own: a review of individual differences and metaphorical perspectives on time

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How do people talk—and potentially think—about abstract concepts? Supported by abundant linguistic evidence, Conceptual Metaphor Theory posits that people draw upon concrete concepts to structure abstract ones via metaphorical connections. Often, the source domain for a metaphor draws upon embodied physical experience, as in the time is space system, whereby representations in the domain of time are thought to arise from experiences of navigating through, orienting within, and observing motion in space. In recent years, psychological evidence has suggested that the connections between space and time are indeed conceptual; however, many gaps in our understanding of the workings of metaphor remain. Notably, until recently, the unique variations in the ways in which people experience metaphor have been largely overlooked, with much research falling prey to what Dąbrowska has identified as one of the 'deadly sins' of cognitive linguistics: to ignore individual differences. By focusing on two widely studied metaphors for time, Moving Time and Moving Ego, this review article shines a spotlight on the varied ways in which people draw on their embodied and enculturated experiences, along with 'human experience' on an individual level and the contexts within which they use metaphor. In doing so, it highlights the importance for metaphoric conceptualization of variation across languages, across contexts, and across individuals, suggesting that while the use and interpretation of metaphor may begin with cross-domain connections, they are but part of the story.

KEYWORDS

time, metaphor, individual differences, Moving Time, Moving Ego

1. Introduction

Across recent decades the question of how people represent and reason about that which we cannot perceive directly through the senses has been of central interest to scholars working in the cognitive sciences (Markman, 1999; Gentner and Bowdle, 2008; Bolognesi and Steen, 2018). One prominent proposal, Conceptual Metaphor Theory (CMT), holds that abstract concepts are understood in terms of more concrete concepts, which are more closely connected to everyday physical and perceptual experiences and, hence, more easily reasoned about (Lakoff and Johnson, 1980). Abundant evidence for this proposal comes from linguistic metaphors, in which abstract concepts are described in terms of more concrete ones, often drawing upon correlations in our embodied physical experience (Grady, 1997). For example, the correlation between physical motion toward an object and our expectation of being located with the object in the future gives rise to the conceptual metaphor TIME IS (MOTION ALONG) A PATH (Grady, 1997, p. 119), motivating expressions such as "We've *arrived at* the moment of truth." In a

parallel fashion, motion of an object toward ourselves correlates with a progressive shortening of the time until it is at our location, giving rise to the conceptual metaphor TIME IS THE MOTION OF OBJECTS (Grady, 1997, p. 119), underlying expressions such as "Spring is *coming*." Through metaphorical connections such as these, our sensory-motor experiences and our interactions with people, objects, and the world at large may provide a basis for understanding many aspects of life that are not perceived through our senses (*cf.*, Rosch et al., 1991).

The physical realities of our spatial world permeate our daily lives, and metaphors drawing upon the domain of space abound (Clark, 1973; Haspelmath, 1997; Lakoff and Johnson, 1999). Indeed, Lakoff and Johnson (1980) argue that "most of our fundamental concepts are organized in terms of one or more spatialization metaphors" (p. 17), meaning that much of how we think and understand our world can be structured by our experiences in space. Furthermore, as a consequence of universal aspects of physical spatial experience, a wide range of metaphorical correlations, including those connecting time and space, have been found to surface across genetically unrelated languages and cultures (Haspelmath, 1997; Moore, 2017; Duffy and Feist, 2023). For these reasons, metaphors drawing upon the source domain of space and, more specifically, the connections between space and time, have provided a rich test bed for investigating claims about the complex nature of metaphorical thinking.

As many have noted, however, linguistic evidence alone is insufficient to establish the conceptual nature of metaphoric connections (Murphy, 1996; McGlone, 2001; Gibbs and Perlman, 2006), leading researchers to seek nonlinguistic evidence for these connections. In tests of the psychological reality of the connections underlying spatial metaphors for time, particular attention has been paid to two deictic spatial metaphors that are used in the conceptualization of time: the Moving Ego metaphor and the Moving Time metaphor. The Moving Ego metaphor construes time as a stationary landscape that the active ego moves across—as evidenced in expressions such as "We've *arrived* at the moment of truth" (referenced above) and "We've *passed* the deadline." In contrast, the Moving Time metaphor represents time as a conveyor belt on which events move, from the future to the past, relative to a stationary ego—as shown in expressions such as "Spring is *coming*" (referenced above) and "The election is *approaching*." In addition to linguistic evidence for these space–time metaphors, a variety of studies have provided evidence of their psychological reality. To begin, McGlone and Harding (1998) found that there is a cognitive cost associated with switching between the Moving Ego and Moving Time metaphors, suggesting that they rely on different underlying conceptual structures. Building on this research, Boroditsky (2000) and Boroditsky and Ramscar (2002) asked whether thinking about spatial motion either toward or away from the self can prime construals of time consistent with the direction of motion, as would be expected if these metaphors truly draw upon spatial conceptualizations. When their participants responded to McGlone and Harding's (1998) ambiguous experimental probe, *Next Wednesday's meeting has been moved forward two days. What day is the meeting now that it has been rescheduled?* those who had been primed with a self-motion scenario—for instance, moving through space toward a stationary object (in line with the Moving Ego perspective)—were more likely to re-use this perspective for time and answer *Friday*. By contrast, when participants imagined motion toward the self—such as imagining a moving object traveling through space toward them (in line with the Moving Time perspective)—they were more likely to respond *Monday*. Based on these findings, Boroditsky and Ramscar (2002, *cf.*, Boroditsky, 2000) argued that people's thinking about time is closely linked to their spatial experiences, such that engaging in thought about motion in space can influence how people reason about time. Subsequent research conducted in a range of settings has provided further support for this conclusion, with demonstrations that non-deictic spatial schemas (Kranjec, 2006; Núñez et al., 2006), abstract spatial motion schemas (Matlock et al., 2011), fictive motion schemas (Matlock et al., 2005; Ramscar et al., 2010), and gesture (Jamalian and Tversky, 2012; Lewis and Stickles, 2017; Winter and Duffy, 2020)—all of which draw upon spatial thinking—may similarly influence how people think about time.

However, while there are indeed universal, shared bodily experiences that can provide a motivation for our metaphorical understanding of abstract concepts, a sole focus on those shared experiences leaves gaps in our understanding of the workings of metaphor. First, although physical spatial experiences may be similar around the world, linguistic evidence suggests that spatial experiences may not be conceptualized in exactly the same way in different cultures (e.g., Pederson et al., 1998; Majid et al., 2004; Feist and Zhang, 2019). It is therefore an open question whether cross-cultural differences in the conceptualization of physical space may give rise to concomitant differences in metaphorical conceptualizations that draw upon space. Furthermore, on an individual level, physical and situational differences may result in variation in people's lived experiences and, thus, in the ways in which people talk and think about the world around them (Gibbs, 2009, 2011). As a result, individual variation in such factors as age, gender, body size, and physical (dis)ability, as well as less tangible factors such as ideology, religious beliefs, and culture, may thereby impact the ways in which speakers conceptualize both their physical and their metaphorical experiences (Dąbrowska, 2016; El Refaie, 2019; Littlemore, 2019).[1] In this way, a complete understanding of metaphor must extend beyond the influences of universal bodily experience, including potentially universal experiences of space, to seek out the roles that may be played by each of these more individual factors.

Indeed, recent lines of empirical research have begun to yield evidence that metaphors are understood differently by different people. For instance, gender may play a role in influencing people's perceptions of power metaphors, with one study finding that male participants were faster to identify powerful groups when they were labeled as male and presented at the top of a computer screen (Winter et al., 2020; see also Charteris-Black, 2012; Pérez-Sobrino et al., 2021). Handedness may also play a role in metaphoric reasoning: right-handers have been found to make more favorable judgments about objects that are presented on their right-hand side, while left-handers have been found to display more favorable judgments about those presented on their left-hand side (Casasanto, 2009a; see also Casasanto

1 See also Bergman and Lundh's (2015) Editors' introduction to the *Journal for Person-Oriented Research* for a broader perspective on the role of the individual in psychological science research.

and Jasmin, 2010; Casasanto and Henetz, 2012; but see Sasaki et al., 2019 for contrasting findings in Japanese). Other research has found that metaphorical mappings of morality in space are more prominent among those practicing religion than among atheists (Li and Cao, 2017), suggesting that religious beliefs may likewise play a role in metaphor interpretation.

With evidence that individual factors play a role in the use and interpretation of metaphor accumulating, the goal of the current review article is to seek a clearer understanding of this role through a focused examination of individual factors in one domain. In recent years, the domain of time, along with its metaphorical connections to space, has offered the "model system of choice" for linguistic and psychological investigations into the relationships between metaphorical source and target domains (Casasanto, 2009b, p. 128). For this reason, the current review will draw upon spatial metaphors for time as a test bed to seek out the range of ways in which a person's individual experience of the world may, in turn, color their interpretation of metaphor. Through an examination of the ways in which the domain of space may interact with an individual's embodied and enculturated personal experiences to give rise to a metaphorical conceptualization of time, we aim to likewise expand understanding of the inner workings of metaphor broadly construed.

2. Time and space across languages

Spatial metaphors for time are used in a wide variety of languages around the world (Traugott, 1978; Haspelmath, 1997; Yu, 1998; Núñez and Sweetser, 2006; Filipović and Jaszczolt, 2012; Moore, 2014; Duffy and Feist, 2023; *inter alia*). However, while McGlone and Harding's (1998) *Next Wednesday' meeting* question has provided an ingenious way to probe the conceptual connections between space and time, cross-linguistic investigations reveal that the ambiguity observed in English may not emerge in all languages. Speakers of Swedish, for instance, demonstrated proclivity (over 80%) for the Moving Ego perspective in both primed and unprimed contexts (Rothe-Wulf et al., 2015), whereas speakers of Mandarin Chinese were found to be more likely (over 85%) to adopt the Moving Time perspective (e.g., Bender et al., 2010; Li, 2020). Within a language as well, we find that speakers from different communities respond differently to translations of this probe: although Belgian speakers of Dutch tended to adopt the Moving Ego and Moving Time perspectives at chance levels in response to the construction *voorwaarts verplaatst* (moved forward; Elvevåg et al., 2011), speakers of Dutch from the Netherlands tended to prefer the Moving Time perspective in response to another translation of the probe, *naar voren verplaatst* (moved forward; 74%; Loermans et al., 2019). In parallel fashion, speakers of Standard German interpreted the *Next Wednesday's meeting* probe in line with the Moving Time perspective up to 95% of the time (Bender et al., 2005, 2010; Rothe-Wulf et al., 2015), while speakers of Swiss German evidenced different interpretations depending on how the probe was translated (Stocker and Hartmann, 2019). In response to translations using the construction *nach fürе verschobe* (moved forward), both *Monday* and *Friday* responses were elicited (59% and 41%, respectively), but in response to translations using the construction *nach vorne verschobe* (moved forward), Swiss German participants (similarly to Standard German participants) showed a reliable preference for the Moving Time perspective (89%). The particulars of the translation likewise influenced interpretations among speakers of Mandarin Chinese. Whereas Li (2020) found that Mandarin speakers overwhelmingly interpreted *qian yidong* (forward move) in line with the Moving Time perspective (87% *Monday* responses), he found that a different version of the question that simply utilized *yidong* (move) was more ambiguous, with 41% of his participants adopting the Moving Time perspective and 59%, the Moving Ego perspective.[2]

Looking beyond the *Next Wednesday's meeting* paradigm, the mapping of *earlier* and *later* times to the sagittal axis[3] (front-back) in naturally occurring metaphors varies across the languages of the world. When Ego is involved, as in the Moving Ego and Moving Time metaphors that play a role in the *Next Wednesday's meeting* probe, we find metaphors in which the future is mapped to Ego's *front* in English, as well as in Japanese (Shinohara and Pardeshi, 2011; Moore, 2014), Wolof (Moore, 2014), Mandarin Chinese (in limited uses; see Yu, 1998; Ahrens and Huang, 2002; Feist and Shi, n.d.), Danish Sign Language (Engberg-Pedersen, 1993), and American Sign Language (Emmorey, 2001). A more limited set of languages has been found that map the future in these metaphors to Ego's *back*, including Aymara (Núñez and Sweetser, 2006), Vietnamese (Sullivan and Bui, 2016), and Mandarin Chinese (Alverson, 1994; Feist and Shi, n.d.). For metaphors in which Ego is not involved (i.e., when times are located relative to other times), mappings to the sagittal axis suggest a direction of motion attributed to time or an event, similar to that implicated in the Moving Time metaphor. This direction likewise varies across languages: earlier times are *in front of* later ones in English, Wolof (Moore, 2014), Japanese (Shinmura, 1998, cited in Moore, 2014), Vietnamese (Sullivan and Bui, 2016), Yucatec Maya (Le Guen and Pool Balam, 2012), Aymara (Núñez and Sweetser, 2006), Mandarin Chinese (Yu, 2012; Feist and Shi, n.d.), Tzeltal (Brown, 2012), and Yupno (Cooperrider et al., 2022). In contrast, Hausa orders events with *earlier* in front of *later*, but days with *later* in front of *earlier* (Hill, 1978); the *later* in front of *earlier* mapping is also observed in Japanese and Marathi (Shinohara and Pardeshi, 2011).

Taken together, these findings suggest that, although the Moving Time and Moving Ego metaphors and the mappings underlying them are attested across a range of languages, there is no single, universal temporal structure that is being mapped, even within a single language. This variation thus gives rise to questions about whether there may be other factors, in addition to language, which influence the mapping from space to time. It is to those questions that we now turn, beginning with an exploration of factors that relate to the individual cognizer before expanding our examination to include

2 As Duffy and Feist (2023) note, along with cross-linguistic and cross-dialectal differences we find differences in the particular morphemes used in translations of the *Next Wednesday's meeting* question across these studies, raising the possibility that variation in interpretations is driven by lexical choice (*cf.*, Feist and Duffy, 2015). Because there is no single 'correct' translation of any given sentence (*cf.*, Werner, 1995), however, these two variables are inextricably bound together, underscoring the role of the language one speaks in the final interpretation of a metaphor.

3 This is the axis referenced in the *Next Wednesday's meeting* question. Variation is likewise found in mappings which involve axes other than the sagittal (Duffy and Feist, 2023). For reasons of space, these variations will not be considered further here.

factors related to the temporal entity being described and the context within which the metaphor is used.

3. Homing in on the individual

Building on evidence that the Moving Ego and Moving Time metaphors are psychologically real (McGlone and Harding, 1998) and, further, that they draw upon conceptual connections between time and space (Boroditsky, 2000; Boroditsky and Ramscar, 2002), a variety of studies have sought to further illuminate the structuring of time as a linear entity ordered along a sagittal axis. As we will see, in addition to strengthening the evidence for a conceptual connection between space and time, these studies have uncovered evidence that the connection is more intricate than that suggested in Conceptual Metaphor Theory (e.g., Lakoff and Johnson, 1980; see Duffy and Feist, 2023).

3.1. Approach and avoidance

In addition to time, a variety of emotions and personality traits have been argued to be connected to space and, more specifically, to spatial approach and avoidance, including anger, happiness, and extroversion. In space, approach entails movement in a forward direction along the sagittal axis, while avoidance may be connected to either backward movement along this axis or stasis. The similarities between these motions and those underlying the Moving Ego and Moving Time metaphors have inspired the examination of connections between approach- and avoidance-related factors and temporal metaphors.

For example, based on its associations with approach-related motivations, Hauser et al. (2009) hypothesized that a shared approach-related spatial motivation might serve as an embodied cognitive link between anger and the Moving Ego representation of time. To test for this connection, in one experiment, Hauser et al. (2009) asked English-speaking participants to complete a series of questionnaires designed to measure trait anger (that is, anger as part of their personality) before answering the *Next Wednesday's meeting* question. As predicted, the findings revealed that participants who averaged higher trait anger were more likely to respond *Friday* (consistent with the Moving Ego perspective) than to respond *Monday* (consistent with the Moving Time perspective).

Examining this relationship further, Hauser et al. (2009) next sought evidence of a potential bi-directional relationship between the two domains, asking whether manipulating representations of time could affect feelings of anger, much in the way that feelings of anger affect reasoning about time. Using a scheduling task designed to prime either the Moving Ego or Moving Time perspective, they found that, when asked to rate how angry they were feeling at the current moment, participants in the Moving Ego condition reported significantly higher scores for reported anger than did participants in the Moving Time condition. Taken together, these findings suggest that the metaphorical domains of anger and time appear to influence one another in a bi-directional manner, in line with the correlations observed between temporal perspective and approach and avoidance motivations.

Looking to other approach- and avoidance-related factors, Richmond et al. (2012) sought to investigate a connection between emotional state (e.g., happy, sad, anxious) and temporal perspective. Reasoning that feeling in control and proactively approaching a positive future is more likely to be connected to positive feelings such as happiness, Richmond et al. (2012) hypothesized that people who adopt the Moving Ego perspective (responding *Friday*) would report experiencing significantly higher levels of happiness. By contrast, passively awaiting the arrival of events is more likely to be connected to negative feelings; hence, people who adopt the Moving Time perspective (responding *Monday*) would report experiencing significantly higher levels of anxiety and depression. As predicted, when they compared British participants' responses to the *Next Wednesday's meeting* question with their scores on a series of questionnaires for assessing individual differences in levels of happiness, anxiety, and depression, they found that participants who responded in line with the Moving Ego perspective likewise reported higher levels of happiness, while participants who responded in line with the Moving Time perspective reported higher levels of anxiety and depression.

Like Hauser et al. (2009), Richmond et al. (2012) next investigated the question of whether people's perspectives on time could influence their emotional experiences. They found that after completing a task designed to prime either the Moving Ego or Moving Time perspective through rescheduling a series of events on a timeline (*cf.*, Hauser et al., 2009), English-speaking participants in the Moving Ego condition self-reported higher levels of happiness, while those in the Moving Time condition self-reported higher scores for anxiety and depression, thus revealing a bi-directional link between approach- and avoidance-related emotional experiences and perspectives on time.

Looking beyond emotion, one of the most fundamental dimensions of personality, extroversion (e.g., Eysenck, 1947; Briggs-Myers and Briggs, 1985; Costa and McCrae, 1985; John, 1990), is likewise grounded in approach motivations. Extroverted individuals are characterized as assertive and sociable, with the main direction of their energies oriented toward the outer world of material objects and people (John, 1990; John and Srivastava, 1999; John et al., 2008)—much in the way that in the Moving Ego metaphor, the self actively approaches events in the future. By contrast, introverted individuals are characterized as reserved and withdrawn, exhibiting a more passive perspective on the social and material world (John, 1990; John and Srivastava, 1999; John et al., 2008)—much in the way that in the Moving Time metaphor, the self passively awaits the arrival of events. Given the connections between other approach- and avoidance-related traits and temporal perspective reviewed above, we hypothesized that there would be differences in temporal reasoning between extroverts and introverts that parallel the spatially-based alignment of these personality types with approach and avoidance, with extroverts displaying more of a tendency to view themselves as approaching future events and introverts showing a greater likelihood of viewing future events as approaching themselves (Duffy and Feist, 2014). To test this, we had British participants complete a questionnaire for measuring extroversion-introversion (BFI; John, 1990) before responding to the *Next Wednesday's meeting* question. As anticipated, participants who adopted the Moving Ego perspective (answering *Friday*) exhibited higher degrees of extroversion compared to participants who adopted the

Moving Time perspective (responding *Monday*), suggesting that the shared spatial motivations may create a link whereby metaphorical reasoning is influenced by not only emotion, but also personality factors.

Noting that the valence of a given social event, and the concomitant desire to approach or avoid it, may differ for different personality types, Duffy and Evans (2017) reasoned that a question about moving *next Wednesday's party* should result in a stronger extroversion effect than that in the original Duffy and Feist (2014) finding. To test this possibility, they presented British participants with a version of the *Next Wednesday* probe that replaced *meeting* with *party*, along with the eight extroversion statements from the BFI (John, 1990). In contrast to the original finding featuring a neutral event (Duffy and Feist, 2014), however, Duffy and Evans (2017) found that *Monday* and *Friday* responders did not differ in their extroversion/introversion scores, giving rise to the possibility that the individual factors influencing metaphor interpretation are interactive rather than additive.

3.2. Lifestyle and control over time

Alongside connections to approach and avoidance, the Moving Ego and Moving Time metaphors differ with regards to the amount of inferred control that Ego has relative to Time. Noting that the majority of studies using the *Next Wednesday's meeting* question had sampled student populations, but that the lifestyle of a student is not representative of the general population, we investigated whether lifestyle may also influence an individual's approach to time and resulting resolution of a temporally ambiguous statement. One salient difference between full-time employees and students is that, whereas workers are paid for their time and have little choice about whether or when they will work, students pay to attend university. As the consumers, students typically have the choice of whether or not to turn up to a lecture, and when to work on their course-related tasks. The flexibility of time inherent in the student lifestyle thus stands in stark contrast to the more rigid structure of time inherent within full-time employment. In light of these differences, and in view of insights from Richmond et al. (2012), who found that English speakers who report higher levels of perceived personal agency were more likely to adopt the Moving Ego perspective, we hypothesized that people who have greater control over the structuring of their time and more temporal flexibility in their daily lives, such as students, may view time differently and, thus, may interpret temporal metaphor differently from those who are subject to more external constraints and who require higher degrees of time management in their professional lives, such as administrators (Duffy and Feist, 2014). To test this hypothesis, we presented the ambiguous *Next Wednesday's meeting* question to UK-based university students and to administrators (such as personal assistants, secretaries, and university timetable coordinators) who are tasked with the daily management of a multitude of events and activities. As anticipated, the findings revealed a difference between the two groups, with administrators more frequently adopting the Moving Time perspective (responding *Monday*; 71%) and students, the Moving Ego perspective (responding *Friday*; 61%).

Similarly to lifestyle, religion may also influence the extent to which a person believes themself to have control over their life. Central to Taoism is the practice of *wu-wei*—that is, the action of non-action (Maspero, 1981; Loy, 1985); thus, Li and Cao (2021) hypothesized that Taoists would be more likely to view time as approaching themselves (in line with the Moving Time perspective) than would their non-religious counterparts. These predictions were supported by participants' responses to a Mandarin Chinese version of the *Next Wednesday's meeting* question (*cf.*, Zheng et al., 2019), providing additional evidence for the connection between feelings of control and people's metaphorical perspectives on time.

More directly addressing the question of control, Loermans et al. (2019) invited speakers of English and Dutch to think of a situation in which they were (or were not) in control before responding to the *Next Wednesday's meeting* probe. While they found a connection between feelings of control and responses to the *Next Wednesday's meeting* probe among English-speaking participants[4] (*cf.* Richmond et al., 2012), this connection was not observed among Dutch-speaking participants[5] (but see Mikša et al., 2018 for evidence of this connection in Croatian). Moreover, a follow-up study revealed that Dutch speakers who responded using the Moving Ego perspective (a minority of their participants, at 24%) and those who responded using the Moving Time perspective (the majority of their participants, at 74%) did not differ in terms of how much control they reported feeling over events in their lives.[6] Taken together, these findings suggest that the roles of individual factors, such as feelings of control, may be intricately tied to cultural factors, such that no single factor influences metaphor interpretation in isolation.

Control may be connected to approach and avoidance motivations, as well. As seen in section 3.1, people with a variety of personality traits associated with approach motivations tended to favor the Moving Ego perspective, while those who embodied personality traits associated with avoidance motivations tended instead to favor the Moving Time perspective. This correlation raises the question of whether encouraging people to experience approach-motivated feelings might give rise to a preference for the Moving Ego perspective (and vice versa for discouraging these feelings). Similarly to other approach-motivated traits, feelings of power have been argued to trigger disinhibited behavior and a sense of control over the environment, while powerlessness triggers "those features of the self-relevant to others' goals" (Keltner et al., 2003, p. 265), aligning well with the Moving Ego and Moving Time perspectives, respectively. However, in contrast to other approach-motivated traits, feelings of power may be induced experimentally in the lab (Carney et al., 2010), thus allowing for the connection between power and temporal

4 However, English speakers displayed no preference between a Moving Ego framing ("I am approaching the meeting") and a Moving Time framing ("the meeting is approaching"), reiterating the suggestion that different tasks may reveal different aspects of temporal perspective (Margolies and Crawford, 2008; see below).

5 Moreover, a trend in the opposite direction was observed, with participants who were primed to think of a situation in which they were in control being more likely to adopt the Moving Time perspective in the *Next Wednesday's meeting* question.

6 As discussed above, however, the construction featured in the Dutch translation of the *Next Wednesday's meeting* probe may not have been ambiguous, thus precluding clear conclusions concerning the absence of a connection between feelings of control and temporal perspective among speakers of Dutch.

perspective to be examined independent of other contributing personality factors.

Like other animals, humans express high levels of power spatially through expansive and open postures, which maximize the use of occupied space, whereas low levels of power are conveyed through contractive and closed postures, which minimize the use of occupied space (Darwin, 1872/2009; de Waal, 1998; Carney et al., 2005). Research has shown that maintaining high-power and low-power poses may not only reflect feelings of power, but also produce them (Carney et al., 2005, 2010; Cuddy et al., 2015; Ranehill et al., 2015), even after as little as 2 min of adopting the pose (e.g., Carney et al., 2010). Building on these findings, we sought to investigate whether the effects of enacting a high- vs. low-power pose might extend to temporal reasoning due to the embodied cognitive link between power and time via the shared intersections between the two domains with approach and avoidance motivations (Duffy and Feist, 2017).

Across two temporal tasks, we found that undergraduate student participants from the UK who adopted high-power poses demonstrated a greater preference for the Moving Ego perspective, compared to those adopting low-power poses. Notably, however, the effects of enacting a high-power pose appear to be stronger than the effects of enacting a low-power pose. First, participants who enacted a high-power pose responded to the *Next Wednesday's meeting* question with *Friday* more often than with *Monday*. By contrast, participants enacting low-power poses demonstrated no preference for either response. Second, when indicating a preference between syntactic framing for temporal metaphors consistent with the Moving Ego perspective (i.e., *We're approaching Christmas*) and framing consistent with the Moving Time perspective (i.e., *Christmas is approaching*), participants in the high-power pose condition preferred statements consistent with Moving Ego while participants in the low-power pose condition preferred statements consistent with Moving Time, as predicted. However, the preference displayed by the high-power pose participants was greater than that displayed by the low-power pose participants.

This asymmetry may shed further light on details of the spatial motivations underlying the metaphorical connections. First, as mentioned above, approach motivation is typically associated with forward movement of the self, while avoidance motivation tends to be connected to backward movement (e.g., Carver and Scheier, 1998; Elliot, 2006). Studies examining connections between imagined movement and metaphorical temporal reasoning have revealed that these two directions are not symmetrical: whereas participants primed with abstract forward motion (i.e., progression along a series, such as counting up or imagining letters of the alphabet in order) were more likely to respond *Friday* to the *Next Wednesday's meeting* question, in line with the Moving Ego perspective, participants primed with abstract backward motion sequences (i.e., counting down or imagining letters of the alphabet in reverse order) showed no preference for *Friday* vs. *Monday* responses (Matlock et al., 2011). One explanation for this pattern of effects lies in the fact that, while forward and backward motion involve symmetric directions, the two directions are not equally frequent in everyday experience (Matlock et al., 2011), thereby blunting the influence of the less frequent direction.

In addition, the two directions of motion are not equally strongly associated with approach and avoidance motivations, respectively (Duffy and Feist, 2017). Specifically, although approach motivations have consistently been associated with active, forward motion, avoidance motivations have been connected to two different kinds of behaviors: in addition to backward motion, avoidance motivations have been connected to passive behaviors, which do not imply motion (*cf.*, Richmond et al., 2012). For this reason, approach motivations may be more strongly connected to forward motion than avoidance motivations are to backward motion, giving rise to stronger effects of high power via the links between level of power, spatial motivation, and temporal perspective.

3.3. Procrastination and conscientiousness

Although the contrast in temporal perspective between students and administrators noted in Section 3.2 may stem from a difference in terms of control over time and time management demands, there are additional differences between the two groups that may be connected to temporal perspective. For example, research shows that procrastination is particularly common in the academic domain, with up to 95% of students habitually deferring academic tasks such as writing assignments, studying for examinations and keeping up-to-date with weekly seminar reading (Ellis and Knaus, 1977; see also Solomon and Rothblum, 1984; Ferrari and Beck, 1998). In contrast to the student population, procrastination has been found to chronically affect only 15%–20% of nonstudent adults, with the lowest rates of procrastination reported by professional, business, and educational employees, such as university administrators (Harriott and Ferrari, 1996). In line with these norms, criteria such as "excellent organizational skills" and the "ability to prioritize workload and manage conflicting priorities" commonly feature in job advertisements for university administrators (*cf.*, Work4Northumbria, 2022).

Procrastination involves the movement of tasks "forward" into the future, in a direction defined by the ego's movement through time (concordant with the Moving Ego perspective), while prioritization (associated with conscientiousness) entails the movement of tasks "forward" toward the present, ergo toward the ego (concordant with the Moving Time perspective). Thus, we hypothesized that the habitual movement of tasks in one of these directions may be a contributor to the temporal perspective adopted in response to the *Next Wednesday's meeting* question, with procrastinators favoring the Moving Ego perspective, and conscientious individuals favoring the Moving Time perspective (Duffy and Feist, 2014). To test this hypothesis, we asked undergraduate students in the UK to complete a questionnaire for measuring trait procrastination (Lay, 1986) and trait conscientiousness (John, 1990) before they provided a response to the *Next Wednesday's meeting* question. Consistent with our predictions, we observed a significant effect, with participants who adopted the Moving Ego perspective (answering *Friday*) reporting higher procrastination scores and lower conscientiousness scores than participants who adopted the Moving Time perspective (answering *Monday*), thus expanding the growing list of personality factors that may be connected to temporal perspective and the interpretation of ambiguous metaphoric language.

Noting that these results, like those from other studies investigating the effects of personality differences on metaphorical temporal reasoning, have relied on participants' self-reported assessments of the variables under study, we next set out to test

whether these relationships can similarly be observed under real world conditions. To do this, we turned our focus to real-life timeliness behaviors that correlate with procrastination and conscientiousness, comparing the resolution of temporal ambiguity to the timeliness of: (1) workers traveling to work; (2) students submitting an essay on campus; and (3) people arriving for a scheduled appointment. Across three experiments, we found that UK-based participants who adopted the Moving Ego perspective were more likely to procrastinate, meeting their obligations later on average than participants who adopted the Moving Time perspective, thus extending earlier findings with evidence that these effects reach beyond the laboratory.

Much like procrastination, a person's "body clock," i.e., their chronotype, likewise represents differences in people's temporal preferences, with some people preferring evenings and others, mornings. In addition, earlier lines of research have shown an association between a preference for evenings and procrastination (Ferrari et al., 1997; Przepiórka et al., 2019), suggesting that chronotype, like a tendency to procrastinate (or not to do so), may influence how people reason about ambiguous temporal metaphors. Building on findings suggesting a connection between temporal perspective and procrastination (Duffy and Feist, 2014; Duffy et al., 2014), Shen and Li (2021) administered a Morningness–Eveningness Questionnaire (Horne and Ostberg, 1976) along with the *Next Wednesday's meeting* question to Chinese university students to examine the relationship between choronotype and temporal perspective. Their findings showed that those who adopted the Moving Ego perspective displayed greater preferences for evening over morning, while those who adopted the Moving Time perspective displayed the opposite preference, concordant with the connections between procrastination and temporal perspective observed in prior research (Duffy and Feist, 2014; Duffy et al., 2014).

Throughout Section 3, we have seen that the interpretation of space–time metaphor is influenced by a variety of individual factors in addition to spatial experience, suggesting that metaphor involves additional factors beyond the mapping from a source domain to a target domain. One common thread running through these factors is their connection to either spatial or temporal experience, suggestive of an interconnected conceptual network underlying the mappings that surface in metaphor. Because cognition exists not only within the mind, but also in the systems with which we interact (Hutchins, 1996), these findings of individual variation in the interpretation of metaphor raise questions about whether parallel factors associated with the context of use of a space–time metaphor may likewise influence metaphor interpretation.

4. The contextualized individual

Just as individuals differ in complex ways, so do the events they describe and the situations in which they speak. For example, speakers may discuss the timing of emotionally charged events, thereby opening a pathway for the valence of the event to impinge upon temporal reasoning (*cf.*, section 3.1). Speakers may also reason about time across a range of contexts, including contexts that mimic the longer-term time pressures that characterize different lifestyles (*cf.*, section 3.2). These connections between the individual-level factors surveyed in Section 3 and the broader contexts within which speakers communicate raise questions about whether the nature of the event, as well as contextual factors, may likewise exert an influence on metaphoric interpretation.

4.1. Affect and features of the "meeting"

As with individuals, there is wide variation in the range of events that people may schedule and reschedule. Noting that McGlone and Harding's (1998) ambiguous question asks about the rescheduling of a "meeting," the nature of which is unspecified to the comprehender, one question that has been raised is whether the valence of the event being moved (positive or negative) may influence whether people consider themselves to be approaching the event or the event to be approaching them. Reasoning that positive affect tends to be spatially represented by approach motivations and negative affect, by avoidance motivations (Cacioppo et al., 1993; Chen and Bargh, 1999; Neumann et al., 2003;[7] *cf.* section 3.1), Margolies and Crawford (2008) hypothesized that positively-valenced events might encourage use of the Moving Ego perspective and negatively-valenced events might encourage use of the Moving Time perspective. To test this hypothesis, they asked participants from the US to envisage an event, scheduled for "next Wednesday," for which they might feel either enthusiasm (e.g., seeing a distant loved one) or dread (e.g., a stressful exam). Participants then responded to a series of task-related questions about the new timing for the event and how they felt about its rescheduling, including both the *Next Wednesday's meeting* probe and a question directed at whether they felt themselves to be approaching the event or the event to be approaching them. As predicted, Margolies and Crawford (2008) observed an association between positive event valence and the Moving Ego perspective and, conversely, between negative event valence and the Moving Time perspective, with participants who responded to a positively-valenced event being more likely to describe themselves as approaching the event, and participants who responded to a negatively-valenced event being more likely to describe the event as approaching themselves. However, the valence of the event did not significantly affect participants' responses to the *Next Wednesday's meeting* question itself (i.e., whether they responded *Monday* or *Friday*); an apparent inconsistency that may stem from a tension between the tendency for people to imagine moving toward positive events (in line with the Moving Ego perspective) and people's desire for positive events to occur sooner (resulting in a direction of change that aligns with the Moving Time perspective). Building on these findings in a follow-up study, Margolies and Crawford (2008) found that participants judged an event to be more positive when it was described using the language of Moving Ego compared to the language of Moving Time, thus suggesting that space–time metaphors also convey information about the valence of an event[8] and strengthening the evidence in support of

7 For contrasting findings, see Centerbar and Clore (2006) and Rotteveel et al. (2015).

8 Noting that Monday and Friday differ in valence, with Friday generally being viewed more positively than Monday, in a follow-up study, Margolies and Crawford (2008) found that when the event was rescheduled to a less positive day (Monday) using a Moving Ego framing, participants still viewed the event more positively than when it was rescheduled to a more positive day (Thursday) using a Moving Time framing.

a bi-directional link between metaphor and individual factors. In discussing the implications of their findings, Margolies and Crawford concluded that:

> Our embodied knowledge and perceptions are a result of an accumulation of sensorimotor experiences, including emotional reactions and spatial movements that influence each other in shaping thought. Abstract thought capitalizes on more concrete domains and thus is subject to influences from both physical and affective experience (2008, p. 1412).

The interrelation between event valence and metaphorical perspectives on time may also be seen in the ways in which speakers choose to describe the events that they have experienced. As a case in point, McGlone and Pfiester (2009) sought to examine whether people make differential use of Moving Ego and Moving Time when they communicate about positive and negative events. In this study, McGlone and Pfiester (2009) asked undergraduate participants in the US to write narratives about pleasant or unpleasant events that they had experienced in the recent past and to rate the events' pleasantness on a scale. An analysis of the metaphorical temporal descriptions revealed that participants tended to use the Moving Ego perspective more frequently for describing pleasant events, e.g., "it was great hanging out in the blind and *passing the time* drinking beer" (p. 17), while the Moving Time perspective was employed more frequently for describing unpleasant events, e.g., "practically an *entire hour passed* while I just sat there" (p. 17). In addition, their findings suggest that speakers not only differentially employ these two perspectives in their descriptions of events, but also infer meaning from another's use of these temporal perspectives. Thus, when participants were asked to read a fictitious first-person account of a journal entry describing the activities of a student over the course of a week during the academic year, they rated the narrator as more excited in contexts that utilized the Moving Ego metaphor and more worried in contexts that utilized Moving Time.

Turning from the lab to the real world, McGlone and Pfiester (2009) next examined the connection between affect and temporal metaphor in natural language uses of Moving Ego and Moving Time metaphors. Specifically, using a selection of American English corpora, they found that the valence of the encoded event (positive, negative, or neutral) co-varied with the temporal perspective adopted in the description. In line with the experimental results, positive events were more frequently encoded by the Moving Ego perspective, e.g., "There is much optimism that we might be *coming to*" (WordBanks USBooks Corpus, cited in McGlone and Pfiester, 2009, p. 13), while negative events tended to be encoded by the Moving Time perspective, e.g., "when *the time comes* she cannot do things and she has to be cared for" (Switchboard Corpus, cited in McGlone and Pfiester, 2009, p. 13), suggesting that the connections uncovered in laboratory experiments extend to natural uses of language.

Event valence has been observed to exert an effect on metaphorical temporal perspectives in Mandarin Chinese as well. For instance, in one study, speakers of Mandarin Chinese were primed with a scenario of a future event that was designed to elicit one of three emotions: happiness, anger, or anxiety (Zheng et al., 2019). They then responded to two measures of temporal perspective: an adapted version of the *Next Wednesday's meeting* question, which replaced the meeting with the described event, and a time motion schema question (*cf.*, Boroditsky, 2000), depicting the Moving Ego and Moving Time perspectives, which asked participants to indicate whether they were approaching the event or whether the event was approaching them (*cf.*, Margolies and Crawford, 2008). Concordant with the findings from English, Zheng et al. (2019) found that participants primed with positively-valenced future events were significantly more likely to adopt the Moving Ego perspective across both measures of temporal perspective.[9]

This pattern of findings has not, however, been replicated in all languages studied. For instance, Loermans et al. (2021) found that speakers of Dutch who were primed with a positive future event were no more likely to adopt the Moving Ego perspective than were those primed with a negative future event. In addition, despite demonstrating a strong overall preference for disambiguating the *Next Wednesday's meeting* question in line with the Moving Time perspective, Dutch-speaking participants showed no preferred temporal perspective in their responses to the time motion schema, thus reiterating the notion that certain measures may tap into temporal perspective in different ways (as seen in the work of Margolies and Crawford, 2008, described above). What did influence participants' temporal perspective in this study, however, was the mere fact of having explicitly thought about their emotional response before interpreting the *Next Wednesday's meeting* question: Loermans et al. (2021) observed a higher rate of Moving Ego responses among participants who had rated their emotional response to the event first and a higher rate of Moving Time responses among those who had rated their emotional response second. In discussing the implications of their findings, Loermans et al. (2021) argued that introspecting about the event in question may have led to heightened feelings of agency, echoing the connection between heightened feelings of control and the Moving Ego perspective reviewed above (section 3.2).

When an event is in our future, movement will result in a diminution of the time until the event takes place. This diminution in time underlies the reasoning connecting event valence to temporal perspective in the studies reviewed thus far. However, this leaves open the question of how speakers will make use of the two perspectives when an event took place in the past, in which case movement will result in a lengthening of the time separating them from the event. Does event valence similarly influence temporal perspective when speakers are considering past events? To find out, Lee and Ji (2014) asked participants at a Canadian university to write about a past experience in which they had either felt rejected or embraced by their friends. They found that participants who wrote about an experience of being rejected were more likely to adopt the Moving Ego perspective (i.e., actively moving away from the past), whereas participants who wrote about an experience in which they felt embraced were more likely to adopt the Moving Time perspective (i.e., remaining closer to the past). In this way, participants metaphorically minimized their distance from pleasant experiences and maximized their distance from unpleasant experiences. These findings present an interesting parallel with the findings regarding approach and avoidance reviewed

9 It should be noted, however, that participants primed with negatively-valenced events also displayed a preference for the Moving Ego perspective, albeit to a significantly lesser extent.

earlier, suggesting that not only temporal motion, but also preferences regarding temporal location may give rise to variation in the perspective adopted when interpreting metaphor.

4.2. Metaphor in context

All language use occurs in a context. Not only do individuals and the events about which they speak exhibit substantial variation, but the contexts of use do so as well. The findings that individual differences, as well as emotional states, influence metaphor interpretation suggest that contextual differences may likewise influence the in-the-moment interpretation of a metaphor. For example, the findings reviewed above suggest that individual differences related to internally imposed time pressure, including lifestyle and personality, exert influence on how people reason about events in time. These findings raise the question of whether externally imposed factors related to time pressure, such as pace of life, may similarly influence temporal reasoning and metaphor interpretation. For example, people who live in larger, more populous areas have been found to exhibit a general tendency to experience life at a faster pace, and to experience higher time pressures than do people who live in smaller, less populous areas (Bornstein, 1979; Levine and Bartlett, 1984; Garhammer, 2002). Building on these findings, Li and Cao (2019) asked whether the type of area people live in and the concomitant pace of life might influence an individual's metaphorical approach to time. They reasoned that residents of faster-paced, densely populated cities would feel themselves to be more regimented by the clock, and therefore would be more likely to demonstrate a preference for the Moving Time perspective. By contrast, residents of slower-paced, less populated cities may experience less time pressure and a greater degree of temporal flexibility, thereby raising the likelihood that they will demonstrate a preference for the Moving Ego perspective. To test this hypothesis, Li and Cao (2019) asked residents of more populous cities (New York City, NY, United States; London, United Kingdom) and residents of less populous cities (Albuquerque, NM, United States; Lancaster, United Kingdom) to respond to the *Next Wednesday's meeting* question. In line with their predictions, Li and Cao (2019) found that participants living in New York City and London were more likely to respond *Monday* (in line with the Moving Time perspective), while participants living in Albuquerque and Lancaster were more likely to respond *Friday* (in line with the Moving Ego perspective). These results, thus, suggest that environmental differences in time pressures, like individual differences in attitudes toward time, may influence people's adopted perspectives when resolving an ambiguous metaphorical question about time.

External demands, however, change over time and across contexts, thus bringing into question whether an individual's metaphorical temporal perspective may likewise vary across changing external demands. In a short-term longitudinal study aimed at addressing this issue, Loermans and Milfont (2018) compared the responses of undergraduate students from New Zealand to the *Next Wednesday's meeting* question over a five-month period. They observed a small but reliable increase in the proportion of Moving Time perspectives over this time period, with participants being significantly more likely to adopt the Moving Time perspective, responding *Monday*, in July ($N = 246$, 75%) than in March ($N = 224$, 68%). This shift gives rise to the question of whether the two times of year might differ in some way that would be connected to a change in preference for the Moving Time perspective (Duffy and Feist, 2023). To find out, we consulted the academic calendar for the university where Loermans and Milfont's (2018) study was conducted (Victoria University of Wellington, 2021). We found that the new academic year tends to begin in late February/early March—coinciding with the time of the participants' first responses in the experiment. Temporal milestones such as the start of a new academic year may be associated with the "fresh start effect" (Dai et al., 2015), in which people's mindsets—particularly with regard to their perspectives on time—may include greater openness to new goals or to meaningful changes to behavior. Because self-motivation and the drive to attain goals are characteristic of high-level agency (Vallacher and Wegner, 1989), which has likewise been found to relate to the Moving Ego perspective (Richmond et al., 2012), we reasoned that participants may have been exhibiting a more agentic, goal-oriented mindset and, thus, a more active approach toward time, at the beginning of the new academic year. By contrast, July tends to mark the start of the middle term and tends to follow the "mid-year break." At this point in the academic year, many students may have established their routines and, thus, they may be less likely to be thinking about how to structure their time. Furthermore, the mid-year break follows a three-week assessment and examination period, so students' mindsets may be affected by their recent pressure to complete assignments. When Duffy and Evans (2017) presented UK university students with the question, *Next Wednesday's* ***assignment deadline*** *has been moved forward two days. What day has the event been rescheduled to?*, they found that their participants were more likely to adopt the Moving Time perspective (responding *Monday*), suggesting that this pressure may be related to the adoption of the Moving Time perspective. In addition, the external demands of assessments and examinations may lead students to feel more regimented, much like the external demands associated with living in a fast-paced, populous city did for Li and Cao's (2019) participants. Thus, the change in responses between the first and second sessions in Loermans and Milfont's (2018) study may have arisen due to a difference in the temporal context of the two sessions, with the first being more conducive to the Moving Ego perspective and the second, to the Moving Time perspective (Duffy and Feist, 2023).

Temporal context may include not only the months of the year, but also the days of the week. As observed by both Winter and Duffy (2020) and Medimorec (2022), this contextual factor also influences metaphorical temporal perspective, with English speakers from the US responding *Monday* more frequently when questioned on a Monday, and *Friday* more frequently when questioned on a Friday. Probing this effect further, Winter and Duffy (2020) found that asking the *Next Wednesday's meeting* question on days closer to Monday and Friday results in progressively more *Monday* or *Friday* responses, respectively. While one possible explanation for these effects is priming—knowing that it is a Monday may help *Monday* to spring to mind more easily (*cf.*, Medimorec, 2022), there may be additional factors at play. For instance, as seen in sections 3.1 and 4.1, *Friday* responses tend to be associated with happiness and with positive affect, while *Monday* responses tend to be associated with depression and with negative affect. Given that associations for both mood and affect are more negative for Mondays and more positive for Fridays (Areni et al., 2011; Stone et al., 2012; Ellis et al., 2015), *Friday* responses

elicited on a Friday may have resulted from positive affect, while *Monday* responses elicited on a Monday may have resulted from negative affect (Medimorec, 2022).

Other contextual factors may similarly tap into affect and, thereby, may influence people's metaphorical perspectives on time. In studies examining connections between temporal perspective and the experience of grief and trauma, for instance, Ruscher (2011) found that individuals forecasted shorter periods of grief in response to a brief vignette about a woman whose young son had died which made use of a Moving Ego framing, as compared to a vignette which made use of a Moving Time framing (Ruscher, 2011; see also Ruscher, 2012; Turner et al., 2020; Pfaltz et al., 2021).[10] Taken together, the results reviewed in Section 4 suggest that metaphorical perspectives may encourage, as well as result from, variation in affect surrounding a context and a topic under discussion, as was seen with the interplay observed between metaphorical perspective and individual emotional experiences surveyed in section 3.

5. Discussion

How do we reason about abstract concepts, given that we cannot see them or touch them? One prominent theory—CMT—suggests that we draw upon our knowledge of concrete concepts, which we can reason about more easily, in order to scaffold our understanding of abstract ones (Lakoff and Johnson, 1980). Conceptual metaphors thus represent an important cognitive tool whereby abstract concepts inherit structure from more concrete concepts (Lakoff and Johnson, 1980), resulting in both linguistic metaphors and patterns of thinking that bear the imprint of these metaphorical connections. Through the examination of people's interpretations of an ambiguous temporal prompt, researchers in the cognitive sciences have uncovered compelling evidence that the metaphorical connections between space and time are not merely linguistic, but rather extend deep within the conceptual system. However, as the findings reviewed in the current article show, these connections alone fail to fully explain the use and interpretation of space–time metaphors. Rather, evidence is accumulating suggesting that the interpretation of metaphor is subject to a host of individual, event-based, and situational factors. This interplay of factors is what might be expected if, indeed, metaphorical connections extend throughout the conceptual system.

In the current review, we considered three types of factors: linguistic (and, relatedly, cultural) factors, individual factors, and contextual factors related to the content of the message and the situation within which it is spoken. At all three levels, we observed that, rather than resulting from a straightforward mapping from physical space to time, space–time metaphors bear the imprint of the individual speaker and the context within which she speaks. Taken together, this confluence of factors suggests that space–time metaphor is built up in real time rather than arising from either existing conceptualizations or a mapping between static domains.

Looking beyond the particular space–time metaphors that constituted the focus of the current review, we find that other metaphorical mappings from space to time are influenced by linguistic and cultural factors, in addition to interactions with other conceptual metaphors. Thus, for example, languages may make use of axes other than or in addition to the sagittal (e.g., Li, 2017 for Mandarin Chinese; Moore, 2014 for Wolof; and Brown, 2012 for Tzeltal); linear directionals may be rare or even absent in temporal metaphors (see Cooperrider et al., 2022, for Yupno; da Silva Sinha, 2019, for evidence from indigenous languages of Brazil); and the choice between one-dimensional and three-dimensional construals of temporal duration may be dependent on other contextually applicable metaphors for time (Alcaraz Carrión and Valenzuela, 2021).

Indeed, recent research in the cognitive sciences suggests that the interpretation of a variety of metaphors, like those describing time in terms of space, is influenced by multiple contextual and personal factors (Gibbs, 2009, 2017; Casasanto, 2017; Kövecses, 2017; El Refaie, 2019; Littlemore, 2019). This confluence of factors has led Littlemore (2019, p. 50) to argue that metaphor "varies according to the specific situations in which we find ourselves," with those situations encompassing cultural and bodily circumstances alongside the context within which a metaphor is being used. In a similar fashion, Gibbs (2009, 2011, p. 552) highlighted the role of multiple, layered factors when he argued that metaphors may be "'soft-assembled' during thinking, speaking, and understanding." At a broader level, Casasanto and his colleagues (Casasanto and Bottini, 2014; Casasanto, 2017; Pitt and Casasanto, 2020) argued for both high-level, general metaphoric links between domains and lower-level, more specific links, resulting in a layered set of influences on mental metaphors. Concordant with these proposals, we argue that the insight that metaphor involves a mapping from a source to a target domain is the beginning rather than the end of an account of the workings of metaphor. While important, this mapping is not accomplished in isolation. Rather, this mapping constitutes one set of inputs to a larger, complex, "blended" conceptualization (Fauconnier and Turner, 1998, 2002; *cf.*, Richards, 1936; Black, 1962), with metaphoric interpretation arising from the entire complex of domain-related factors, linguistic and cultural factors, individual factors, and contextual factors (Duffy and Feist, 2023). At a broader level, this blended conceptualization suggests a richly interconnected conceptual system whereby aspects of a variety of concepts may combine and recombine to create the range of in-the-moment interpretations observed in studies of space–time metaphor and in uses of metaphor in the real world.

6. Conclusion

In recent years, evidence across the cognitive sciences has revealed the importance of individual differences to the workings of the mind, demonstrating that, in order to piece together the puzzle of human cognition, we need to not only embrace this variation, but to integrate it with those findings which can be generalized (Prather et al., 2022; Scott-Phillips and Nettle, 2022). As we have seen, metaphor is no exception: research on the workings of metaphor has revealed a multiplicity of factors that together influence its use and interpretation, layered on top of the mapping from a source to a target posited by

10 It should be noted, however, that other research has found that people primed with the Moving Ego perspective have underestimated to a greater extent the time needed to complete a task compared to those primed with the Moving Time perspective (Boltz and Yum, 2010), suggesting that people may underestimate durations of time that are framed from the Moving Ego perspective more generally.

Conceptual Metaphor Theory. The variety uncovered, and the range of metaphoric mappings in which multiple factors have been observed, suggests that this work has just begun; the identification of additional factors, along with investigations of the ways in which these factors may interact with one another, will be necessary in order to fully understand the ways in which people draw upon one domain in service of understanding another.

Gibbs (2021, p. 494) points to a further challenge for metaphor researchers, noting that, while the use of metaphor is a general property shared by all humans, there are at the same time individual differences in the use and interpretation of metaphors, such that all people use metaphor in their own "unique, highly personal way." As seen in the research surveyed in the current review, the factors influencing metaphor interpretation, like metaphor itself, include both general factors shared across communities and factors that are quite personal and individual. The influences of both general and individual factors on the interpretation of space–time metaphors thus suggest that a complete understanding of metaphor requires an understanding of both "the general within the specific and the specific within the general" (Gibbs, 2021, p. 496). The need to integrate these factors into a coherent, comprehensive account, therefore, points the way forward.

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Words for the hearts: a corpus study of metaphors in online depression communities

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Purpose/significance: Humans understand, think, and express themselves through metaphors. The current paper emphasizes the importance of identifying the metaphorical language used in online health communities (OHC) to understand how users frame and make sense of their experiences, which can boost the effectiveness of counseling and interventions for this population.

Methods/process: We used a web crawler to obtain a corpus of an online depression community. We introduced a three-stage procedure for metaphor identification in a Chinese Corpus: (1) combine MIPVU to identify metaphorical expressions (ME) bottom-up and formulate preliminary working hypotheses; (2) collect more ME top-down in the corpus by performing semantic domain analysis on identified ME; and (3) analyze ME and categorize conceptual metaphors using a reference list. In this way, we have gained a greater understanding of how depression sufferers conceptualize their experience metaphorically in an under-represented language in the literature (Chinese) of a new genre (online health community).

Results/conclusion: Main conceptual metaphors for depression are classified into PERSONAL LIFE, INTERPERSONAL RELATIONSHIP, TIME, and CYBERCULTURE metaphors. Identifying depression metaphors in the Chinese corpus pinpoints the sociocultural environment people with depression are experiencing: lack of offline support, social stigmatization, and substitutability of offline support with online support. We confirm a number of depression metaphors found in other languages, providing a theoretical basis for researching, identifying, and treating depression in multilingual settings. Our study also identifies new metaphors with source-target connections based on embodied, sociocultural, and idiosyncratic levels. From these three levels, we analyze metaphor research's theoretical and practical implications, finding ways to emphasize its inherent cross-disciplinarity meaningfully.

KEYWORDS

metaphorical expressions (ME), conceptual metaphors (CM), MIPVU, semantic domain analysis, online health communities (OHC), depression

1. Introduction

Mental health is a crucial component of public health and a major issue affecting citizens and society. Psychological and behavioral problems have increased due to rapid economic and social development and public health emergencies such as the COVID-19 pandemic. Worldwide, depression is the leading cause of disability, with over 700,000 people dying from

depression-related suicides each year, and around 280 million people suffer from depression. In China alone, the number of people with depression has reached 54 million (WHO, 2022). Furthermore, stigmatization and shame associated with depression have resulted in a low identification rate of 21% and a low intervention and treatment rate of 10%, making depression an important public health concern in China (NCMHC, 2022). Depression might come with symptoms including feeling sad or hopeless, losing interest in activities once enjoyed, having difficulty concentrating, and sometimes thoughts of death or suicide (Leis et al., 2019; Taylor-Jackson and Moustafa, 2021). These symptoms can make it difficult to leave the house, attend outdoor activities, or even socialize with others. Self-isolation and disconnection can lead people with depression to ruminate more on negative thoughts and feelings, thus worsening their symptoms (Yoon et al., 2019; WHO, 2022).

Online health communities (OHC) have changed how people access health information. Users in OHC talk about their conditions and treatment options, share their cases and experiences, seek social support and help, and alleviate social fears and stigma (Xu and Zhang, 2016; Ríssola et al., 2019). A better understanding of how OHC users with depression communicate can boost the effectiveness of counseling and interventions for this population by shedding light on how they frame and make sense of their experiences. However, this line of research is still in its infancy, and identifying and analyzing more ambiguous and abstract information, such as metaphors, remains challenging (Kauschke et al., 2018; Poppi and Kravanja, 2019; Coll-Florit et al., 2021).

The current paper emphasizes the importance of identifying the metaphorical language used in OHC to gain insights into their cognitive mechanisms and behavioral patterns. Such insights could help identify and manage mental health issues, particularly in cultural contexts where individuals are reluctant to seek help due to the stigma associated with depression. First, we will review metaphor identification research and describe its gradual focus on combining metaphors in language, thought, and communication. Afterward, we present an overview of metaphor analysis in health-related communication, emphasizing the need to examine metaphor use in OHC, in our case, among depressed users. In the next stage of the paper, we identify and analyze depression metaphors in a Chinese corpus by following a three-stage procedure. This paper concludes with methodological, theoretical, and practical implications and suggestions for future research, synthesizing psychotherapy and discourse analytic perspectives.

2. Literature review

2.1. Metaphor identification research

By extending metaphors beyond rhetoric to cognition, Conceptual Metaphor Theory (CMT) marks the cognitive turn in metaphor study (Lakoff and Johnson, 1980; Lakoff, 1993). By focusing on using metaphors as a cognitive tool for understanding and organizing experience (Lakoff and Johnson, 1980), CMT departed from the traditional belief that metaphors are ornamental, arguing metaphors are of conceiving one thing in terms of another (Lakoff and Johnson, 1980). A cognitive linguist describes conceptual metaphors (CM) according to the formula TARGET IS SOURCE, i.e., CM allow one to conceptualize a target domain through a source domain by comparing properties and categorical relationships. This process of comparing and categorizing metaphors is also known as metaphor processing (Tong et al., 2021). Linguistic metaphors stem from CM or cross-domain mappings within one's conceptual system. For example, DEPRESSION IS BATTLE maps the abstract concept of depression onto the concept of battle. This metaphor allows us to understand depression in terms of conflict, violence, and victory. Metaphorical expressions (ME) are prevalent in everyday life as evidence that linguistic expressions (metaphors within language) reflect certain cognitive systems (metaphors in thought) (Charteris-Black, 2012; Coll-Florit and Climent, 2019).

Researchers have questioned the legitimacy of extrapolating linguistic expressions to cognitive structures and have argued that language users may not similarly relate to these ME in their minds (Semino et al., 2004, 2016), i.e., metaphorical languages do not necessarily produce metaphorical cognition, and the same metaphor can also produce different cognitive patterns or metaphorical systems in different groups (McMullen and Conway, 2002; Reijnierse et al., 2017). Metaphor processing occurs during text comprehension, leading to the emergence of features that are not inherent in target or source domains, also known as emergent meaning (Tong et al., 2021). For example, *depression is battle* contains far richer shades of meaning than *depression is hard*. Both express a similar meaning, but the latter expression is unlikely to be as concise as the use of the word *battle*. *Depression is a battle* denotes depression is a struggle, a fight, and a test of endurance. These additional connotations add richness and depth to the understanding of depression. Language users might deliberately introduce topic shifts or perspective changes into discourses (Reijnierse et al., 2017). For instance, looking at depression from the perspective of a battle can help us see it differently, not as something to be ashamed of, but rather as a challenge to overcome. It is necessary then to include an analysis of metaphors in the communicative process (metaphors in communication) (Reijnierse et al., 2017; Coll-Florit and Climent, 2019).

As a result, metaphor research has developed a three-dimensional analytical framework: metaphors in language, thought, and communication (Semino et al., 2016; Coll-Florit and Climent, 2019; Tong et al., 2021). A direct result of this development of metaphor theory is the development of metaphor identification methods as well.

Initially, metaphor studies sought to establish a systematic correspondence between metaphors in language and thought. Metaphor identification aimed to analyze the conflict between metaphorical and literal meanings in non-textualized example sentences, leaving metaphor identification largely to subjective judgments (Gibbs and Franks, 2002; Semino et al., 2004; Kimmel, 2010). In the same way as (1), if the word *freedom* evokes a concept directly related to slavery and imprisonment, then its use may be considered metaphorical, whereas a more general interpretation of the concept of *freedom* that entails the ability to choose points to a literal meaning (Steen et al., 2010).

> (1) They had so kindly offered *freedom* (Coll-Florit and Climent, 2019).

The MIP (metaphor identification procedure) proposed by the Pragglejaz Group (2007) provides normative steps for metaphor identification and greatly simplifies the problem by emphasizing

attention to the distinction between contextual meaning and basic meaning. The basic meaning is an important concept in metaphor identification systems. It tends to be more concrete, historical, and more likely to evoke human sensory experience. Suppose a lexical unit has a more basic current meaning in other contexts than in the given context, and the contextual meaning contrasts with the basic meaning. In that case, the lexical unit is labeled as a metaphor. The basic meaning derives from the dictionary definition (Burgers et al., 2016). In (2), for example, *attack* denotes verbal exchange in the current context; however, this is a non-direct meaning because the basic meaning of *attack* in other contexts is physical activity; and through this layer of basic meaning, the current context implies the meaning of verbal exchange. Thus the *attack* in example (2) is a ME.

> (2) Hillary Clinton *attacks* Bernie Sanders as New York primary looms (Semino et al., 2004).

Informed by CMT, Steen et al. (2010) propose the Metaphor Identification Procedure Vrije Universiteit (MIPVU) for manually identifying metaphor-related words (MRWs) in a text. MIPVU's comparison of basic and metaphorical meanings makes metaphor identification less dependent on researchers' subjective judgment and allows for more objective identification of the role of metaphors in communication. There are also other important works for metaphor identification and interpretation. The Deliberate Metaphor Identification Procedure (DMIP) provides a useful framework for understanding how people deliberately use metaphors to introduce topic shifts or perspective changes into discourses (Reijnierse et al., 2017). DMIP presents normative procedures for metaphor identification and strengthens the function of metaphors as their purpose in communication (e.g., to persuade, to add interest). For example, DEPRESSION IS BATTLE provides a frame of reference for understanding depression in terms of conflict and victory, and its purpose is to persuade the reader that depression is a serious illness and hard to cope with. Researchers also focus on systematicity, which refers to the idea that metaphors are not just isolated figures of speech, but systematically based on underlying conceptual structures through recurrent connections between the source and the target (Sardinha, 2011; Van Stee, 2018). For example, DEPRESSION IS BATTLE is based on the underlying conceptual structure of conflict, including elements such as opponents, strategies, and outcomes. Similar metaphors, such as depression is WAR, CONFLICT, and FIGHT, are in the same part of a larger system of metaphors that conceptualizes depression in terms of conflict.

These works provide valuable insights on metaphor identification and interpretation methods, especially the lexical patterning of metaphorical language and criteria for determining metaphor use. However, they require too much manual labor and are time-consuming (Dorst et al., 2013; Marhula and Rosinski, 2017; Landau et al., 2018). Moreover, Gibbs (2008) points out that claims regarding the importance or ubiquity of particular metaphorical patterns lack empirical basis. For example, one could report the frequency of different metaphors appearing in specific texts or compare metaphor analysis with that from large corpora (p. 12).

In this respect, corpus analysis, which describes linguistic properties through large-scale data, provides explanatory power to metaphor theory, since linguistic expressions (metaphors in language) corroborate cognitive systems (metaphors in thought). As a result of using corpus analysis to quantify metaphorical patterns, CM identified by introspection in cognitive linguistic analyses are substantiated, thereby contributing to our understanding of CM' relative salience in communication (metaphors in communication) (Semino et al., 2016; Coll-Florit and Climent, 2019; Tong et al., 2021).

There are mainly two approaches to corpus analysis of metaphors. Using a bottom-up approach requires the researcher to identify all metaphors in a text and analyze them, but the vast amount of information makes it impossible. A top-down approach begins with a list of known metaphors, then the researcher searches for those metaphors in the text and adds a metaphor that is not already there. However, identifying unusual or creative metaphors is often difficult since it only identifies metaphors already known to the researcher. Researchers have minimized the risk of overlooking potentially interesting patterns and avoided the disadvantages of both approaches. Sardinha (2011) suggests adopting a preselection procedure to limit the number of concordances. In Semino (2017), metaphors are studied qualitatively, including identification, interpretation, and explanation, and afterward, concordances are quantitatively analyzed. Charteris-Black (2012) analyses ME using keywords that previous research had shown are commonly used metaphorically by people experiencing depression, e.g., DARKNESS, DESCENT, and WEIGHT. As a next step, he determines whether these keywords had a more basic meaning using the Pragglejaz Group (2007) method in the concordance context. Coll-Florit et al. (2021) incorporate both approaches and uses working hypotheses and reference lists to identify metaphor patterns.

There is a strong focus on English instead of other languages in corpus analysis of metaphors so far. Unlike English, Chinese uses a morphosyllabic writing system in which the basic orthographic unit is the character. There is a phonological syllable in each character, which corresponds in most cases to a morpheme. Chinese words can contain multiple characters; without explicit word separators, any two or more consecutive characters can represent a single word or phrase. Chinese is also known for having relatively simple word forms, with compound words being the most common (Pritzker, 2003; McEnery and Xiao, 2004; Tay, 2015). As a result, certain word classes are also difficult to distinguish from one another (e.g., verbs and adjectives) in the absence of morphological clues. Considering the Chinese orthographic and morphological differences above, delineating units of analysis may be challenging.

Our study aims to address the problem of metaphor identification in a large-scale Chinese corpus. We seek to develop a more reliable, efficient, and replicable metaphor identification procedure for Chinese corpora, combining bottom-up and top-down approaches.

2.2. Metaphors of depression

Metaphors are important for human beings to recognize, think and express. Comparing uncertain and unfamiliar experiences to familiar references helps people communicate complicated, sensitive, and emotional topics (Gibbs, 2008). A metaphor is a form of figurative language that understands a target domain (which often refers to a complex or emotional experience) by a source domain (which tends to be an object or phenomenon that is simpler and more familiar than the target domain). For example, people who suffer from depression might describe their TREATMENT TRAJECTORY (i.e., the target domain) as JOURNEY (i.e., the source domain) to convey the varied

emotions they experienced at different points in the process. Healthcare professionals benefit from using metaphors in counseling and psychotherapy in challenging situations (Tay and Neimeyer, 2021). In addition to helping people understand their symptoms and treatment options, metaphors can help people cope with the emotional challenges of chronic illness. Some recent studies show metaphor use in various medical conditions, such as cancer (Semino et al., 2015; Spina et al., 2018; Hendricks et al., 2019), diabetes (Abdollahi et al., 2019), end-of-life services (Potts and Semino, 2017), and COVID-19 (Panzeri et al., 2021; Semino, 2021; Pérez-Sobrino et al., 2022).

In the mental health arena, researchers from both psychotherapy and linguistics share their insights on metaphors as a tool to facilitate clients' communication with therapists (Tay, 2017). Psychotherapists study metaphors from a functional perspective and need epistemological and communicative competencies to achieve client compliance. Using metaphors can make client compliance more feasible by explaining the reason for diagnosis and treatment and framing the experience of illness according to the client's needs. Alternatively, metaphors may encourage clients' beliefs about illness and allow them to make a shared decision with their therapists. Through metaphors, clients can better understand their emotions, thoughts, and behaviors (Pritzker, 2003; Tay, 2015; Tay and Neimeyer, 2021).

Meanwhile, linguistics researchers focus more on metaphors' identification and contextual richness (McMullen and Conway, 2002; Charteris-Black, 2012; Poppi and Kravanja, 2019). In particular, they are interested in metaphors' target and source domains. For instance, Barcelona (1986) conducted one of the earliest qualitative studies on depression metaphors based on his experiences (Coll-Florit et al., 2021). He exhibited some metaphors that would later be documented in empirical studies to structure depression in English, including the directional metaphor HAPPINESS IS UP/UNHAPPINESS IS DOWN (e.g., "I am in low spirit"), and the perceptual metaphor HAPPINESS IS LIGHT/UNHAPPINESS IS DARKNESS (e.g., "I feel under a cloud"). Depression has been conceptualized as FORCE, BURDEN, JOURNEY, LIVING ORGANISM, ENEMY, or BOUNDED SPACE.

Researchers only began analyzing metaphors of depression through corpus analysis of larger corpora in recent decades because it is difficult to collect a large corpus of text from people with depression. McMullen and Conway (2002) analyze the therapy session recordings of 21 people diagnosed with major depression and find that the dominant conventional metaphor for depression is DESCENT. It is often described as an expression of physical descent, and the destination is envisioned as a container (such as a well). According to Semino (2017), the most frequent domains for clinical depression are UP/DOWN, ENCLOSED SPACE, JOURNEY, and PHYSICAL ENTITY. Depression sometimes equates with ENEMY and depression sufferers are conceptualized as MALFUNCTIONING MACHINES. Charteris-Black (2012) analyze 38 interview discourses to determine whether depression is gendered, and they find the dominant conventional metaphor of depression is DESCENT. Men and women use similar metaphors (DESCENT, WEIGHT, PRESSURE, DARKNESS, and LIGHT). Within their corpus, containment metaphors rank second in frequency. The result is a model for depression in which the self is "contained" within the depression, but also "contains" the trapped, sad feelings.

Furthermore, most current research pertains to English culture, when other cultures are also worthy of scholarly interest. An individual's culture profoundly affects how they perceive and express their experiences, thoughts, and feelings (Lakoff, 1993; Gibbs and Franks, 2002; Kimmel, 2010; Semino et al., 2015; Munday et al., 2021). As Lakoff and Johnson (1980) noted, "the most fundamental values in a culture will be coherent with the metaphorical structure of the most fundamental concepts in the culture" (p. 22). Using interviews with three depressed people, Yu (1995) demonstrates the Chinese metaphor of thinking and feeling is characterized by the heart, because the Chinese believe that the heart and the brain are intimately connected, regardless of the primacy of the heart, and that any damage to the heart can negatively affect the brain on a cognitive and emotional level. Coll-Florit et al. (2021) examine 23 blogs in Catalan by people with depression. They suggest that contextual factors (such as stigma, poor communication, or medical practices perceived as repressive) can also significantly impact the lives of people with depression.

To fill these gaps, the current study addresses a need for research on metaphors about depression which can inform practice and contribute to our understanding of how people experience, make sense of, and communicate about depression in a context where people are still reluctant to discuss their depression openly, for fear of being judged or ostracized. By understanding how online health community users frame and make sense of their depression through metaphors, we can boost the effectiveness of counseling and interventions for this population.

To pursue these aims, we posed the following research question:

> *RQ*: For making sense of and communicating about their experiences with depression, what metaphors do OHC users use?

3. Research methodology

The following section explains our research methods in details. Using a web crawler, we extracted texts from an online community of depression sufferers. A three-stage procedure is followed to identify metaphors within the self-compiled corpus, including a manual bottom-up metaphor identification process, an automatic, top-down semantic domain analysis, and a reference list for categorizing metaphors (see Figure 1).

(1) Bottom-up identification of ME and the initial formation of working hypotheses in conjunction with MIPVU: 343 metaphorical expressions (ME) are manually identified, resulting in preliminary working hypotheses of CM of depression.
(2) Collect more ME in the corpus from top-down by performing semantic domain analysis on the identified ME: Using USUA semantic domain analysis on the 343 ME identified in stage 1, 141 ME within the same semantic domains are identified, and another 168 extended ME are identified in the near discourse fragments.
(3) Use the reference list to analyze ME and categorize CM.

Using comparison and categorization as paths, this procedure explores a variety of target-source pairs: the bottom-up analysis helps in finding metaphors based on their comparable similarities, whereas the top-down semantic domain analysis helps in tracing metaphors from their categorization paths.

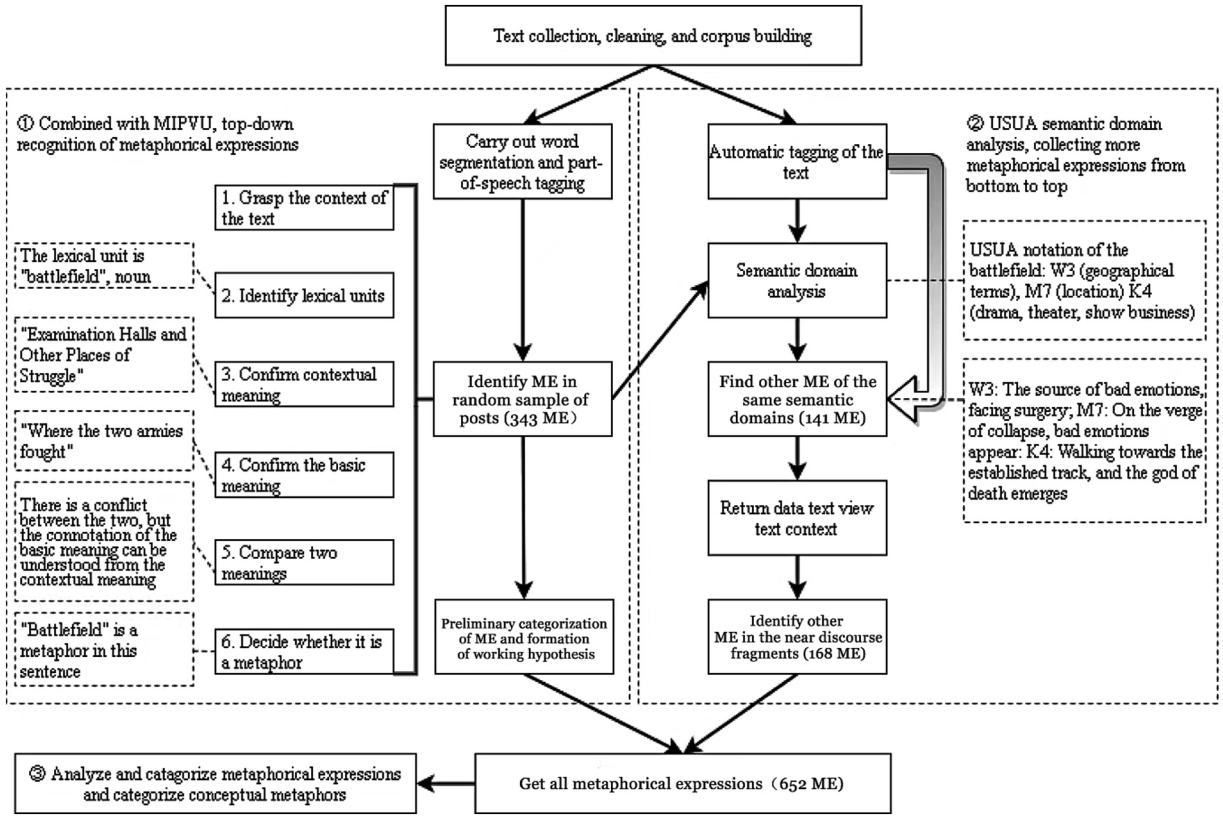

FIGURE 1
Stages of metaphor identification procedure in the Chinese corpus. Uses the example (3) to explain the key stages of the procedure: (3) 只要/vu 闭上/v 双眼/n 便/a 不会/vu 再/d 失去/v 任何/r 事物/n ， /w 即便/c 如此/r ， /w 你/r 还是/d 要/vu 投身/v战场/n 吗/u? (As long as you close eyes will not lose anything again, even if so, you still want to join the battlefield?).

3.1. Data collection and analysis

Since its launch in August 2009, Sina Weibo has been experiencing explosive growth, with 511 million monthly active users and 224 million daily active users as of early 2021, making it one of China's largest social networking platforms (SINA, 2021). Users access it through multiple mobile terminals such as personal computers, cell phones, and tablets to instantly share and spread interactive information through text, pictures, videos, and other multimodal data.

In this study, we used Python to obtain the open-source data on Weibo. Using "depression" as the keyword, 3,854 posts were collected from January 1, 2022, to March 31, 2022, on Sina Weibo's Depression Super Talk platform. The timeline data of each user included: post text, username, posting time, retweeting times, comments, etc. After eliminating short texts that contain too little useful information (<7 words), we kept 2,664 posts. After data cleaning of the texts, a corpus of 23,195 characters was built.

3.2. Chinese corpus metaphor identification procedure

3.2.1. Stage 1: bottom-up identification of metaphorical expressions using MIPVU

The Pragglejaz Group (2007) emphasizes the need to use a dictionary compiled based on large-scale corpus analysis as a reference to distinguish between basic and contextual meanings. Accordingly, we selected the Modern Chinese Dictionary (7th edition) and the Xinhua Dictionary (12th edition) (TCP, 2020) as the lexical tools of the project. Both are the most authoritative Chinese dictionaries available, continuously revised and reprinted according to language norms and standards, with the former containing nearly 70,000 entries and the latter 13,000 single words. The advantage of the former is that the examples of words are longer and rich in contextual information, which facilitates the determination of contextual meaning. The latter's advantage is its introduction of the words' historical meanings, which can be used as basic meanings in MIPVU. In addition, we used the Modern Chinese Corpus of the National Language Commission (Xiao, 2016) as a reference, being it a large-scale balanced corpus with a wide range of categories and PoS (part of speech) coding of the corpus.

Using MIPVU for Chinese language identification requires lexical unit adjustment. While English has strict word boundaries, Chinese has blurred word boundaries as described in section 2.1. Chinese is also known for its relatively simple word forms, and the distinction between word classes is also very blurred. These have motivated computational linguists to adopt different standard word separation algorithms (Pritzker, 2003; McEnery and Xiao, 2004; Tay, 2015). Using the BFSU Standard Parser developed at Beijing Foreign Studies University, two native Mandarin-speaking coders reviewed the output and corrected a few tagging errors (e.g., proper nouns, idioms). Two coders randomly selected 300 posts and compared the basic and

contextual meanings for manual metaphor identification based on the definitions given by two dictionaries.

We explain step-by-step the process of MIPVU (6 steps in total) for metaphor identification using (3) as an example:

> Step 1: Read through the entire text to fully grasp the context and meaning of the text.
>
> Step 2: Establish the lexical unit for the analysis on the result of the text tagging. The BFSU Standard Parser is used to identify lexical units, especially adjectives, adverbs, nouns and verb word classes (part of speech, PoS). The lexical unit established here is战场 *battlefield*, a noun labeled as /n (noun) by the BFSU Standard Parser.
>
> Step 3: Refer to the context to establish the contextual meaning of the lexical unit. For each lexical unit in the text, check its meaning in the context, i.e., how it applies to the entity, relationship, or attribute in the current situation evoked by the text (contextual meaning). Consider the content before and after the lexical unit. The contextual meaning is derived from dictionary interpretations. After comparing the interpretations given in the dictionaries, the more refined interpretation of the latter was selected: 2. 考场及其他斗争的场所*the examination room and other places of struggle*.
>
> Step 4: Analyze the presence of more basic interpretations. Contrary to the contextual meaning, which can be abstract, the basic meanings are more concrete, related to bodily actions, more precise (as opposed to vague), and historically older. Based on the dictionary, the basic meaning of *battlefield* is: 两军交战的地方*A place where two armies are engaged in battle*.
>
> Step 5: Decide whether the contextual meaning conflicts with the basic meaning, but can be understood by comparison. The basic meaning of *battlefield* is more concrete and historical than the contextual meaning that indicates the place of struggle, and the two meanings are in conflict. Nevertheless, it is still possible to understand the situation and emotion of struggle from the contextual meaning.
>
> Step 6: Therefore, code 战场*battlefield* as a ME.

Two coders analyzed 300 randomly selected posts and annotated them with NVIVO software, yielding 343 ME with rater reliability of Cohen's Kappa of 0.71. (2007) uses the Kappa values reported by previous MIP and MIPVU raters' reliability as an annotation criterion for metaphor identification, reporting a Kappa value of 0.62 for dialogue texts and 0.72 for news texts, while Steen et al. (2010) report Kappa values ranging from 0.70 to 0.96 for different text types (academic text, fiction, news, and dialogue), with the dialogue type obtaining the lowest value. Therefore, Chinese metaphor identification using MIPVU meet the rater reliability criteria.

We performed NVIVO coding of 343 ME to classify metaphors into preliminary target domain categories, such as PEOPLE WITH DEPRESSION, DISORDER, LIFE WITH DEPRESSION, and INTERPERSONAL RELATIONSHIP. This division facilitates the formation of our initial working hypothesis (working hypothesis) (De Choudhury et al., 2013; Tobin and Lyddy, 2014; Yoon et al., 2019). Since we analyzed a smaller amount of extracted data (300 randomly selected posts), instead of analyzing each word using the MIPVU, the time required is significantly reduced. We might miss some ME candidates. However, the study aims not to detect every ME in the corpus, but to identify the main CM; as elaborated in section 2.1, to achieve an awareness of the systematic linguistic correspondence behind ME provides explanatory power to metaphor theory. The substantial time savings offset the deficit of losing some ME candidates to ensure the project's feasibility.

3.2.2. Stage 2: top-down ME identification with semantic domain analysis

The second phase of the study used USUA Semantic Tagset, an inbuilt tagset of an online corpus tool (Wmatrix) developed by Lancaster University, to automatically annotate the semantic domains in the corpus (Rayson, 2008; Piao et al., 2015). 21 major discursive fields or semantic domains (A-Z) have been assigned to words. Semantic tags group together similar word senses because they are connected at some level with similar mental concepts (for a complete list and prototypical examples).[1] Each semantic domain contains several sub-domains, 232 in total: e.g., the semantic domain "S social behavior, state, and process" contains "S1 social behavior, state; S2 people; S3 relationships; S4 relatives …S8 help/hindrance; S9 religion, superstition," etc., and the sub-domains can divide further, e.g., "S3 relationships" has sub-domains "S3.1 General relationship, S3.2 Intimacy/sexual relationship." This list includes synonyms, antonyms, hypernyms, and hyponyms, with approximately 37,000 words in the lexicon and over 16,000 multi-word units in the template list.

The specific analysis process is to perform semantic domain analysis on the ME identified in Stage 1 (see section 3.1), find other lexical units under the same semantic domain, and check the concordance context (*cf.* Semino, 2017). We analyzed only lexical units of depression-related expressions, which saved a lot of time since many lexical units are under one semantic domain. From a top-down approach, searching lexical units through semantic domains facilitates metaphor identification. Though the process is automated, the user can review alternative tags for words with ambiguous meanings. Based on its built-in dictionaries, the USUA tagging system provides alternative tags in descending probability order. As a simple example, the system assigns the construct 'DEPRESSION IS A BATTLEFIELD' to the category 'W3 geographic terms', along with 'M7 location' and 'K4 drama, theatre, performing arts'. The USUA tagging system has identified 'battlefield' as a noun in each case, providing the word's most common meaning: space, place, and fight.

We repeated the MIPVU identification procedure to determine whether the lexical unit is a ME in the discourse fragment. In return, we found more ME used for depression in the categories of W3, M7, and K4, such as:

W3 Geographic terms:

> (4) 所有的坏/情绪的源头我妈能占一半。
> *All of bad emotions* ***source*** *my mom can take up half.*

1 see: https://ucrel.lancs.ac.uk/wmatrix/

(5) 希望这辈子不用再面对手术。
*Hope this lifetime no need again **face** surgery.*

(6) 我情绪崩溃想消失。
*My emotions collapse and (I) want to **disappear.***

M7 Location:

(7) 一些细节总是能把自己逼到崩溃的边缘。
*Some details can always force me to the **edge** of collapse.*

(8) 总会有莫名其妙的情绪出现把我打倒。
*Always have some emotions **appear** that beat me down.*

(9) 你能看见我吗, 我把我弄丢了。
*Can you **see** me, I **lost** myself.*

K4 Drama, Theatre, Performing Arts:

(10) 原生家庭深深地影响了我, 我出生在这泥沼里，挣扎了很久也没逃出去。
*My family of origin deeply affected me, I was born in this mire, struggled for a long time but did not **escape.***

(11) 本来可以安安稳稳朝着既定轨道向前走，为什么会这样?
*Could have peacefully walked toward a steady **track**, why would be so*?

(12) 我的未来又浮现出了死神的怀抱。
*My future again **emerges** The Reaper's embrace.*

Using the USUA semantic domains for top-down metaphor identification, we found 141 more ME with the same semantic domains of the 343 ME identified in stage 1. Discourse-level information helps to identify extended metaphors, i.e., sustained use of the same metaphors in a discourse fragment. As a result, we further identified 168 extended metaphors in near discourse fragments (after removing duplicate items), such as (4) 占 *take up*, (6) 奔溃*collapse*, (7) 逼到*force to*, (8) 打倒 *beat down*, (10) 沼泽*mire*, 挣扎*struggle*, (11) 向前*forward*, (11) 走*walk*, (12) 死神*The Reaper* and 怀抱 *embrace*. In total, we identified 309 ME in the second phase.

Semantic domains are very useful in formulating patterns, which have been introduced in corpus research of metaphors based on the similarity between the source and the target (Tay, 2017; Spina et al., 2018). Similarity builds on the different levels of "sameness" between the source and the target, which makes it possible to link two things psychologically (Semino, 2017). It essentially involves reorganizing categorical relations. Metaphors are created by reorganizations within categories (*cf.* section 2.1). Semino et al. (2016) suggest that the USUA semantic domains effectively identify metaphors through categorical similarities. By specifying the semantic grouping rather than the individual words, they can be more useful when used as search terms to query a corpus. A disambiguation phase consists of seven dimensions: the POS-tag, the general likelihood ranking, the overlapping template resolution, the domain of discourse, text-based disambiguation, contextual rules, and local probabilistic disambiguation (Rayson, 2008). To determine the most likely semantic tag, the USAS-tagger uses information such as the grammatical tag, frequency of semantic sense in the reference data, the known domain of the surrounding discourse, and the assumption that a word carries a consistent semantic meaning throughout a text. Regarding accuracy, the Wmatrix USAS has high reported figures (96–97 and 91%, respectively) (Collins, 2011; Piao et al., 2015; Semino et al., 2015).

Using Wmatrix across research domains demonstrates its usefulness as a ready-made analytical tool, but we must be cautious about accepting USAS categorization as standard. Analyzing how such a system privileges certain readings of the text is worthwhile. In most cases, researchers use semantic tagging as a preliminary step in their analysis before exploring the findings in greater depth (Collins, 2011). In example (6) *disappear* and (8) *appear*, despite their opposite meanings, they are classified as Geographic terms and Locations, respectively. As a further consideration, we classified (6) *disappear* in People With Depression as CONTAINER because it contextualizes the speaker's feeling of isolation and constrained feelings, which is characterized by being constricted by bad emotions and feeling isolated. Our categorization of (8) *appear* is DEPRESSION IS LIVING ORGANISM because bad emotions are personified as beings that show up and beat down the patient. In another example (5), USUA automatically classifies *face* as metaphors in Geographic terms. The patient is reluctant to live with surgery, which makes TREATMENT OPTION IS LIVING ORGANISM a more accurate classification of the ME.

3.2.3. Stage 3: metaphor reference list: analyze ME and categorize conceptual metaphors

We used a reference list to analyze ME and categorize conceptual metaphors. Specifically, the list contains the following studies:

(1) Literature on depression metaphors (Hughes-Hammer et al., 1998; McMullen and Conway, 2002; Pritzker, 2003, 2007; Schoeneman et al., 2004; Charteris-Black, 2012; Refaie, 2014; Kauschke et al., 2018; Leis et al., 2019; Yoon et al., 2019; Beck, 2020; Tong, 2020; Coll-Florit et al., 2021; Malkomsen et al., 2021; Munday et al., 2021; Taylor-Jackson and Moustafa, 2021)
(2) List of metaphors (Lakoff et al., 1991)
(3) Oxford guide to metaphors in CBT (Stott et al., 2010)

In this study, the reference list is used in two ways. First, the reference list allows us to locate CM quickly, combining metaphors in language, thought, and communication. The reference list contains works that provide valuable insight into metaphor identification and interpretation techniques, especially those that discuss the lexical patterning of metaphorical language and how to determine whether a metaphor is being used. Some typical depression metaphors have been illustrated in the literature, including DEPRESSION IS CONTAINER, FORCE, BURDEN, JOURNEY, and LIVING ORGANISM. We first look at the metaphor reference list to see if a corresponding CM exists. We then verify or counter-verify them, resulting in more consistent and time-saving annotations. The main reason is that many generic CM in the reference list are repeated in texts. For instance, DISORDER IS CONTAINER can be instantiated in a mire, well, hell, whirlpool, jar, and swamp. The reference list also contains a guideline for metaphors in cognitive behavioral therapy to help us understand

metaphors as a means of communication (metaphors in communication). As the guideline describes (Stott et al., 2010), isolation and withdrawal are core beliefs and schemas of depression (p. 112–114). Cognitive and behavioral factors conspire to maintain isolation: People suffering from depression often feel isolated, develop a habitual pattern of low activity, and become truly isolated. This helps us understand DEPRESSION IS CONTAINER and DEPRESSION IS THEATRE, as the metaphorical essence of both is depressed individuals being cut off by a barrier and losing human connection with others.

The second benefit is that the reference list provides a consistent and standardized way to categorize CM, allowing for a better understanding of the topic and provides a framework for analysis. In example (19), we categorize *rope* as a THING, but it could be interpreted as an animated entity or personification based on the context ("binds me tightly"). Regarding the current research, the distinction is particularly relevant and we categorized based on literature preferences derived from the compiled reference list. For instance, Coll-Florit et al. (2021) differentiate DISORDER IS THING and DISORDER IS LIVING ORGANISM as the former "usually is a nuisance" (p. 11), while the latter "is instantiated in terms of a monster, an evil being or ghost, or a person with whom you live, or to whom you attribute characteristic human actions" (p. 10). Based on online visual representations, Poppi and Kravanja (2019) distinguish between DEPRESSION IS THING (e.g., tentacular entities) features in the victim's inability to change and immobility, while DEPRESSION IS LIVING ORGANISM (e.g., ferocious animals) portrays predatory or hostile traits of depression. Therefore, we categorized (19) *rope* as DEPRESSION IS THING since it denotes discomfort and nuisance. In contrast, we categorized (5) *face* as TREATMENT OPTION IS LIVING ORGANISM, for the patient expresses reluctance to live with surgeries as if they were people.

4. Results

We identified a total of 652 ME. Drawing on the principle of grounded theory, we used NVIVO to classify them into four types: PERONSAL LIFE, INTERPERSONAL RELATIONSHIP, TIME, and CYBERCULTURE. Table 1 shows the types and their numbers of ME. 77.15% of the ME belong to PERONSAL LIFE, which involves how users understand their lives, themselves, the disorder, and treatment options. INTERPERSONAL RELATIONSHIP metaphors accounted for 12.27% of the total. In addition, TIME and CYBERCULTURE metaphors accounted for 6.29 and 3.07%, respectively.

TABLE 1 Categories and number of metaphorical expressions of depression.

Metaphorical categories	Quantity	Percentage
PERSONAL LIFE *metaphors*	503	77.15%
• DISORDER is	230	35.28%
---DESCENT	65	9.96%
---DARKNESS	41	6.29%
---CONTAINER	32	4.91%
---WEIGHT	28	4.29%
---COLDNESS	21	3.22%
---LIVING ORGANISM	20	3.07%
---FORCE	11	1.69%
---THING	9	1.38%
---IMBALANCE	3	0.46%
• LIFE WITH DEPRESSION is	143	21.93%
---JOURNEY	58	8.90%
---WAR	44	6.75%
---THEATRE	32	4.91%
---CONTAINER	7	1.07%
---THING	2	0.31%
• PEOPLE WITH DEPRESSION are	102	15.64%
---CONTAINER	34	5.21%
---MACHINE	28	4.29%
---THING	25	3.83%
---SPLIT SELF	8	1.23%
--- THEATRICAL ROLE	7	1.07%
• TREATMENT OPTION	28	4.29%
---SUPPORT	16	2.45%
---FORCE	5	0.77%
---LIVING ORGANISM	4	0.61%
---CAPTOR	3	0.46%
INTERPERSONAL RELATIONSHIP *metaphors*	80	12.27%
---REPRESSIVE POWER	32	4.91%
---ENEMY	24	3.68%
---CONTAINER	14	2.15%
---SUPPORT	10	1.53%
TIME *metaphors*	41	6.29%
CYBERCULTURE *Metaphors*	20	3.07%
Other	8	1.23%
	652	

4.1. PERSONAL LIFE metaphors

The four main target domains of personal life metaphors are DISORDER, LIFE WITH DEPRESSION, PEOPLE WITH DEPRESSION and TREATMENT OPTION.

DISORDER metaphors are the most frequent (35.28%), related to pleasure deficit and physical ailments. Most DISORDER metaphors are embodied metaphors (30.82%), including (13) DESCENT, (14) DARKNESS, (15) WEIGHT, and (16) COLDNESS. According to CMT, conceptual metaphors help us understand abstract concepts by using the sensory-motor system as a representation. It is almost universal to metaphorically understand abstract targets in terms of everyday bodily experiences, such as warmth, hunger, walking toward a destination, and moving in and out of physical containers (Wen and Hua, 2018). In the Chinese corpus, although DEPRESSION IS DESCENT does not appear as frequently as it does in McMullen and Conway (2002) or Charteris-Black (2012), metaphors related to the

loss of control over emotions are quite common. As shown in Table 1, DESCENT (9.97%) is the main CM to describe the disorder. This result is consistent with the embodied conceptual association of HAPPINESS IS UP/UNHAPPINESS IS DOWN. For instance, as noted above (*cf.* section 2.2), in the English context, McMullen and Conway (2002) analyze the therapy session recordings of 21 people diagnosed with major depression and find that 90% of conventional metaphor for depression is DESCENT. In our corpus, DESCENT metaphors relate closely to (13, 17) CONTAINER metaphors (4.91%), in which individuals experience a physical descent, and the destination is envisioned as a container (such as 漩涡 *whirlpool*, 沼泽 *mire*, 深井*deep well*, 水坑*pit*, 地狱 *hell*).

(13) 我就只能自己苦笑着自嘲着在这个情绪漩涡里一点一点沉底
*I can only bitterly smile and mock myself as I slowly **sink** to the **bottom** in this emotional **whirlpool**.*

(14) 大脑里的灯全部被人关掉，一片黑暗，就像被关在没有窗户密闭的空间就像溺水的人掉进水坑。
*All the lights in my brain have been turned off by someone, it's **dark**, like being locked in a windowless enclosed space, like a drowning person falling into a pit.*

(15) 感觉好压抑，好像有一团厚厚的湿云把你层层包裹，好压抑，好压抑，好想逃，好吵啊!
*It feels so oppressive, as if a **thick** wet cloud is wrapping you layer by layer, so oppressive, so oppressive, I want to escape, it's so noisy!*

(16) 像我常年活在冰冷泥泽中的人，见到阳光也会畏缩的回到我原来的地方。
*Like me who has lived in the **cold** swamp for many years, when I see the sun I will also shrink back to where I was originally.*

(17) 开药吃了后还不好，那我只能认命了，就坠入地狱吧!
*If I am still not good after taking the medicine, then I can only accept my fate, and fall into **hell**!*

Several researchers argue that the concept of up-down spatial representation in Chinese has the notion of efficacy: "up" is excellent, moral, and sacred, while "down" is negative, evil, and shameful (Wang et al., 2016). Likewise, McMullen and Conway (2002, p. 181) observe that in "representing our experience of what we call depression in images of descent, we might be compounding the sad affect that appears to be the core of depression with associations of failure and loss of control."

The Chinese corpus has the main metaphors identified in other contexts (Charteris-Black, 2012; Coll-Florit et al., 2021). Other main CM related to disorder are (18) LIVING ORGANISM (e.g., 怪物*monster*, 催命鬼*death ghost*, 黑狗*black dog*), (19) THING (e.g., 考验*test*, 绳索*ropes*, 脚镣*shackles*), and (20) FORCE (e.g., 反复*repetition*, 重建 *rebuild*). People with depression are conceptualized as energetically deprived in the first two types of metaphors, which imply that their agency has been limited, thus associating disempowerment with a loss of control over their lives; in the latter case, the disorder possesses insurmountable control power, which may be related to the high relapse rate of psychiatric disorders and antidepressant side effects (Cunningham et al., 2021; De Choudhury et al., 2021).

(18) 抑郁症就像一个催命鬼跟在你身后甩都甩不掉。我又来了心情很低落无意义感又上来了黑狗又来了吗?我真的很累，很累。
*Depression is like a **death ghost** following you and you cannot shake it off. I'm back again, feeling very low and meaningless. Has the **black dog** come again? I'm really tired, very tired.*

(19) 这绳索将我牢牢捆绑，没来由的处于要崩溃但不是完全崩溃的阶段
*This **rope** binds me tightly, inexplicably in a stage of collapse but not completely collapsed.*

(20) 不上不下的情绪就卡在这里，坏情绪瓦解的同时又在重建，就像是冰山消融的同时却不断凝结；陷入了死循环，找不到尽头纾解。
*The mood is stuck here, neither up nor down. The bad mood is disintegrating while **rebuilding**, like an iceberg melting while constantly condensing; trapped in a **vicious circle**, unable to find relief in the end.*

As shown in Table 1, LIFE WITH DEPRESSION is mostly conceptualized through three main source domains: JOURNEY (8.90%), WAR (6.75%), and THEATRE (4.91%).

Our corpus analysis shows that SERIOUS ILLNESS IS WAR is prevalent. The use of WAR metaphors to conceptualize conflict situations and JOURNEY metaphors to conceptualize processes are widely documented in CMT. Metaphors that compare serious illness experiences to WAR are prevalent in support forums, chemotherapy drug websites, and intervention websites. Despite this, previous research has not supported battle metaphors in the context of cancer. Researchers suggest that WAR metaphors ignore social and emotional aspects of healing (Spina et al., 2018), emphasize the importance of treatment at all costs, and present failure to recover as personal failure (Semino et al., 2015). In our corpus, when mapped to the target domain, PEOPLE WITH DEPRESSION are FIGHTERS or STRUGGLERS. DISORDER and INTERPERSONAL RELATIONSHIP are the main objects of the battles (see Table 2). Some depression sufferers feel like they are fighting an invisible and recurrent enemy and are losing the battle due to its high recurrence rate. Interestingly, ME like 挺*persist*, 扛住*survive* seem to help the users retain agency and empowerment when the battle is related to interpersonal relationships (e.g., parents) or sociocultural factors (e.g., prejudice, stigma). Results support Semino et al. (2015)'s assertion that people use BATTLE metaphors in both empowering and disempowering ways, depending on their experiences and preferences.

Semino (2017) also point out that the JOURNEY metaphor helps people recognize depression as a process, rather than a fixed condition, and reminds them that they are not alone. As part of our corpus, the JOURNEY metaphors explain how users perceive treatment processes, mental changes, and life challenges (see Table 2). OHC users generally perceive themselves as going through a long, difficult journey with no end. Our data thus confirm that WAR and JOURNEY metaphors shape the subjective experiences of both mental and physical illnesses.

The study finds many THEATRE metaphors, i.e., LIFE WITH DEPRESSION is metaphorically described as 梦境*dream*, 电影*movie*, 舞台*stage*, and 戏剧*drama*, which are absent in other contexts (Charteris-Black, 2012; Coll-Florit et al., 2021). We argue that THEATRE metaphors belongs to the conceptual metaphor EXISTENCE IS

TABLE 2 Cross-domain mappings of the JOURNEY and WAR metaphors.

Type	Cross-domain mappings	Example
JOURNEY	journey, road, track = > life with depression direction, goal, end, signpost = > life purpose go forward, persevere, cheer = > life roadblock, potholes, trap = > life difficulties	• *Life is a lonely journey. Whether you are married or not, you have to achieve self-growth alone and with difficulty.* • 人生是一个孤独的旅程。无论结婚与否，你都得独自艰难地实现自我成长。 • *The shadows left by the disappointments, disappointments, and failures in the decades of your life miles before you met him* • 你在遇见他之前的几十年人生里程中的失望、失意、失败留下的阴影 • *I cannot do anything right, I have insomnia every day, I'm irritable every day, the darkness is never ending, and I cannot seem to walk out of it forever* • 我什么都做不好，每天失眠，每天烦躁，黑暗永无止境，我好像永远都走不出来了
WAR	Black dogs, demons = > disorder Enemies, stigma, prejudice = > interpersonal relationship Fight, struggle, resist, combat = > treatment Persistence, struggle, survive = > the mindset of fighting mental disorders	• *I do not know if I got rid of it. Just suddenly paralyzed with exhaustion, as if I had finished a* ***battle*** *that I did not want to* ***fight*** *at all.* • 不知道自己是不是摆脱了。只是突然累瘫了，好像打完了一场我完全不想打的仗 • *Every time I try to get better and study hard there are always inexplicable emotions that appear to* ***knock me down****.* • 每次努力变好，努力学习时总会有莫名其妙的情绪出现把我打倒。 • *Every time they start with "you are just like this" and ends with "forget it," it's really funny…but I still do not want to give up* ***fighting****.* • 他们每次都以"你就这样"开头,"算了吧"结尾，可真逗……但我还是不想放弃战斗啊。

VISIBILITY. First, due to the hindrance in cognitive level, interpersonal communication, and motor behavior, patients with depression have a lot of negative self-assessment and rigid self-concern when they have difficulty in real life. They can feel watched and judged, but they also desire to be understood and seen by others (De Choudhury et al., 2013; Refaie, 2014; Yoon et al., 2019). Secondly, people may fear being judged or ostracized for discussing depression in Chinese culture because of the emphasis on collectivism and face. This is because Chinese culture traditionally emphasizes the importance of maintaining one's public image and avoiding anything that would be seen as a sign of weakness that would damage the collective reputation of the family or community. Studies have supported the concept of sociocentric personhood in relation to mental disorders, as Chinese culture constructs and experiences the disorders in somatic or interperson settings (Xu and Zhang, 2016; Yoon et al., 2019; Zou et al., 2020; Shi and Khoo, 2023). Many people fear appearing burdensome to their families or losing their face if they admit to having depression. As a result, users conceptualize their lives as a disguise. Lastly, THEATRE metaphors resonate with the observation that dream metaphors are prevalent in Chinese stories and legends (Sun, 2022). THEATRE metaphors remind us to pay further attention to the sociocultural connotations of the metaphors.

There are 102 metaphors to describe people with depression, in five categories: CONTAINER (5.21%), MACHINE (4.29%), THING (3.83%), SPLIT SELVES (1.23%) and THEATRICAL ROLE (1.07%).

In SPLIT SELF metaphors, a person suffering from depression is viewed as a divided entity, or as having two different personalities coexisting within them. A healthy self is conceptualized as a long entity that makes us who we are, and a sick self is conceptualized as an ill self (Lakoff, 1993). According to Coll-Florit and Climent (2019), SPLIT SELF metaphors serve as a self-conceptualization tool not only for people with psychotic disorders (such as schizophrenia), but also for those with affective disorders (such as depression). Schizophrenia is characterized by SPLIT SELF metaphors - in keeping with schizophrenia's literal meaning, split mind.

> (21) 抑郁症我的心里好像住着两个灵魂一个让我找他人求助，一个让我不要祸害他人一个让我多和朋友沟通，一个让我远离他们一个让我多交朋友，一个让我不要惹是生非一个逼着我我活下去，一个让我闭眼休息.
> *Depression. It's like two* ***souls*** *live in my heart. One tells me to seek help from others, one tells me not to harm others. One tells me to communicate more with friends, one tells me to stay away from them. One tells me to make more friends, one tells me not to cause trouble. One forces me to live on, one lets me close my eyes and rest.*

People with depression also present themselves to the world through THEATRICAL ROLE metaphors, such as (22) 小丑 *clown*, (23) 演员 *actor*, and (24) 面具*mask*. They can take on different roles according to their settings, often in an attempt to disguise their true feelings. People with depression turn to fictional characters or theatrical roles that embody their double-sided personalities. The actors within (23) come from a Japanese cartoon novel (*Gin Tama*), in which *Gintoki* is a brave soldier who strives to maintain a peaceful and well-balanced virtual world (*Tendoshu*) against the evil *Oboro* (Darkness). *Matsuyama* is the real persona of an immortal figure called Utsuro, a figure obsessed with death and meaninglessness. To reclaim the meaning of life, *Matsuyama* insisted *Gintoki* decapitate *Utsuro*. People suffering from depression use these examples to express their desire to find inner peace, where the good side must overcome the evil side to remain true and regain meaning in life. Masking is another coping mechanism that involves pretending to be happy and healthy when feeling depressed, by putting on a fake smile, avoiding talking about feelings, or withdrawing from social activities. Masking can make it more difficult to get the help needed. To some extent, THEATRICAL ROLES resonate SPLIT SELF metaphors, where a theatrical role always represents the healthy one, and the *other part* of the self, represented by another theatrical role, is the ill one. It seems that the healthy part of the self is constantly fighting the unhealthy part, which can lead to guilt, self-doubt, self-loathing, and exhaustion.

> (22) 我真的思考了很久，发现自己是个小丑，外面人模人样，其实里面就是烂人，控制不住自己的废物。

*I really thought about it for a long time and found out that I am a **clown**. I look like a person on the outside, but in fact, I am a rotten person inside, a waste that cannot control myself.*

(23) 我们更要像银时一样永不放弃的战斗，打败自己内心深处的胧，夺回松阳，打败天导众在内的阴暗面，拿回我们曾经失去的快乐。
*We must fight like **Gintoki**, never give up, defeat the **Oboro** deep in our hearts, take back **Matsuyama**, defeat the dark side including the **Tendoshu**, and regain the happiness we once lost.*

(24) 大家都在嘲笑我，只有戴着面具或者这条路了
*Everyone is laughing at me, only wearing a **mask** or this road is left.*

Repeatedly, depression sufferers conceptualize themselves as MACHINES with weak properties, such as (25–26) 坏 *broken*, 失灵*malfunctioning*, or 低电量 *low battery*, which explain the hopelessness and helplessness they experience (Pritzker, 2003; Refaie, 2014; Yoon et al., 2019). Users also associate themselves with inanimate (27–28) THINGS (e.g., 绿植 *plants*, 废物 *waste*) to condemn their subjectivity and agency. However, MACHINE and THING metaphors tend to emphasize the physical symptoms of depression and ignore its emotional and psychological components. It can reinforce shame and isolation when individuals are conceptualized as defective, broken, or useless. Meanwhile, this finding suggests that metaphors with negative connotations should also be considered as critical self-disclosure attributes, despite the fact that most ready-made analytical tools (such as LIWC) rely on negative adjectives to detect online depressed users (Shi and Khoo, 2023).

(25) 最近药又加了回来，感觉自己变成了只知道开心的单一情绪机器
*Recently, the medicine was added back, and I feel like I have become a single-emotion **machine** that only knows happiness.*

(26) 如果我也能像手机一样有个充电线就好了，低电量的我什么也做不了，只能维持基本运行。还不知道能坚持多久。
*If only I could have a charging cable like a **mobile phone**, I cannot do anything when my battery is low, and I can only maintain basic operations. I do not know how long I can hold on.*

(27) 我可能像许久没有打理的房间,也或许像许久没浇水的绿植, 像是抽完的烟蒂
*I am like a **room** that has not been taken care of for a long time or maybe like a **green plant** that has not been watered for a long time, like a **cigarette butt** after smoking.*

(28) 我就是一个众所周知的废物啊
*I am just a well-known **waste**.*

Conversely, there are fewer metaphors for treatment (4.29%) than for life, people, and disorders. It may be a result of some factors, including the low rate of detection and recovery from depression, the negative outlook on life that many people with depression have, and the lack of treatment options (Kronmüller et al., 2011; Lu et al., 2021; Yao et al., 2022).

TABLE 3 Cross-domain mappings of the FAMILY metaphors.

Type	Cross-domain mappings
CONTAINER	Source of bad mood ==> family Pipeline, output ==> impact Hell, mire ==> family life Containers, burdens ==> people with depression
THEATRE	Pain maker, nightmare, clutches ==> family Creating painful episodes, scenes ==> impact Stage, dream, story background ==> family life Clowns, ghosts, dreamer ==> people with depression

4.2. INTERPERSONAL RELATIONSHIP metaphors

The main source domains for INTERPERSONAL RELATIONSHIP are (29) REPRESSIVE POWER (4.91%), (30–31) ENEMY (3.68%), (32–33) CONTAINER (2.15%) and (34) SUPPORT (1.53%) (see Table 1).

It is worth noting that FAMILY metaphors are generally negative, and the main source domains include (30) ENEMY, (31) NIGHTMARE, (32) NEGATIVE SOURCE, and (33) SHADOWS, which are extended metaphors for DEPRESSION IS CONTAINER and DEPRESSION IS THEATRE. In DEPRESSION IS CONTAINER, depressed users are like a container of bad emotions, whereas family is the pouring source of the negative emotions. For example, (33) the *shadow* is a part of users' unconscious mind that contains repressed thoughts, feelings, and desires. In DEPRESSION IS THEATRE, family is the pain maker, the enemy, or the oppressor (which is sarcastically represented as saints in example 30), whereas the depressed sufferers are tragic characters (see Table 3). (30) "Parents are saints" establishes a framework for coordination between parents and saints with their shared qualities of demandingness and supervision. On the contrary, (34) SUPPORT metaphors are applied to OHC and online friends.

(29) 真的想逃离这个世界，父母最大的爱好就是否定我，骂我，把我一点点推进深渊，然后说一句"废物"
*I really want to escape from this world. My parents' biggest hobby is to deny me, scold me, **push** me little by little into the abyss, and then call me "**waste**"*

(30) 可恨的这是我的父母。也许我生来就注定活在炼狱,而他们则是高高在上的圣人，说我是个小丑
*It's hateful that these are my parents. Maybe I was born to live in **hell**, and they are the **saints** above, saying that I am a **clown**.*

(31) 原生家庭是我一辈子逃不出的噩梦
*The original family is a **nightmare** that I cannot escape for a lifetime.*

(32) 每次和我妈打完电话都瞬间心如死灰，所有的坏情绪的源头我妈能占一半
*Every time I finish a call with my mother, my heart instantly turns to ashes. Half of the **source** of all bad emotions can be attributed to my mother.*

(33) 被嘲笑、被欺凌、被排挤这些经历大概率会变成一辈子都无法摆脱的阴影

*Being laughed at, bullied, and excluded are experiences that are likely to become lifelong **shadows** that cannot be escaped.*

(34) 在这个超话里认识了很多新朋友，他们都很温暖，是我的支柱，对我很好，希望我们大家都能坚持下
*I have met many new friends in this super talk forum. They are all very warm, they are my **pillars**. They are very good to me. I hope we can all hold on.*

4.3. TIME WITH DEPRESSION metaphors

There are 41 TIME metaphors. On the whole, this study confirms the scholars' conclusions about the time domain representation: Chinese generally presents the metaphorical characteristics of "past in the back and future in the front," such as 前世*past life*,向前看*looking forward* (Li, 2018; Wang, 2021). Chinese TIME metaphors, such as (35) *behind* and (36) *float back*, are consistent with those in English texts, with an underlying CM of TIME IS MOTION (e.g., the due date has *passed*; there are 3 h *remaining*). In addition, Chinese is more driven by multidimensional time perception, and there is a cultural preference for the representation of time, including more ontological metaphors about time, such as comparing time to (36) 水流 *running water*, (37) 芳华*prime time,* and (38) 花期*flowering season*.Using ontological metaphors allows us to deal rationally with our experiences by recognizing that all concepts are transposable and give abstract concepts concrete form (Lakoff and Johnson, 1980). By identifying time as a separate entity, such as the *flowing season* or the *prime time*, depressed individuals can make sense of their experiences and navigate the complexity of reality.

In contrast to other categories (e.g., PEOPLE WITH DEPRESSION, LIFE WITH DEPRESSION, or INTERPERSONAL RELATIONSHIP), TIME WITH DEPRESSION appears in more idiosyncratic metaphors, rendering it difficult to categorize and discern source and target domains. It is nevertheless important to analyze idiosyncratic metaphors. Firstly, it shows that people may create metaphors to express the experience of TIME WITH DEPRESSION due to its complexity and multifaceted nature. By creating metaphors, they demonstrate their attention and attempt to comprehend and communicate their predicament in online health communities. Secondly, idiosyncratic metaphors might reveal meanings not previously apparent. The imagery associated with it might be vivid and memorable, encouraging the user to think about their issue along these lines. For instance, (37) *prime time* and (38) *flower season* remind users time is brief and fleeting but beautiful and memorable, helping them find meaning and acceptance in difficult times. It can also challenge and motivate them to take action and make positive life changes.

(35) 暴雨，有那么一瞬间希望可以下大点，把我淹了，就不用去想那些身后事了，毕竟与我无关……
*Rainstorm, there was a moment when I hoped it could rain harder and drown me so that I do not have to think about the things **behind** me. After all, it has nothing to do with me…*

(36) 如果时光倒流的话我一定不要再来到这个世界，哪怕这里有最爱的人。
*If time **floats back**, I will definitely not come to this world again, even if there are people I love the most here.*

(37) 然很想知道自己这辈子的闪光点在哪里，就算是想烟花一样只拥有刹那芳华。
*But I really want to know where my shining points are in this life, even if with only **prime time** like fireworks.*

(38) 我日复一日所重复的生活真的有意义吗? 因什么有意义呢? 它的花期又会有多久
*Does the life I repeat day after day really make sense? Why does it make sense? How long will its **flowering season** last?*

4.4. CYBERCULTURE metaphors

In this paper, CYBERCULTURE metaphors are a distinct type, comprising 20 metaphors. Online health communities (OHC) is a unique genre where jargon and slang are often used. The definitions of many internet buzzwords are lacking in dictionaries or corpora, with no consensus on their meaning. As a result, the source and target domains of CYBERCULTURE metaphors are also difficult to distinguish. CYBERCULTURE metaphors, nevertheless, are characterized by contrasting basic and contextual meanings, such as 树洞*tree holes*, 网抑云 *net suppression cloud*, and躺平 *lay flat*. For example, (40) 网抑云*Net suppression cloud* refers to the widespread posting of depressive content on an app (Neteast Cloud Music) to gain sympathy or attention. The posts can be harmful, as they can normalize depression and make it seem desirable. They can also lead people struggling with depression to feel isolated and alone.

Moreover, CYBERCULTURE metaphors can be used by members of OHC to create a sense of community. For example, (39) 树洞 *Tree hole*, an internet buzzword, refers to a platform on the internet for bearing secrets, and private matters. The term comes from the fairy tale *The Emperor Has Donkey Ears*, which refers to a place where secrets can be told to it without fear of them leaking out.

(39) 每个人都需要一个树洞，存放那些不可轻易示人的秘密、引而不发的情绪、难以启齿的柔弱
*Everyone needs a **tree hole** to store secrets that cannot be easily revealed, emotions that are not easily expressed, and weaknesses that are difficult to speak.*

(40) 网抑云对于真正抑郁的人来说就是刀子。
***Net suppression cloud** is like a knife to people who are truly depressed.*

5. Discussion

Depression may cause persistent sadness, physical pain, shame, negative emotions such as anger and self-loathing, a loss of interest in daily activities, and suicidal thoughts (Yoon et al., 2019). Researchers have found that using first-person singular pronouns, negative emotion words, and death words helps reveal depression symptoms (Liu et al., 2018; Pan et al., 2020). In particular, first-person singular forms can help detect depression since self-references are more frequent among depressed

people: a person experiencing physical or emotional pain tends to focus more on themselves and thus use more first-person singular forms (Shi and Khoo, 2023). This paper finds a significant presence of metaphors in OHC that specifically conceptualize the individual with depression. Self-conceptualization metaphors are also a distinct feature of the depressed group: Personal life metaphors accounted for the largest proportion (77.15%), including DISORDER (35.28%), LIFE WITH DEPRESSION (21.93%), and PEOPLE WITH DEPRESSION (15.64%). DISORDER IS DESCENT or CONTAINMENT, LIFE IS JOURNEY, WAR or THEATRE, as well as SELF IS A CONTAINER, MACHINE or THEATRICAL ROLE express feelings of helplessness, loneliness, melancholy, and low agency. There are the fewest metaphors associated with TREATMENT OPTION (4.29%), which in some ways corroborates the observation that groups with depression tend to think negatively (De Choudhury et al., 2021). Alternatively, it may be a result of low treatment rates, slow healing rates, and high relapse rates (Kronmüller et al., 2011; Lu et al., 2021; Yao et al., 2022). Accordingly, negative metaphors should also be considered critical self-disclosure attributes of this population, despite the fact that most ready-made analytical tools (such as LIWC) detect online depressed users using negative adjectives (Shi and Khoo, 2023).

Moreover, we find that container has a different connotation in the Chinese corpus. CONTAINER metaphors can be directly related to SADNESS IS CAPTIVITY (McMullen and Conway, 2002). Other languages also use CONTAINER metaphors heavily. Charteris-Black (2012) argues that CONTAINER metaphors have two connotations: people with depression are conceptualized as containers of negative emotions and confined in enclosed spaces from which they cannot escape. In contrast to LIFE IS CONTAINER (7, 1.07%), the Chinese corpus frequently uses SELF IS CONTAINER (34, 5.21%). The difference probably lies in the value placed on social harmony and face in Chinese culture: people may feel compelled to suppress their emotions, even when feeling negative. Similarly, the Chinese word for depression is 抑郁症, which translates as *suppressed illness, associating depression* with suppressing one's emotions. In contrast, the English word *depression* derives from the Latin word *depressus*, which means *pressed down*, meaning people feel weighed down by negative emotions. In a similar vein, the Chinese corpus associates suppressing negative feelings with physical limitations, such as 憋*holding*, 压抑*suffocating*, 奔溃 *collapsing*, and 窒息*breathlessness*.

Our data also indicate two connotations with SELF IS CONTAINER: (1) contextual factors conceptualized as a container from which they feel excluded, primarily due to stigma and discrimination; and (2) interpersonal relationships, particularly family, as a container in which they feel trapped. Contrary to social restrictions and interpersonal difficulties experienced by the OHC users, relational connections are vital for mental health. Individuals and groups can exchange feelings, thoughts, and behaviors through relational connections. People might share inherent resources, including social support, through these connections (Cobb et al., 2010; Myneni et al., 2016; Lei et al., 2022).

Regarding INTERPERSONAL RELATIONSHIP, SUPPORT metaphors are used for (1) the medical treatment and options; and (2) the online health community. According to Coll-Florit et al. (2021) in a Catalan study, most medical diagnosis metaphors are critical of psychiatry and the medical system for limiting the agency and capacity of patients. Medicine is seen as a repressive power that denies individuals with depression agency, the doctor as a prosecutor, or the doctor as a captor who locks them into a diagnosis. Contrary to that, in our corpus, medical treatment is depicted as a source of support and warmth for providing depression sufferers with the necessary assistance and support; or the doctor is seen as a living organism (e.g., 救星 *savior*) for offering hope and vitality. Possibly, this difference can be explained by different medical systems for diagnosis and treatment. Coll-Florit et al. (2021) argue that the Catalan medical system is more problem-focused than person-focused, emphasizing medication and surgery. Antidepressants have many side effects and patients usually have cyclic relapses; therefore patients might lose faith in the medical system. The Chinese medical system, on the contrary, emphasizes balance and harmony through traditional Chinese medicine, which emphasizes mental health as a holistic issue that involves a person's physical, emotional, and spiritual well-being (Yu, 1995; Pritzker, 2003; Wen and Hua, 2018). Further investigation is needed to understand this difference.

Another group of SUPPORT metaphors is applied to OHC, which demonstrates the value of these communities in helping those suffering from depression, especially when these conditions are stigmatized. In our corpus, many "friends" do not refer to traditional face-to-face friends, but are synonyms for other users of online communities. OHC have become increasingly attractive for social connection due to social deficiencies in offline social circles (Lei et al., 2022). For example, OHC are commonly used by individuals whose primary social network (i.e., friends and family) have limited knowledge of their health condition (Wright, 2016; Liu et al., 2018; Pechmann et al., 2020). The use of OHC can assist users with depression in expressing their emotions and relieving stress. By creating a sense of social belonging, they also assist people with depression to overcome stigma, stigmatization, and social fears (Pan et al., 2020; Lu et al., 2021; Yao et al., 2022).

Users run counter to the negative conceptualization of the family as a source of pain and negative emotions (see Table 3). There are only two instances of FAMILY IS SUPPORT in our corpus, which differs significantly from the prevalence of it in other contexts (Charteris-Black, 2012; Coll-Florit et al., 2021). Possible explanations are: Firstly, Chinese society has a general social expectation of family members' responsibilities. When people with depression cannot carry out normal social interactions, academic life, and economic output, they may perceive themselves or are seen as "burdensome" to their families. As a result of the wide gap between family expectations and unfulfilled expectations, a feeling of abandonment and deprivation can also occur (Yao et al., 2022); Secondly, depression is associated with low social support, especially when it has long-term adverse effects on close relationships (Kronmüller et al., 2011; Quinlan-Davidson et al., 2021). In particular, Chinese parents of depressed children have poor parenting practices, characterized by low emotional warmth, high denial, harsh punishments, and overprotection (Zou et al., 2020). Family metaphors differ in this way, which reminds us to consider the sociocultural characteristics of the metaphor and implement family-based intervention programs for depressed groups.

In addition, our research finds many THEATRE metaphors, i.e., life is metaphorically described as *dream*, *movie*, *stage* or *drama*, which are absent from other contexts (Charteris-Black, 2012; Coll-Florit et al., 2021). Users frequently use LIFE WITH DEPRESSION IS THEATRE (4.9%), and they describe themselves as actors on stage, performing a part and delivering carefully crafted and rehearsed lines, similar to playing a role in a play. Two cultural connotations are intertwined with THEATRE metaphors. In Chinese culture, there is a

strong emphasis on collectivism and face, which may make people feel ostracized or judged if they discuss depression. In non-western cultures, Marsella (1985) notes that depressive disorders and experiences are often expressed without the existential problems associated with Western cultures because non-western tend to construct and experience the disorder in somatic or interpersonal settings. The concept of sociocentric personhood and its relation to mental disorders is also supported by other studies (Xu and Zhang, 2016; Yoon et al., 2019; Zou et al., 2020; Shi and Khoo, 2023). Since Chinese culture emphasizes maintaining one's public image and avoiding anything that could be perceived as a sign of weakness, it is important to avoid anything damaging the reputation of the family or community. If they admit to depression, many fear appearing burdensome to their families or losing their face. Accordingly, users construct false realities by performing social identities, which are deceptive or hypocritical, as MASK metaphors also imply. Secondly, the THEATRE metaphors describe the concept of EXISTENCE AS VISIBILITY. In the realm of literature study, Clausson (2017) finds THEATRE metaphors are overwhelmingly used in Dashiell Hammett's *The Maltese Falcon*, suggesting the novel portrays a world where one is trying to see past duplicity, dissimulation, and roleplaying of others while trying to hide one's own. Due to impairments in cognitive ability, interpersonal communication, and motor behavior, patients with depression have negative self-assessment and rigid self-concern. In addition to feeling watched and judged, they may also worry that others will penetrate their masks to discover what lies beneath and hide signs that might reveal the hidden reality (De Choudhury et al., 2013; Refaie, 2014; Yoon et al., 2019). As a result, they could feel overwhelmed by negative emotions due to the disguise, leading to suppression and repression, which worsen the depression.

Finally, embodied metaphors also reflect the sociocultural characteristics of metaphors. Descriptions of emotional disorders vary according to cultural and historical context. A depressive state may be characterized by somatic symptoms rather than sadness or guilt in some cultures, for example, complaints of nerves and headaches (in Latino and Mediterranean cultures), fatigue, weakness, or imbalance, as well as problems of the "heart" (in Chinese and Asian cultures) or being "heartbroken" (among the Hopi) may all be expressions of depressive states (Marsella, 2002). According to Reali et al. (2016), Spanish culture frames mental illness more as a brain disease than a consequence of psychosocial factors, which influences participants' initial interpretations of social causal factors and is proposed as a strategy for combating stigma. Two reasons might explain the high proportion of embodied metaphors in the Chinese corpus (30.82%): Firstly, the majority of symptoms of depression are related to physical and mental limitation and pain (Tong, 2020; Taylor-Jackson and Moustafa, 2021). When symptoms are difficult to understand or explain, users process abstract concepts through more familiar simulations of perceptual-motor experience (Poppi and Kravanja, 2019; Beck, 2020). For example, abysses, valleys, and wells are insurmountable, narrow, and dark. The graphic structures of these concrete concepts map the pathological features of depression, including low mood, persistent inhibition of volitional activity, impaired cognitive functioning, learning difficulties, and social impairment (Kauschke et al., 2018); Secondly, embodying metaphors for physical pain also fits with the concept of the mind–body connection in Chinese traditional medicine, which holds that mind and body are interconnected (Pritzker, 2003, 2007). Therefore, any imbalance in either can affect the other. Another proof is that the Chinese corpus associates suppressing negative feelings with physical limitations, such as 憋*holding*, 压抑*suffocating*, 奔溃 *collapsing*, and 窒息*breathlessness*. It remains true, however, that depression metaphors in Chinese and other languages share some sociocultural similarities, such as HAPPINESS IS UP/UNHAPPINESS IS DOWN, JOURNEY, and CONTAINER metaphors, providing a theoretical basis for researching, identifying, and treating psychological disorders in multilingual settings (Charteris-Black, 2012; Coll-Florit et al., 2021).

6. Implications and limitations

This section will conclude with methodological, theoretical, and practical implications and suggestions for future research. First, our study has implications for metaphor study, particularly regarding corpus identification of Chinese metaphors and for using the online health community (OHC) as a genre to examine metaphors. Second, a better understanding of how OHC users with depression communicate could boost the effectiveness of counseling and interventions for this population by shedding light on the way they frame and interpret their experiences.

6.1. Implication for metaphor study

In this paper, we propose an effective, reliable, and reproducible procedure for metaphor identification in the Chinese corpus (see Figure 1): (1) combine MIPVU to identify ME bottom-up and formulate preliminary working hypotheses; (2) collect more ME top-down in the corpus by performing semantic domain analysis on identified ME; (3) use a reference list to analyze and categorize ME. Its working principle is to identify CM not only on a word-level, but also on the discourse level, which has largely been ignored. From a cognitive perspective, the latter is a key part of the intentional use of metaphors in communication.

In addition, this procedure uses comparison and categorization as paths to explore various target-source pairs: the bottom-up analysis helps to find metaphors based on the comparable similarities between the target and the source, whereas the top-down semantic domain analysis helps trace metaphors based on their categorization path. Both comparison and categorization are possible metaphor processing paths, and the choice depends on the metaphor's conventionality and linguistic realization (Tong et al., 2021). A metaphor is typically processed through comparison until it becomes conventionalized and processed through categorization, which requires less cognitive effort than comparison. Figure 1 provides an example: ME of 战场*battlefield*. Based on its comparison of basic and context meanings, the bottom-up MIPVU analysis detects it as ME; the top-down analysis expands this category to include geography, location, and theatre. It helps identify more extended metaphors and explores various target-source pairs related to the metaphor.

Culture profoundly affects how people perceive and express their experiences, thoughts, and feelings (Lakoff, 1993; Gibbs and Franks, 2002; Kimmel, 2010; Semino, 2017; Munday et al., 2021). During metaphor processing, emergent meaning is created by interacting with the social and cultural context in which it is used. This research highlights a culturally contextualized approach to metaphorical

language in interpreting its connotations. For instance, in cybercultural metaphors, 树洞*tree hole* represent concrete objects without metaphorical meaning in most situations. Another example would be the use of THEATRE metaphors: users describe themselves as actors and perform social identities to construct false, deceptive, or hypocritical realities, which means that the disorder is constructed and experienced within somatic or interpersonal settings where users feel rejected, judged, suppressed, and ostracized. As another example, CONTAINER metaphors in the Chinese Corpus have two connotations: Firstly, contextual factors are conceptualized as containers from which individuals feel excluded, primarily due to stigma and discrimination. Secondly, interpersonal relationships are conceptualized as containers in which individuals feel trapped. These metaphors demonstrate that people are concerned not only with restrictions imposed by the disorder but also with limitations imposed by their sociocultural contexts. Research in the future can also strengthen the integration of metaphorical morphology, coding, phonology, semantics, and pragmatic information from multiple perspectives to provide references for metaphor identification, translation, and interpretation.

Lastly, we contribute to depression metaphor study in a new genre, namely online health communities. Researchers have suggested that bloggers benefit from self-disclosure in maintaining and extending their relationships, which improves their mental well-being (Xu and Zhang, 2016; Lei et al., 2022). By posting on social media, people are less likely to perceive self-disclosure as risky, encouraging them to express themselves openly, vent negative feelings, and seek support from others (Cobb et al., 2010; Potts and Semino, 2017). The lack of social connections within offline social circles or the limited availability of like-minded individuals have made OHC especially attractive for socializing (Ríssola et al., 2019). From several perspectives, our research confirms the value of OHC: (1) Following the findings that OHC are frequently used by individuals whose primary social network (i.e., friends and family) is unaware of their health condition (Wright, 2016; Yoon et al., 2019; Pechmann et al., 2020), users attribute SUPPORT metaphors to OHC and online friends; (2) New metaphors for depression, disorder, and interpersonal relationships have been identified that support the notion that OHC enable people with depression to express themselves freely and provides a better basis for analyzing their conceptualizations. Our findings are in line with the proposals of Coll-Florit et al. (2021) and Semino et al. (2015), and a wide range of other researchers that online discourse genres can enable those in need to regain a sense of control over their lives and emotions, and to alleviate their suffering (Potts and Semino, 2017; Lu et al., 2021; Lei et al., 2022). As we will demonstrate shortly, OHC and its metaphorical language also have implications for mental health management.

6.2. Metaphors for mental health management

Metaphors can be a very powerful tool in healthcare. As metaphors facilitate access to and symbolize emotions, uncover and challenge tacit assumptions, and introduce new frames of reference, they play a significant role in constructing and expanding alternative perspectives (Tay, 2017). By providing relevant theoretical nuances derived from linguistic studies of metaphors, we find ways to emphasize more meaningfully the inherent cross-disciplinarity of psychotherapeutic metaphor research. Therapeutically relevant topics correspond to target domains, conceptual resources used to describe them correspond to sources, and how the latter is understood to be related to the former corresponds to cross-domain mappings (Tay and Neimeyer, 2021). Joining psychophysical and discourse analytical points of view, we will analyze the implications of metaphor research based on source-target connections at the three levels found in this study: embodied metaphors, sociocultural metaphors, and idiosyncratic metaphors.

First, depression metaphors present a high proportion of embodied metaphors, probably because somaticization symptoms associated with depression are common (Coll-Florit et al., 2021; Cunningham et al., 2021; De Choudhury et al., 2021). The ABYSSES, VALLEYS, and WELLS are difficult, narrow, and dark, which correspond to the pathological features of depression, including depressed mood, persistent inhibition of voluntary activity, impaired cognition, and social impairment. Embodied metaphors are unlikely to misunderstand, and Semino et al. (2016) note that embodied metaphors can facilitate some form of embodied simulation in the addressee, which may lead healthcare professionals to provide empathic responses. Psychiatrists and health service practitioners should therefore consider embodied metaphors as essential languages for practice, develop corresponding standards, especially linguistic specification of metaphorical terms for interventions and treatments, and devise strategies to enhance their ability to analyze metaphors. For example, psychiatrists can send sunny and warm pictures to visitors on cloudy days as part of psychological intervention programs, collect somatization health information with somatic suits, or analyze embodied metaphors in visitors' online self-disclosure texts. An example relevant here is Tay's (2014) analysis of metaphors used by earthquake victims to describe their trauma. Earthquake victims used the metaphors "the ground was still moving" and "it was dark" to describe their bodily experiences of the earthquake. These metaphors are examples of target domains because they are used to describe the physical sensations of the earthquake. A chain-like dynamic emerged, however, as the interaction progressed, where topics transformed from targets to sources, which were creatively exploited as source domains for other aspects of victims' trauma, such as their uncertainty about the future (for example, *we did not know where the future was going*, and *we were in the dark*). The "chaining" dynamic is possible because metaphors are embodied, which means they are grounded in our bodily experiences, making them flexible and creative. In a recent study, Tay (2023) has further argued that topic-triggered metaphors have source domains whose pragmatic motivations are driven by the topic rather than some ostensibly static conceptual metaphorical structure. It has implications for evaluating the use of embodied metaphors in health-related contexts because topic-triggered metaphors enable people to analyze metaphors in terms of their impact on patient outcomes.

Furthermore, we have discussed metaphors on a sociocultural level, where culture-specific knowledge and experience are crucial to constituting, interpreting, and fully appreciating the source domain. The most disabling mental illness, depression, is associated with low social support, especially when it has long-term adverse effects on close relationships (Pan et al., 2020; Pechmann et al., 2020). Identifying depression metaphors in the Chinese corpus pinpoints the sociocultural environment people with depression are experiencing: lack of offline

support, social stigmatization, and substitutability of offline support with online support. Practitioners can incorporate metaphor analysis into parenting education, family therapy, and community support groups. Family-based interventions can help practitioners address various issues, including child maltreatment, substance abuse, and mental health concerns. A metaphor with social-cultural connotations is always elaborate, individualistic, mini-anecdotes. It contains a richer dramatic content and contextualization, allowing the therapist and client to construct a scenario with its internal logic, encouraging the client to "think their thinking" and to find new ways of approaching old problems through analogy (Stott et al., 2010). Therapists can, for example, assist the client in explicitly developing a range of scripts from his/her THEATRE METAPHORS and aid him/her in recognizing the arbitrariness of those scripts and their loose relationship to reality. Moreover, there may be a greater opportunity for effective communication between AI robots and depressed users, reducing the stigma associated with mental health issues and encouraging people to seek help. By providing personalized feedback and responses, AI robots can help reduce feelings of isolation and help users cope with depression by providing a safe space for people to interact and share their feelings without judgment. Developers of companion robots, electronic chat rooms, and chatbots should incorporate metaphors into their scripting language to provide "appropriate" answers to more obscure conversations that contain metaphors. Meanwhile, we also provide new evidence supporting the potential benefits of OHC for depression, as friends and contacts in online support communities may indicate a higher level of social integration, leading to greater social support (Pan et al., 2020; Lu et al., 2021). The substitutability of offline illness work may be particularly helpful to those without or with limited access to offline support. Based on our metaphor types, OHC organizers can develop metaphorical images, audio, and emojis to increase users' willingness to participate, help them cope with loneliness and anxiety, and get emotional support.

Finally, this study finds that some source-target connections are built at the idiosyncratic level, at which individuals' knowledge and experiences are unique (Tay, 2017). In the Chinese corpus, there is a user who eloquently describes depression, which translates as: "When anxiety and depression come, try first notice the thoughts and ideas in the brain, do not judge, do not entangle, then imagine, put 'them' in a drift bottle, seal it, watch this 'disease-filled' drift bottle slowly move away along the tide and disappear on the horizon." (当焦虑和抑郁来袭得时候, 可以试试, 先觉察到脑中的思绪和想法, 不评判, 不纠缠, 然后想像一下, 把"他们"装在一个漂流瓶里, 封住, 注视着这个装了"病"的漂流瓶顺着海水慢慢离自己而去, 消失在天边). Unlike the conventional DEPRESSION IS CONTAINER, the user draws on a novel metaphor that creatively depicts the container as a floating bottle. She uses extended metaphors to describe how she unravels the bad emotions by letting the bottle float away with the tide. This image may resonate with her experience of using a floating bottle to release deep-buried psychological loneliness and depression. In a similar instance, Tay (2015) documents a case in which a therapist and client used metaphors that shared an underlying embodied inferential structure of "moving out of a physical container," facilitating the development of a collaborative framework to solve a problem. Tay (2017) argues that since therapists cannot contribute substantive details at the idiosyncratic level, allowing clients to play an active role in facilitating their own betterment may increase their sense of empowerment and agency. Additionally, individuals can incorporate metaphors into self-care through writing, painting, singing, or other forms of multimodal discourse, expressing emotions, obtaining support, and building communication channels.

This study still has some shortcomings. Most microblog users are young and middle-aged, so this study's results may not apply to elderly population with depression. Conducting a follow-up study to examine metaphors used in elder groups and how metaphor research can be applied to aging issues would be beneficial (Landau et al., 2018; Malkomsen et al., 2021). The second limitation of this study is that it analyzes linguistic data alone and does not include multimodal data, such as pictures, videos, and music. Particularly, metaphors are related to visual stimuli, gesture analysis, and multimodal representations such as films and advertisements (Potts and Semino, 2017; Poppi and Kravanja, 2019; Semino, 2021; Pérez-Sobrino et al., 2022). Metaphors influence human conceptualization beyond the canonical verbal and textual cues, and metaphors also affect other representational modalities.

7. Conclusion

In this paper, we propose an effective, reliable, and reproducible procedure for metaphor identification in the Chinese corpus: (1) combine MIPVU to identify metaphorical expressions (ME) bottom-up and formulate preliminary working hypotheses; (2) collect more ME top-down in the corpus by performing semantic domain analysis on identified ME; (3) analyze ME and categorize conceptual metaphors using a reference list. In this way, we have gained a greater understanding of how depression sufferers conceptualize their experience metaphorically, in an under-represented language in literature (Chinese) of a new genre (online health community). We confirm a number of depression metaphors in other contexts and compare them with the Chinese metaphors, providing a theoretical basis for researching, identifying, and treating psychological disorders in multilingual settings. We find sociocultural attributes of Chinese metaphors that represent constraint and containment, especially in terms of THEATRE and CONTAINER metaphors, that portray the disorder and the lack of offline interpersonal support. As a result, this study confirms the potential of online health communities to serve as a metaphor genre for facilitating users' expression, alleviating social fear and stigma, and assisting them in seeking social support. Our study also identifies new metaphors with source-target connections based on embodied, sociocultural, and idiosyncratic levels, which were not previously considered in depression metaphor research. We have examined metaphor research's theoretical and practical implications at these three levels, emphasizing its inherent cross-disciplinary nature in meaningful ways.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

JS: conceptualization, methodology, investigation, project administration, writing, review and editing. ZK: methodology, formal

analysis, and editing. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Thinking by metaphor, fast and slow: Deliberate Metaphor Theory offers a new model for metaphor and its comprehension

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The immense increase in metaphor theory and research over the past decades is posing a threat of fragmentation to the field, which has been responded to by calls for new and more encompassing approaches to virtually all aspects metaphorical. This article argues that the opposite response may be more productive. By focusing on a different way of theorizing metaphor and its comprehension, existing theories and data can be re-ordered in an alternative and coherent way, which moreover breaks new grounds in tying up both with a general theory for all utterance comprehension as well as a general theory for all cognition as involving fast and slow thinking. The core of the new theory highlights the differentiation between deliberate and non-deliberate metaphor use, related to how people see the use of a metaphor as a metaphor in communication, that is, as a metaphor that counts as a metaphor between language users. It shows how this distinction can be employed to make sense of many insights about metaphor and its comprehension in innovative ways. The article outlines the foundations of the new theory and discusses how existing data, old and new, can be seen as supporting the new proposals.

KEYWORDS

metaphor structures, metaphor processing, deliberate metaphor use, utterance processing in discourse comprehension, fast and slow thinking, Deliberate Metaphor Theory

1. Introduction

Since metaphor shifted from the humanities (philosophy, poetics, and rhetoric) to cognitive science (linguistics, psychology, and communication science), theories and hypotheses as well as evidence and data have exploded. The main outcome of this development today can be summed up in one word: variation. There is a daunting range of theories and hypotheses as well as a wealth of research and data that suggest that metaphor may not be one thing. Although many researchers accept that the use of metaphor is a form of understanding one thing in terms of something else, not all researchers do; nor do all manifestations of metaphor processing in the real world require conceptualizing one thing in order to understand another. There is arising a serious question of unity in diversity. As Semino and Demjén (2017: 2) write: "The sheer quantity, extraordinary variety and richness of recent work on metaphor means that the field can appear fragmented and overwhelming." In some fundamental way, this is not just an appearance, however, but a confusing reality. It needs to be addressed head on.

Indeed, when the available data about metaphor structures and metaphor processes are combined, there may even be a paradox of metaphor, to the extent that, in language

use and verbal discourse, most metaphor may not be processed metaphorically (Steen, 2008). This is a problematic situation that hints at another question: what would count as a real metaphor, or, more philosophically, what would be a paradigmatic case of metaphor? Upon close inspection, metaphor studies may be in a paradigm crisis, which does not facilitate fruitful discussion, let alone engender progress, between various schools of thought.

One attempt to address this situation for language use and discourse is Deliberate Metaphor Theory, or DMT (e.g., Steen, 2017, 2023). It aims at accounting for variation in the phenomenon and its theoretical modelling; it allows for considering new paradigmatic cases; and it may affect the definition of metaphor in language use and discourse. A new elaboration of DMT has presented its main argument in a more encompassing conceptualization and new operationalization (Steen, 2023), the core of which may be summarized as follows.

The cognitive-scientific paradigm has highlighted metaphor's specific nature as a figure of thought as opposed to a figure of speech. However, research has shown that not all language use that can be seen as an expression of such figures of thought is comprehended by means of live metaphorical mappings between conceptual domains in on-going communication between people. Instead, only those figures of thought that are treated *as* metaphors by language producers and/or receivers, count as figures of thought in communication between language users and discourse participants, too. In advancing this proposal, DMT aims to resolve the paradox of metaphor. In DMT, all metaphor counting as metaphor in communication also gets comprehended metaphorically by means of some form of cross-domain mapping (or analogy), while all metaphor that does not count as metaphor in communication does not. In DMT, metaphor comprehension is hence not about figures of thought but about figures of thought that count as such in communication.

In addition, if all metaphor is a form of cognition, then it can also display different speeds of processing. Alluding to Kahneman (2011), DMT highlights that it is possible to think in fast and slow manners by metaphor, too. The idea that people can think by metaphor in slow manners, however, goes against the main trend in the cognitive-scientific paradigm. The new question concomitantly arises how this relates to the above-mentioned use of metaphor *as* metaphor in communication. This is addressed in the more recent elaboration of DMT (Steen, 2023) in such a way that it reinforces previous proposals of DMT and strengthens DMT's position as a new approach to metaphor as a form of fast and slow thinking that lies at the heart of cognitive science.

This paper will discuss the present-day situation in metaphor studies as problematic because of the exponential increase in theoretical and empirical variation that is threatening to pull the field apart (Section 2). The proposed solution is to rethink the foundations of metaphor research in terms of DMT's new theory and model for metaphor and its comprehension (Section 3). Section 4 will then consider old and new evidence that can be marshalled in favor of DMT. In the final discussion, the argument will be briefly reconsidered from the perspective of thinking by metaphor in fast and slow ways, and indicate some new prospects (Section 5).

2. The problem: variation in metaphor and its comprehension

2.1. Variation in theories and research

There are two sides to the immense variation of metaphor and its comprehension. On the one hand, an increasing amount of structure and process data is being generated by researchers, introducing ever new aspects of metaphor to the big picture. On the other hand, there is a substantial number of competing and partly overlapping theories of metaphor and its comprehension which account for different configurations of these aspects in partial models. A very brief inventory will help to suggest the scope of this variation, and provide a motivation for its alternative management in DMT.

The latest handbook of metaphor and thought opens with two sections, on the roots of metaphor and on metaphor understanding, offering no fewer than nine different theories and models (Gibbs, 2008). The new handbook on metaphor and language presents four theoretical approaches (Semino and Demjén, 2017), all of which are also covered by Gibbs (2008). In their review of models of figurative language comprehension, Gibbs and Colston (2012: 58–127) add several other models to the list of nine represented in Gibbs (2008). Overlap and competition are rife.

Most of these models have been sorted into three groups by Holyoak and Stamenković (2018), who review the state of the art in metaphor comprehension. They argue that there are three main strands in empirical research on metaphor processing, pointing to three distinct hypotheses:

1. Metaphor is processed by analogy.
2. Metaphor is processed by categorization.
3. Metaphor is processed by conceptual mapping.

According to Holyoak and Stamenković, the data collected and analyzed with reference to these hypotheses have not yielded one clear winner. There hence is not just a lot of variation in metaphor itself, but also in theories of metaphor processing; it is quite possible that these different theories cater to different aspects of variation in metaphor and its comprehension.

A recurring conclusion is that there is not just one process of metaphor comprehension and therefore not just one most successful model. Here are Gibbs and Colston (2012: 126) summarizing their review of models of figurative language comprehension:

> We maintain that it is quite unlikely that certain default processes occur apart from contextual influences in each case of interpreting figurative meaning and that people do not always use contextual information in the same way in all discourse situations. The temporal course of figurative meaning interpretation depends on numerous factors that include the types of figurative language, the people involved, their likely goals and motivations, social and cultural context, local discourse interactions, and (quite importantly) the specific task used to study how language is processed and what is understood.

This is probably true. But it also assumes that the role of these "certain default processes" gets clarified. This is what DMT aims to do.

Gibbs and Colston's (2012) view is completely in line with the conclusion drawn by Holyoak and Stamenković (2018), who also call for a more encompassing theory of metaphor comprehension. This should include a wider range of metaphors, pay greater attention to context and pragmatics, and develop connections with literary psychology. Ever new contexts are being examined and this increases the number of aspects of metaphor comprehension that need to be taken into account. The most encompassing version of this tendency is the proposal of a dynamical systems theory for metaphor (Gibbs, 2017).

As to variation in metaphor itself (as distinct from the process of metaphor comprehension and understanding), one focus of research is on the structures and functions of metaphor in language (as differentiated from metaphor in thought). Next to the section on theoretical approaches to metaphor and language, Semino and Demjén's (2017) handbook has two sections devoted to formal variation and functional variation. Formal variation includes the role of the lexico-grammatical structure of metaphor, like the role of parts of speech, the combination of metaphor-related words into structural patterns in text, and the opposition between plain metaphor and simile. Formal variation is related to the contrast between novel and conventional metaphor in thought, which in language is often manifested as creative versus familiar, attested uses. Functional variation, by contrast, targets the role of metaphor in various domains of discourse, which constitute broad contexts for the use of metaphor in concrete utterances, including education, science, politics, advertising, and the internet. Yet another section in this handbook connects all this research to applied approaches to metaphor, which considers how metaphor is and can be utilized for problem solving in society: here the focus is on variation in metaphorical expression and conceptualization by topic, and the way in which this variation can be exploited in specific problem spaces, like private, professional, and public discourse about diseases such as cancer, HIV/AIDS, and dementia in health care. Structural-functional variation of metaphor in language use and discourse is great and many-faceted.

A comparable body of research on the structures and functions of metaphor in thought is not broadly available by itself. It is most often linked to work done by linguists and discourse analysts who approach the structures and functions of metaphor in thought via metaphor in language. Data focusing on the variation in the structures and functions of metaphor in thought by themselves can be found, however, in seminal theoretical publications on Conceptual Metaphor Theory (CMT), such as Kövecses (2015, 2020). Here, metaphor in thought in the form of conceptual metaphors is postulated to exist on four different levels of schematicity, ranging from image schemas through domains and frames to mental spaces (*cf.* Dancygier and Sweetser, 2014), and illustrations offer analyses of data that have often been constructed for the purpose by the analyst.

What is also important in this type of work is the variation in conventionalization of conceptual metaphors themselves, setting out from the simple opposition between conventional versus novel. Another source of variation at a conceptual level is metaphor aptness. And a third source of variation bears on the degrees of concreteness and abstractness of source and target domains. All of these are structural-functional aspects of metaphor in thought that play a role in the research reviewed by Holyoak and Stamenković (2018).

The common conclusion is that there is not just one structure and function of metaphor in language and in thought. It is true that, for metaphor in thought, one important representative of CMT does discern one kind of unity:

> A major strength of CMT, and a source of its attractiveness, is that it offers new insight to a huge variety of topics and subject matters in the humanities and the social as well as the natural sciences. The insights all have to do with the fact that human beings are conceptualizing beings and that conceptualization, as suggested by CMT, is to a large degree metaphorical in nature. (Kövecses, 2021: 200)

This is a bold claim and points to an ambitious program about the structures and functions of metaphor in thought, which has been growing fast since Lakoff and Johnson (1980).

But the claim is not uncontroversial. For instance, Relevance Theory, offering an entirely alternative approach to metaphor in language, cognition, and communication, has labelled itself "a deflationary account" of metaphor (Sperber and Wilson, 2008), in order to signal disagreement with the inflationary account that is here represented by Kövecses (2021). In addition, Kintsch (2008) has argued that metaphor may be recognizable as a unified linguistic category, but that it does not exhibit one related psychological process. Kintsch's position, in turn, however, is also problematic: to many linguists and discourse analysts, it is the very variation in metaphor as a linguistic category that is at issue and in need of one underlying conceptual basis (which accounts for the perceived dominance of CMT in research on metaphor in language, see Semino and Demjén, 2017: 8). The relation between metaphor in language and thought remains a great challenge.

These issues are often hotly debated, and this is the reason why Gibbs (2017) entitled his overview *Metaphor wars*. It is true that there is great interest in the potential role of metaphor, which may have exploded mostly as a result of CMT (Gibbs, 2017: 5–7); but it is much less clear what the status is of the insights generated by its empirical (as opposed to theoretical) investigation. Given this state of affairs, what reliable and valid knowledge has been produced about metaphor's distinguishable structures, functions, processes, and effects? How can which data be interpreted best by which theories? This question is not easy to answer.

2.2. Problems in relating theory and research

The evidence for the wide range of available theories is, as might be expected, also rather varied and mixed. Indeed, different conceptualizations in different theories even should lead to different data, while null results for each of these theories do not commonly get published. If metaphor is not defined as understanding one thing in terms of something else (Lakoff and Johnson, 1980), but as a form of loose talk (Sperber and Wilson, 2008), then different sets of data will be deemed relevant. At the same time, they will also display overlap on account of their at least partly shared object of study.

Moreover, the varying popularity of distinct theories obviously affects how many and which types of data get produced. This creates the impression that there is massive evidence, for instance, for CMT, while there is much less evidence for a number of its competitors. Such a state of affairs is at least partly a reflection of the attractiveness

of a theory and a hypothesis. Yet this does not mean that this theory and hypothesis are in fact better, or have been tested better by the data in comparison with the competition.

Variation in data counting as evidence is also due to the diverse nature and scope of the thousands of empirical studies that have been carried out to collect and analyze them. A case study in text analysis has a different value than a meta-analysis of dozens of experiments. Moreover, methods and techniques vary wildly between all of these publications, ranging from neuro-scientific research into the milliseconds of activation of parts of the brain to corpus work examining the distribution of specific sets of words across huge amounts of natural language use. More general conclusions may only be drawn in different and careful ways from all of these distinct studies. They may come together naturally in one encompassing framework like CMT, but this does not mean that they all contribute to one clearly formulated model of processes and structures. This in fact remains the negative conclusion of contemporary reviews, as we have seen. Frameworks, theories, and models are essentially different things.

Each of these methods and techniques do not only have their own strengths, but also their own limitations. The ecological validity of some psycholinguistic experiments has been contested, for instance, when it comes to using *A is (like) B* stimuli (e.g., Deignan, 2005; Gibbs, 2017): these forms hardly occur in natural language use, but have been the basis for much of the theoretical debate between competing approaches in psycholinguistics. In spite of this low ecological validity, however, the internal validity of these studies, and hence of their conclusions based on the particular experiment, may be great. The reverse may hold for other types of research. The problem for generating a more encompassing picture, both in terms of framework and model, lies in their generalizability to other types of materials and tasks.

Similarly problematic is the reliability of linguistic and conceptual metaphor identification and classification 'in the wild'. In practice this depends on large degrees of shared but often implicit assumptions. These have only recently been made explicit for part of the question in new methods for metaphor identification in language use (Pragglejaz Group, 2007; Steen et al., 2010). The issue of reliable conceptual metaphor identification, however, or some equivalent outside CMT, is still open.

This holds even more forcefully for the postulated connection between a specific word or group of words, on the one hand, and a particular conceptual metaphor, on the other. This is a connection that typically has not been independently and systematically tested. More generally, the interpretation of structural-functional data of metaphor in language and discourse in terms of what they say about the associated processes of metaphor comprehension and understanding often involves leaps of faith. These may be highly informed and inspiring, but they still require independent investigation in behavioral research, which so far has kept offering a mixed picture.

Part of this situation has been addressed by the notion of converging evidence, which has been a cornerstone in the development of cognitive linguistics, the main basis for CMT (e.g., Schönefeld, 2011). Researchers have invested lots of attention in the relation between structural-functional, observational research versus processing-product, behavioral research in all kinds of areas of language use, including metaphor. This has especially worked as a way to motivate a practical division of labor between scientists coming from different disciplines, such as linguistics and psychology. But systematic attempts to investigate the same hypotheses, materials, and data about metaphor and its comprehension by means of these two broadly differing approaches are the exception, not the rule.

As a result, the evidence that is there, for distinct theories, can best be called piecemeal and local. There is a lot of data in specific studies, or groups of specific studies, which can be seen as valid and reliable evidence for theories about aspects of metaphor and its comprehension. Thus, there is growing corpus evidence about the distribution of metaphor-related words, for instance, in all sorts of situations of use. Functional interpretations of these patterns in terms of metaphorical conceptualization in cognition abound, but they need support and validation from process research on the effect of metaphor in comprehension and understanding and interaction.

Crucially, there is conflicting evidence about the role of analogy and cross-domain mapping in metaphor comprehension (Gibbs, 2017; Holyoak and Stamenković, 2018). This has even led to fundamental changes in the hypotheses involved in the theoretical debate: thus, according to Gibbs (2017; *cf.* Gibbs and Colston, 2012), it may be better to think of conceptual metaphors as emerging *from* comprehension, during understanding, instead of leading *to* comprehension, as was the bold original idea of CMT. The latter was the target of a lot of psycholinguistic research in the 1990s. If this view is now relativized if not abandoned, then the question arises: what does happen in comprehension? And when and how do conceptual metaphors emerge from comprehension, and in which forms?

All of this has also been noted by recent reviews, which have therefore called for new theories (Gibbs, 2017; Holyoak and Stamenković, 2018). There has even been a call for a preliminary consideration of the criteria for such new theories (Zlatev et al., 2021). This is not because there is a generally accepted clear and trustworthy picture of metaphor and its comprehension.

2.3. The need for a new model: bigger or smaller?

Consider the following quotation from the online *Stanford Encyclopedia of Philosophy* entry on Thomas Kuhn by Alexander Bird (https://plato.stanford.edu/entires/thomas-kuhn, last accessed April 6, 2023):

> Kuhn describes an immature science, in what he sometimes calls its 'pre-paradigm' period, as lacking consensus. Competing schools of thought possess differing procedures, theories, even metaphysical presuppositions. Consequently there is little opportunity for collective progress. Even localized progress by a particular school is made difficult, since much intellectual energy is put into arguing over the fundamentals with other schools instead of developing a research tradition. However, progress is not impossible, and one school may make a breakthrough whereby the shared problems of the competing schools are solved in a particularly impressive fashion. This success draws away adherents from the other schools, and a widespread consensus is formed around the new puzzle-solutions.

Bird's summary of a pre-paradigmatic period in some scientific field seems to be applicable quite nicely to the situation in metaphor

studies. In that picture, CMT may have been the breakthrough "whereby shared problems of the competing schools are solved in a particularly impressive fashion." CMT has indeed generated widespread consensus around the new puzzle-solutions, especially in the structural-functional study of metaphor in language and thought. This has also generated a whole new set of paradigmatic examples of metaphor and how it is processed in use.

However, the borders of this solution now may have been reached. Variation and sometimes fragmentation appear to take over from unity in occasionally bewildering ways. This is leading to the above-mentioned call for new theories that can encompass even more phenomena, both in terms of structure (and function) as well as psychological process (and product). But much more than a call for new developments in this direction, and indications of what has to be included in such a new research program, is not really there.

There is an alternative solution. We should focus on one of the key problems in the debate between the various schools and address this problem in more radical terms than has been done so far by the existing schools. This would yield a theory that attempts to clarify the relation between hypotheses and data on the basis of what has been learned by 40 years of speculation and research.

A radical way of responding to the growing attention to variation in metaphor and its processing is to adopt the following position: "not all metaphor in language and thought apparently works as metaphor in communication." This claim is a new way of handling the paradox of metaphor (Steen, 2008), which says that not all metaphor in the structures of language and thought may be processed metaphorically, that is, by means of a local analogy or more extended conceptual cross-domain mapping (*cf.* Holyoak and Stamenković, 2018). The paradox is an embarrassing problem for many metaphor researchers, which is caused by the limitation of their view to metaphor in language and thought.

The paradox can be resolved when the perspective is broadened beyond metaphor in language and thought to metaphor in communication. The main hypothesis is that, for language use and discourse, there is an interaction between metaphor and communication. In particular, when metaphor counts as a metaphor in communication, it is comprehended by analogy or cross-domain mapping, and when it does not count as such, it is comprehended by categorization and lexical disambiguation. This conceptualization of the interaction between metaphor and communication resolves the paradox of metaphor by claiming that all metaphor in communication is comprehended metaphorically, while all metaphor (in language and thought) that does not count as metaphor in communication is not comprehended metaphorically.

The move to include communication as another dimension besides thought and language in the model for metaphor and its comprehension has been around explicitly in Relevance Theory and less explicitly in discourse approaches to metaphor. There is no doubt that metaphor research has profited from these approaches. However, they have not resolved the paradox of metaphor and have not led to agreement about a greater unification of the field. Indeed, Relevance Theory has greatly downplayed metaphor as a category of its own. It would be productive if all of these tendencies could be brought together in one explicit framework, theory, and model, and this is what DMT hopes to facilitate.

The next section will sketch out the foundations of this new theory. Data that can be marshalled in its support will be provided in Section 4. The new approach offered by DMT is also important for the impact metaphor studies can have in other domains of research as well as in society, which will be served by broadening the framework of metaphor studies in Section 5 to slow thinking by metaphor.

3. The solution: rethinking metaphor comprehension

3.1. Four dimensions of metaphor in utterance representation in discourse comprehension

DMT hypothesizes that there is a fundamental processing difference between metaphor when it is used *as* a metaphor in communication, on the one hand, for instance as in the case of a simile, versus metaphor not used as a metaphor in communication, on the other, for instance as with the regular temporal and abstract uses of spatial prepositions (Steen, 2008, 2023). This is another type of variation, which can be added to the many different types of variations already observed. It can be associated with readily distinguished structural-functional categories of variation such as metaphor versus simile, and novel versus conventional metaphor (*cf.* Semino and Demjén, 2017). And it can be based in specific hypotheses and data in comprehension research involving categorization (plus lexical disambiguation) versus analogy (plus cross-domain mapping) (*cf.* Holyoak and Stamenković, 2018). This is where DMT sets out from existing hypotheses and data.

Yet DMT requires a new model for metaphor comprehension that goes beyond the currently dominant two dimensions of metaphor in language and thought (including, respectively, metaphor versus simile, and novel versus conventional metaphor), a status quo which also has limiting consequences for what counts as context. Contrary to what seems to be a widely shared assumption now, communication in the real world is not a context for individual metaphor comprehension, but an integral part of it, as is also stressed in Relevance Theory (see also Soares da Silva, 2021). This is a less common view, which is afforded, however, by grounding metaphor comprehension in a more general and widely accepted multi-dimensional model for all utterance comprehension in discourse. This is the Construction-Integration model developed by Walter Kintsch and Teun van Dijk over the past decades (Kintsch and van Dijk, 1978; Van Dijk and Kintsch, 1983; Kintsch, 1998; Van Dijk, 2008). It models utterance comprehension in its communicative relation to the text in the discourse situation and its users, and it has had a great impact on all discourse comprehension theory and research (e.g., Pickering and Garrod, 2004, 2013; *cf.* McNamara and Magliano, 2009; Schober et al., 2018).

DMT's use of this model shows roughly the following conditions for metaphor comprehension (Steen, 2023: 115–136). When language users comprehend an utterance in a discourse event, they construct four distinct but related mental models for the meaning of the utterance. These mental models yield a surface text (representing aspects of language), a text base (representing aspects of thought), a situation model (representing aspects of the microworld referred to by the utterance), and a context model (representing communicative aspects of the utterance in the discourse event). The content of these four mental models naturally exhibits which aspects of meaning of a metaphor are predicted to be relevant for the generation of an

appropriate utterance meaning in discourse comprehension. This produces a four-dimensional model for metaphor in utterance processing in discourse, which we will return to in Section 3.2.

DMT has advanced an associated 4D model for the structures and functions of metaphor itself as well. It argues that metaphor does not just have linguistic and conceptual properties, including metaphor versus simile in language and conventional versus novel mapping in thought, but that metaphor also exhibits referential and communicative properties, notably the difference between direct and indirect reference to the source domain, and deliberate versus non-deliberate use in communication. This is hence an elaboration of the original 3D model called for in Steen (2008) as a result of on-going research (Steen, 2023): the dimension of reference in the situation model has now been distinguished from the other three dimensions that were postulated before.

For metaphor, the crucial question for reference and for communication is this: Is an utterance meant to make the addressee really think of one thing in terms of something else, or is it not? Or, in terms of the addressee: Does the addresse see the utterance as meant to make them understand one thing in terms of something else, or not? In other words, is it part of the (communicative) meaning of the utterance that it involves making a comparison between two distinct things that are both somehow involved in the meaning of the utterance? These questions go to the heart of how metaphor works.

This is why the new slogan of DMT is: "to compare or not to compare, that is the question". This clearly is a very different solution to the paradox of metaphor than what has been proposed in Relevance Theory, which sees metaphor as a form of loose talk without requiring comparison, although similar developments can be discerned in Carston (2010, 2020; *cf.* Carston and Wearing, 2011). What is more, this approach also allows for people's finding and resolving figurative comparisons in much less fast and automated ways than has been the typical case in modern metaphor studies (Steen, 2023; *cf.* Kahneman, 2011). Instead, some metaphor comprehension is in fact much closer to problem solving than to fast and automated language use (Kintsch, 2008).

Here is one new and radically surprising outcome of this approach (Steen, 2023). We know that the bulk of metaphor is indirect and conventional (Steen et al., 2010): allusion to the source domain is indirect, and the source domain itself is a widely attested form of conceptualization for the target domain. This is because most metaphor is based in lexical polysemy, as has been a corner stone of present-day metaphor research. As a result, however, utterances that contain this kind of metaphor are in fact potentially ambiguous between two readings. They can be seen as either deliberately metaphorical, requiring some form of active comparison (or, figurative analogy), or as non-deliberately metaphorical, which does not require comparison or analogy for the intended utterance meaning. This ambiguity has been missed in most metaphor research, but its recent discovery in DMT (Steen, 2023) has big consequences for the status of these metaphors as metaphors in language use and discourse.

Consider, for example, *She died yesterday after a long fight against cancer* (*cf.* Steen, 2023: 163–168, 278–282, 298–317). In the deliberate reading, this utterance is intended to invoke a live cross-domain mapping, which requires comparison or figurative analogy between the source domain of fighting and the target domain of a determined effort to prevent something from turning bad. In the non-deliberate reading, this utterance is intended to talk about cancer in terms that are familiar for cancer discourse, without invoking any cross-domain comparison. This reading does not require analogical comparison, but can be handled by lexical disambiguation (e.g., Gentner and Bowdle, 2008; Giora, 2008; Glucksberg, 2008; Kintsch, 2008). The surprising point is, though, that, other things being equal, both types of readings are possible. It is the intentions of the sender, then, but also, and even independently, of the addressee that decide which reading (based on which interpretation of *fight*) is deemed most relevant in comprehension. This does not even have to lead to the same result, which can cause a problem for the interaction and its continuation.

The referential and communicative meanings of the utterance change accordingly. In the deliberate reading, their combination can be paraphrased like this:

> "The speaker means to say that she died yesterday after a long (literal) fight against cancer (where a (literal) fight with an enemy is meant to be similar to a determined attempt to stop cancer)".

In the non-deliberate meaning, it can be paraphrased like this:

> "The speaker means to say that she died yesterday after a long determined attempt to stop cancer".

These are two diverging meanings. The one involves thinking by metaphor, while the other does not. They can be formally expressed and seen as predictions for the two versions of possible content of people's mental representations of the utterance during comprehension of this utterance (Steen, 2023: 280, 314–315).

Language users who are critical of violence metaphors for talking about cancer (*cf.* Semino et al., 2018; Wackers et al., 2021) may legitimately comprehend the utterance as involving a live metaphor, and spell out the first reading of the utterance as what they hear was conveyed and then raise their objections. But language users who do not intend to talk about cancer in terms of violence but simply wish to use the familiar, conventional linguistic means at their disposal, may legitimately deny that they intended to convey such a comparison. They may point to a user's dictionary such as Macmillan and argue that the word *fight* simply and conventionally means "a determined attempt to stop something." They may also argue that that was all they thought of when they expressed the utterance. And this may clearly also be what many hearers will understand, and, indeed, what a language learner may want to learn about the meaning of the English noun *fight*. That linguists and critical language users may point to connections between the conventionalized figurative meaning and the (perhaps original) non-figurative meaning, is another matter.

As a result, we have two communicative scenarios that, in principle, are equally possible, with one scenario requiring analogical processing, or thinking by metaphor, while the other does not. Moreover, we also see that either scenario is crucially linked to language user intentions, both for production and for comprehension. What is more, the one scenario, with the analogy, in fact also sets up a form of reference of its own to the source domain of fighting, or physical violence, as part of the meaning of the utterance. The second scenario does not do so, and the source domain of fighting or physical violence is not part of the projected state of affairs about handling the disease of cancer. There is a difference between metaphor in language and thought (where we do have the metaphor-related word *fight* in the surface text and

its related concept FIGHT in the text base), on the one hand, and metaphor in reference and communication on the other (where we have two different states of affairs in the situation model, and two different communicative intentions in the context model). This illustrates how there are four different dimensions in comprehension that can convey different meanings and suggest different cognitive processes for the complex comprehension of metaphor.

3.2. Framework, theory, and model

The updated version of DMT starts out from a theoretical framework that includes several big factors of metaphor use (Steen, 2023). These are distinct activities of cognition (e.g., comprehension and production), levels of cognition (language use and discourse), cognitive processes (lexical disambiguation, categorization, analogy, cross-domain mapping, and comparison), and speeds of cognition (thinking fast and slow, a little less fast, and even slower). This framework can be seen as an overall ordering of bigger factors and more distinct variables, which any theory of metaphor needs to adopt some position about. There probably are more than just these four, as is also suggested by the calls for encompassing theories and their preliminary criteria mentioned above. DMT's selection makes a start, is compatible with most theoretical and empirical insights, and is already quite complex.

DMT then proposes its own theory of metaphor and its comprehension, which sets out from a general processing model for utterance comprehension, the Construction-Integration model. The CI model itself is based on a more encompassing theory of all utterance processing in discourse, and this kind of theory is what any theory of metaphor in language use and discourse should eventually be compatible with. The theoretical framework of the CI model therefore also provides a theoretical framework for re-thinking the model for metaphor comprehension. This is particularly important for distinguishing the dimensions of language and thought as well as reference and communication in terms of processing (the four mental models) as well as metaphor structures and functions (the four dimensions of metaphor).

In particular DMT proposes that, for language use and discourse, the key hypothesis about metaphor comprehension turns on deliberate versus non-deliberate use. This is primarily linked to the dimension of communication and the cognitive process of building a context model. DMT claims that language users somehow decide whether a metaphor is intended as a metaphor in communication, that is, counting as a genuine metaphor between language users, or not. This happens in production and comprehension (activities), whether a metaphor is expressed within the boundaries of an utterance or across utterances as distinct units of discourse (levels), and whether this occurs fast and automatically or slow and in a more voluntary way (speeds).

The crux of this hypothesis turns on the fourth remaining factor of the above framework: processes. DMT claims that deliberate metaphor use always requires processing by analogy (or its more extended manifestation of cross-domain mapping) and therefore also involves comparison. This is live understanding of one thing in terms of something else. Here metaphor is being comprehended metaphorically.

Non-deliberate metaphor, by contrast, does not require processing by analogy. Instead, it is handled by lexical disambiguation and categorization. This is not live understanding one thing in terms of something else. But it is also true that relations between a word's senses and its related concepts can be interpreted as involving understanding one thing in terms of something else, and this may happen in post-comprehension understanding.

In the DMT model for metaphor comprehension, people build four representations in a row, even though this clearly is a simplification: for the complexities of a full computational model, see Lemaire et al. (2006). In this initial, more simple model of processing, language users in comprehension first build a representation of the utterance as part of a surface text, and this is where they represent its linguistic features; they then build a representation of the utterance as part of a text base, where they represent its conceptual features; next, the text base is used to project a situation model, which captures the picture of the world evoked by the utterance in terms of its referential properties; and finally they include this situation model in a more encompassing context model that represents how the situation in the utterance plays a role in what the sender wants to communicate to the receiver. Again, the step-by-step ordering of each complete mental model is a simplification: it helps theory development and presentation, but in practice a more complicated model is needed that roughly works on word-by-word and phrase-by-phrase basis (Lemaire et al., 2006).

The crucial transition in the model occurs when the Construction stage (building surface text and text base) moves into the Integration stage (constructing a situation model and context model). DMT holds that for non-deliberate metaphor use, lexical and conceptual disambiguation discard with source-domain senses and related concepts, and that the situation model as a result will only exhibit a target-domain referent. To illustrate with the help of our example of *She died yesterday after a long fight against cancer*, DMT's application of the CI model predicts the following non-deliberate scenario:

1. In the surface text, the word *fight* is represented as polysemous between a physical fight and the more abstract fight of a determined attempt.
2. In the text base, both of these senses activate related (sub) concepts for FIGHT, which contribute to the building of propositions for a text base and enable the projection of a situation model.
3. In the situation model, the situation that is not metaphorical is in this case preferred, yielding a state of affairs that has the following referential structure: 'she died yesterday after a long determined attempt to stop cancer'.
4. In the context model, this situation model is included in a representation of the communicative intentions of the sender: 'The speaker means to say that she died yesterday after a long determined attempt to stop cancer'.

This analysis of the utterance is automatically produced by the comprehension model, predicts what language users will do when they receive this utterance as a non-deliberate metaphor, and at the same time offers a structural-functional description of its meaning.

Compare this with the situation when the metaphor is used deliberately. The first two steps are identical:

1. In the surface text, the word *fight* is represented as polysemous between a physical fight and the more abstract fight of a determined attempt.
2. In the text base, both of these senses activate related (sub) concepts for FIGHT, which contribute to the building of propositions for a text base and project a situation model.
3. In the situation model, however, FIGHT is used to project a referent that involves physical violence against some opponent: 'she died yesterday after a long physical and violent fight against cancer.' Since people as a rule do not physically and violently fight with a disease, this creates a problem of coherence. DMT posits that it is this coherence problem that triggers the recruitment of analogy or cross-domain mapping as a problem solving device (*cf.* Miller, 1979). This move involves setting up an extra step to create a new situation model that referentially is coherent and therefore does make sense: 'she died yesterday after a long (literal) fight against cancer (where a fight with the enemy is similar to a determined attempt to stop cancer)'.
4. The adjusted situation model is finally incorporated within the context model: 'The speaker means to say that she died yesterday after a long (literal) fight against cancer (where a fight with the enemy is similar to a determined attempt to stop cancer)'.

In this way, DMT accounts for the contribution of the metaphor-related word *fight* to the ambiguous meaning of the utterance and the way that it is predicted to be processed in comprehension in two different ways: as non-deliberately metaphorical and as deliberately metaphorical. In principle, these two interpretations are equally possible, the utterance is ambiguous between deliberate and non-deliberate use, and this is one novel finding of DMT (Steen, 2023).

The new question that this reveals is: how do we know whether an utterance is meant to be deliberately metaphorical or not? In other words, how do we know whether metaphor-related words count as a metaphor in communication in an utterance in a specific discourse event? This also includes the question, for which specific language user, or class of language users, and discourse participant(s), and in which activities (production, reception, interaction)? This is hence where other theoretical components come into play.

3.3. Deliberate versus non-deliberate metaphor use in comprehension

The central hypothesis in DMT generates a number of subsidiary hypotheses and specific predictions. The structures and functions of metaphor are one crucial factor for suggesting whether a metaphor can be used deliberately. They are closely linked to experimental research on whether a particular class of metaphors is indeed processed by analogy. Structures and functions are not the only factor, but they clearly provide a baseline. There are three main structures that have been shown to be crucial by now: presence or absence of metaphor signaling, conventionality versus novelty, and (in)directness.

Signaled metaphors, novel metaphors, and direct metaphors are all metaphor structures that promote deliberate metaphor use. Thus, the preposition *like* signals the intended need for comparison, whether this is figurative or not. Novel metaphors do not have a conventionalized target domain and the sender of the utterance commonly intends that this has to be constructed on the spot by analogizing from the novel source-domain element; if this does not happen, the novel source-domain element would present an incoherent relation with the utterance and the discourse. Direct metaphors are metaphors that (intentionally) present a direct expression of one or more elements of some source domain, and these need to be integrated within the surrounding target domain by means of analogy, too. The relations between these metaphor structures and the deliberate use of a metaphor has been the basis of DMT's predictions from the start.

The role of these properties can now also be explained by the 4D model. Thus, metaphor signals are part of the linguistic dimension of the model; they are represented in the surface text. Novel versus conventional metaphor is part of the conceptual dimension of the model; relevant properties emerge in the text base. And direct versus indirect reference to the source domain is part of the referential dimension of the model; it can be seen as part of the situation model. These structures relate to the intention to use a metaphor as a metaphor or not, which is part of the communicative dimension, and is handled in the context model. This systematic approach afforded by DMT's employment of the CI model hence further grounds these aspects of metaphor within DMT as a theory, aspects which have received a lot of attention in general metaphor research.

By contrast, non-signaled, conventional, and indirect metaphors do not promote deliberate metaphor use. They are more associated with non-deliberate metaphor use. Given the possible implications of the ambiguity of the *fight* example above, however, this view may have to be nuanced. Perhaps many if not most indirect conventional metaphors are structurally ambiguous between deliberate and non-deliberate use. It may therefore be their interaction with aspects of the discourse situation that decides how the ambiguity is resolved in actual use by promoting a decision about intentions on the part of the language user. These aspects of the discourse situation obviously include a metaphor's discourse purpose as well as the discourse domain of the discourse event and characteristics of the participants involved in it.

DMT predicts that all of this automatically leads to a representation of some metaphors as intended as metaphorical, or deliberate, in the context model. By contrast, for most metaphors it does not, and these count as non-deliberate metaphors. This is the core proposition formulated by DMT and a decade of research is now beginning to outline the main trends (Steen, 2023).

Why would most metaphors not be deliberate? Here the shift of attention in DMT from language and thought to communication and reference can help. In retrospect, the emphasis on language and thought in early cognitive-scientific work on metaphor focused on one important function, which is conceptualization and its verbal expression. The shift of attention to communication (and reference) reveals another important function: perspectivization (and its relation to mental world-making). In language use and discourse, metaphors most often serve just for conceptualization and expression, exhibiting specific and situated uses of conceptual and linguistic systems, as has been shown in four decades of research. But what happens in language use and discourse in terms of communication is something essentially different: there we can observe the use of metaphor for offering an alien perspective on some target referent and topic, in order to do a comparison between two unlike things that are each referred to as distinct elements in the situation model.

In general, people do not go around making live comparisons as parts of utterances and texts all the time. This includes making metaphorical comparisons. We just use language and discourse for thinking and talking about things in the concepts and terms that are part of our conceptual and linguistic systems. That some of them are

linguistically and conceptually metaphorical is irrelevant for the communicative side of those acts of language use and discourse events. When these metaphor-motivated aspects are there, metaphor-related words and concepts are also present in the surface text and text base as forms of polysemy, but, and this is crucial, they are absent from the situation model and context model (Steen, 2023). This is how DMT models the workings of these different classes of metaphor in specific situations of use, where potential ambiguity between deliberate versus non-deliberate metaphor use is resolved by the intentions of the specific language user and discourse participant whose comprehension process is being modeled.

The model can be further refined by the proposals advanced by Cuccio (2018). Her analysis of neuro-scientific research on metaphor suggests that, for conventional metaphor, all relevant senses and sub concepts may be in play during the Construction stage of lexical access and concept activation [as is also suggested by Giora's (2008) Graded Salience Hypothesis]. This spread of automatic and ubiquitous sense and concept activation would lead to automatic attempts of concept combination, too, for the purpose of constructing a text base that can ground the projection of a situation model (*cf.* Kintsch, 1998). This blind combining process may also include neuro-cognitive activation of source-domain concepts for the text base. This can even be interpreted as involving a form of metaphoric thought.

However, when during the beginning of the Integration stage preference is awarded to those concepts and referents that exhibit conventionalized target-domain meanings, metaphoric thought is cut short. Then the utterance gets interpreted and represented as non-deliberately metaphorical. It sets up situation models that are restricted to the target domain, and this is what is the result of lexical and conceptual disambiguation for the purpose of integration. This situation model and context model consequently do not manifest metaphorical thinking. DMT adopts this subsidiary hypothesis about early source-domain activation and subsequent abandonment as entirely compatible with its theory and model.

This process can even be influenced by another variable, which is the varying salience of the distinct word senses that get activated in lexical access (Giora, 2008). Sometimes figurative senses are stronger and get activated faster than non-figurative (original source-domain) senses. This would increase their chances of forcing a non-deliberate interpretation of the metaphor, and would promote their processing via lexical disambiguation. The intended target-domain interpretation of the polysemous word is then readily available and first accessible and, other things being equal, this would be the meaning of the utterance that would count as adequate and relevant.

Finally, this model of metaphor comprehension is also compatible with the potential emergence of conceptual metaphor during full metaphor understanding, after a metaphor has been sufficiently comprehended (Gibbs, 2017). At that point, further processing of source-domain aspects may set in during processes of interpretation. They may even pick up from what was left behind before, as is also suggested by Giora (2008). In this way, DMT can offer specific roles to previous theoretical proposals as reinterpreted within one encompassing and explicit model.

3.4. Language use and discourse

The next step in modelling deliberate versus non-deliberate metaphor use in comprehension has to do with the interaction between metaphor structures and functions on the one hand and the factor of level of cognition on the other (*cf.* Deignan et al., 2013). This suggests that metaphors expressed as structures and functions at the level of discourse (e.g., Musolff, 2004, 2016a; Charteris-Black, 2011; Ritchie, 2017) may be distinct from metaphors expressed at the level of language use (e.g., Semino et al., 2018). In the former case, a cross-domain mapping is expressed between several utterances, while in the latter, it stays within the limits of one utterance. In the former case, metaphors work as structural-functional elements of text-in-code-in-context, in the latter, as structural-functional elements of utterances (Steen, 2023). Metaphors within utterances are probably the paradigmatic case of metaphor today.

DMT holds that metaphors expressed at the level of discourse work in a way that is typical only of that class. This is because they are always used deliberately as comparisons between distinctly expressed, unlike entities that work across utterances. They hence always require processing by analogy or cross-domain mapping. They are hence also the most extensive and therefore prominent example of genuine thinking by metaphor. This also more easily allows for slowing metaphor down (Steen, 2023).

An extended comparison, continuing a deliberate metaphor in one utterance through one or more following utterances, is not only deliberate at the level of language use (in the separate utterances) but also deliberate as a whole (in the text). It requires planning and processing as a whole, and is constitutive of (a substantial part of) the text. A well-known example is Shakespeare's Sonnet 18: lines 1 through 12 build a concrete and specific comparison between the speaker's lover and a summer's day that is more specific than line 1 by itself.

Metaphor expressed at the level of discourse is a matter of secondary modeling (Steen, 2023), which has to do with building a text as a story, an argument, an exposition, and so on. Secondary modeling makes use of utterances, that in themselves manifest primary modeling, involving a state, a process, and action, and so on. Primary modeling yields states of affairs, secondary modeling yields text types. Primary models also have different functions than secondary models: utterances have speech act functions like promising and directing, while secondary models have discourse functions like informing, persuading, and instructing. Metaphors within utterances can be combined to build a metaphor between utterances that requires its own contents in the mind. This is what is organized by the factor of level.

Another type of case would be texts having a paragraph in the language of a source domain which is then meant to be compared with another, roughly equivalent or closely related, paragraph about the target. This is also clearly deliberate. An atypical example is a TED-talk about sex as eating pizza (Steen, 2023, chapter 8). In that talk, Al Vernacchio discusses how aspects of baseball are relevant to talking about sex without Vernacchio mentioning sex explicitly in that paragraph; he then moves over to do the same for eating pizza in the next paragraph, moves back to another aspect of baseball in the following paragraph, and then returns to eating pizza in the fourth paragraph. The language and discourse ostensibly are just about baseball, eating pizza, baseball, and eating pizza. But the meaning of the talk is about baseball in comparison with sex, eating pizza in comparison with sex, and so on. This comparative intention is explicitly announced at the beginning of the text. This is highly deliberate metaphorical meaning, and it requires hard thinking by metaphor, both in production and in reception. In the event of the

talk, speed of cognition is controlled by the speaker, but when you see the film of the TED-talk, or read the transcript, then you can slow down according to your own needs and interests.

Other well-known examples concern even more encompassing stretches of text that are supposed to function as source domains for an explicit or implicit target, such as parables and allegories (*cf.* Ritchie, 2017). A famous example is George Orwell's *Animal Farm*. And this situation does not just apply to narrative texts, but also to argumentative and expository texts. The hypothesis is that all of these are deliberate metaphors expressed at the level of the discourse event (as differentiated from language use), typically because parts of the source domain are directly expressed as distinct parts of the text. What this means in practice is that they all require analogical processing of their structures and functions. This may also be the place where thinking by metaphor is more easily or frequently slowed down.

All of the source-domain elements (summer's day, baseball, eating pizza) that function as part of such a cross-domain mapping at the level of the discourse are part of a deliberate figurative comparison that enfolds in the growing situation model which includes them as referents in the content of the discourse. They directly refer to the source domain as one leg of the comparison. This must therefore be deliberate, that is, intended by the producer of the text. There is no ambiguity here between a deliberate and a non-deliberate reading, as is possible within the confines of one utterance for conventional indirect metaphor. This basis in extended source-domain reference would be a working hypothesis for the reason why metaphors expressed at the discourse level may always be deliberate and require analogical thinking that occasionally takes a lot of cognitive effort and time.

This view has knock-on effects on DMT's view of another type of metaphor that is quite well-known too. This is when two or more sentences exhibit vocabulary that derives from one particular semantic field that is conventionally used to talk about a topic related to another semantic field, for instance cancer as violence or war. The consistent presence of such violence or war vocabulary across utterances is often taken as a reflection of the fact that senders really think about one thing in terms of something else, and that addressees need to do so too if they want to catch their meaning (e.g., Semino et al., 2018). This would thus be another type of metaphor expressed at the level of discourse that needs to be described and explained.

DMT has a different perspective, and argues that this may only hold throughout all utterances if one of the expressions at some point is clearly deliberate, for instance in the form of an explicit comparison. If this does not hold, then this manifestation of metaphor is similarly ambiguous between deliberate and non-deliberate use as our *fight* example above. In that case it is also possible, and even quite plausible, that all metaphor-related words are used as non-deliberately metaphorical, or, simply the way to talk about a particular topic. This would mean that neither in production nor in comprehension any of these words would necessarily activate a cross-domain mapping, since they can be handled by lexical disambiguation within the boundaries of distinct consecutive utterances. This especially holds if the source-domain meanings pertaining to for instance violence and war are less salient than the conventionalized target-domain meanings pertaining to handling a serious or difficult situation. These are testable predictions.

In production, such series of words may arise by lexical priming and by the conventional way to talk about a topic. The selected words therefore do not have to come from some scenario that would be in the mind of the producer. This too can work simply from one utterance to the next without requiring the presence of a metaphorical plan for the structures and functions of the discourse. For DMT, the situation changes if the relevant scenario actually comes up in the referential dimension as well. If the relevant source-domain concepts are discarded during the move from the text base to the situation model, however, then it is only the related and conventionalized target-domain equivalents that go through to the situation model, as is probably the case with most indirect conventional metaphor. DMT hence predicts that the postulated kind of framing effect of consistent series of metaphor-related words and their possibly associated scenarios is minimal, since they are typically indirect and conventional and therefore promote non-deliberate use within the utterance.

This issue is intimately connected with the question of the purpose of a metaphor, which has come to be seen as the role of a metaphor in the discourse event it is playing (Charteris-Black, 2012; Semino et al., 2018). As noted above, metaphors generally have the function of conceptualization or perspectivization in language use, which is one level of cognition, but this in itself can also have a purpose in the discourse event it is in, which is another level of cognition. DMT posits that non-deliberate metaphors do not have discourse purposes, because they do not count as metaphors in the communicative dimension of language use, and therefore not in the discourse. They essentially disappear from the mental representations of situation model and context model during the integration stage of comprehension. Deliberate metaphors, by contrast, can also have discourse purposes: their construction of an intended local or more extended comparison is often clearly done for a purpose, which can be related to several aspects of a discourse event. For instance, deliberate metaphors can function as various parts of setting up an argument (e.g., Renardel de Lavalette et al., 2019; Van Poppel, 2020; Finsen et al., 2021; Wackers et al., 2021). People can then legitimately wonder why a particular alien perspective in one or more utterances is used by the producer of some argumentative or other text.

In all, then, DMT has a number of theoretical proposals about the role of deliberate versus non-deliberate metaphor use in language use and discourse. They are based on a combination of theories of metaphor comprehension, the four-dimensional CI model of all utterance processing in discourse comprehension, and the various structures and functions of metaphor that have been uncovered in language use and discourse in the past four decades of metaphor research. It is now high time to turn to the way in which these hypotheses can be related to old and new data.

4. From theory to research: old and new evidence

4.1. Data before DMT

Data for examining the hypothesis that there is an interaction between metaphor structures and metaphor processes were first collected in order to test the Career of Metaphor Theory (Bowdle and Gentner, 2005; *cf.* Gentner and Bowdle, 2008). This proposal was a response to the then state of the art and the resulting contrast between the comparison versus the categorization views. This is another way of distinguishing between the three positions differentiated by Holyoak and Stamenković

(2018), who also discuss the wide range of data supporting each of these positions. Given the availability of this review, explicitly repeating the data from all relevant studies here is not necessary, but they include reaction time studies, metaphor interpretation tasks, metaphor rating studies, neuro-imaging studies, and so on. The overall picture suggests that categorization, comparison, and conceptual mapping may each play a role depending on different linguistic and conceptual structures. DMT has brought this together in one coherent theory and model that expands the Career of Metaphor Theory.

The Career of Metaphor Theory claims that there are two main sets of data (in favor of lexical disambiguation plus categorization versus analogy plus comparison) and that their related hypotheses are valid, but for different sets of cases, and that this is due to the evolutionary status of the conceptual structure of a metaphor. Moreover, the Career of Metaphor Theory also claims that there is an association between this evolution and the preferred ways of expressing a metaphor in distinct linguistic forms, such as plain metaphor versus simile. According to the Grammatical Concordance Hypothesis, conventional metaphors associate more with categorization (and its expression as plain metaphor), while novel metaphors associate more with comparison (and its expression as simile).

The data in Bowdle and Gentner (2005) were collected because previous studies had shown that conventional metaphors were comprehended faster and differently than novel metaphors, which was taken as a reflection of the assumption that conventional metaphors have highly accessible metaphorical meanings. Therefore Bowdle and Gentner (2005) collected preference ratings that showed that conventional metaphors were more compatible with categorization statements than with comparison statements, which agrees with the idea that novel metaphors still work as comparisons while conventional metaphors do not necessarily do so. Thus, taking examples from Bowdle and Gentner's materials, for conventional metaphors *Faith is (like) an anchor* or *A soldier is (like) a pawn*, the preference for the categorization form (that is, without the preposition *like*) was higher than it was for novel metaphors such as *A mind is (like) a kitchen* or *A beach is (like) a grill*.

In a second experiment, the same stimuli were offered for comprehension. Novel metaphors were comprehended more slowly than conventional metaphors. In addition, there was the predicted interaction with linguistic form: when novel metaphors were offered as similes they were comprehended faster than when offered as metaphors; conventional metaphors, by contrast, were comprehended faster when offered as metaphors than as similes. All of this is in accordance with the Career of Metaphor Hypothesis and the Grammatical Concordance Hypothesis. It became the basis of DMT (*cf.* Steen, 2008).

But DMT offers new interpretations of these existing data. First, the focus on simile (versus metaphor) brings out two dimensions out of four in DMT: in the 4D CI-model, simile includes both linguistic form (*like*) as well as direct reference (the word expressing the source-domain concept). Second, Glucksberg's (2008) original hypothesis as well as data in favor of processing by categorization included a notion of "dual reference", to both source-domain and target-domain aspects of meaning of the metaphorically used word. This notion cannot only be related to the ubiquity of polysemy, as was done by Bowdle and Gentner (2005: 198), which is a matter of the dimension of language; but it can now also be related to what is a genuine potential for dual reference in the situation model, as in the example *She died after a long fight against cancer*. And third, the expression of conventional metaphors as similes (instead of metaphors) may precisely lead to their revitalization as deliberately figurative instead of their use as non-deliberately metaphorical; the need for constructing a live analogy or cross-domain mapping because of the simile form, in spite of the conceptual conventionality, may precisely be the reason why these take longer to process.

Evidence related to comprehending metaphor-motivated polysemy and its handling by lexical disambiguation was collected in research for Rachel Giora's Graded Salience Hypothesis. Giora (2008) concludes that metaphor is not unique in that all senses of any word are always activated from the start of processing, and that some activations are faster and stronger than others. This depends on their salience, which has to do with their degree of conventionality and frequency of use, placing them in the forefront of our mind. She notes that, in the case of metaphor-motivated polysemy, many literal meanings (pertaining to the source domain) are less fast and less strong than figurative senses (pertaining to the target domain) for the same word. This suggests that figurative senses are easily available and accessible. They can even be preferred when lexical disambiguation projects the target-oriented situation model from the surface text and text base, and do not require *ad-hoc* construction of a target-domain referent by some form of analogy or cross-domain mapping.

This is not what was originally concluded from the wealth of data collected for testing Conceptual Metaphor Theory. What was concluded there, instead, was that metaphors needed cross-domain mappings for their comprehension (*cf.* Holyoak and Stamenković, 2018). They include data from studies utilizing many different methods and techniques, such as ratings of sensibility of different expressions, formulation of mental images for different expressions, priming data, true-false judgments, comprehension times, and so on.

In the past decade, the interpretation of these data has changed, from pertaining to metaphor *comprehension* to metaphor *understanding* (Gibbs and Colston, 2012: 151; Gibbs, 2017: 85, 212). Thus Gibbs (2017) argues that cross-domain mapping is needed for a full and embodied processing of a metaphor, but he allows for this to take place *after* the more narrow comprehension process has been completed—and the latter clearly may also be based on lexical disambiguation, as is also acknowledged (Gibbs, 2017: 215, 106–111). This suggests that metaphor comprehension based on lexical disambiguation may allow for later (and perhaps optional) metaphor understanding by means of cross-domain mapping, which is precisely how DMT would interpret the data for CMT. This position implies that the various processing data related to lexical disambiguation, categorization, analogy, comparison, and conceptual mapping do not only apply to different structures and functions of metaphors, but that they also may pertain to different moments in the processes of comprehension and understanding (*cf.* Cuccio, 2018). This would resolve the alleged conflict between CMT and DMT completely.

Finally, there are data from other studies that have been interpreted as showing that analogy and cross-domain mapping are active during conventional metaphor comprehension, which according to DMT would as a rule promote lexical disambiguation and categorization instead. These studies may be re-interpreted in a different way (see Steen, 2017). This is not to disparage the value of these studies, because they have obviously revealed important aspects of metaphor processing. However, this is instead to show that they can be given a motivated alternative interpretation within DMT, an alternative which even accords with the above proposals about the difference between comprehension and understanding.

Thus, Steen (2017) argues that some of these studies utilize conventional metaphors that are used deliberately, in for instance studies involving ratings and processing times in Pfaff et al. (1997), experiments on reasoning and decision making in Read et al. (1990) and Robins and Mayer (2000), a study of word and sentence recognition from text in Allbritton et al. (1995), a mental imagery study in Gibbs and Bogdonovich (1999), and an interpretation task in McGlone (1996). Other studies may be re-interpreted as in fact stimulating a deliberate use of conventional metaphors in their task, as in Boers and Littlemore (2000), where participants have to explain conceptual metaphors; Gibbs (1991), which collects verbal explanation of idioms by children; Gibbs (1992), focusing on intuitions about and ratings of metaphorical idioms in five out of six studies; Gibbs et al. (2006), examining people's reported imaginations of impossible actions; Gibbs et al. (2004), with a questionnaire about people's knowledge about desire as hunger; Gibbs and O'Brien (1990), examining reported images of idioms; and Nayak and Gibbs (1990), collecting offline appropriateness judgments. In brief, when the task focuses people's attention on the source domain, this may have triggered deliberate metaphor processing, involving analogy and cross-domain mapping instead of lexical disambiguation, so that the data presented here may in fact count as evidence for DMT.

In conclusion, old processing data can be recruited as evidence for DMT in three ways. First of all, data in favor of the Career of Metaphor Theory can also count as support for DMT, since the Career of Metaphor Theory can be seen as a special case or even one foundation of DMT. Second, data in favor of CMT have been re-interpreted in recent years as possibly pertaining to metaphor understanding rather than comprehension, and this can be seen as complementary to and even compatible with DMT instead of in conflict with it, since understanding is a post-comprehension process. And third, data that have originally been interpreted as pertaining to conventional metaphor comprehension by cross-domain mapping can be seen as the effect of deliberate metaphor use rather than non-deliberate metaphor use because of the materials or tasks used in the experimental research. In all, there is a substantial amount of "old" processing data that can be accounted for in new ways by DMT.

Turning to "old" data on the structures and functions of metaphor that can be related to metaphor and its deliberate or non-deliberate use, it can be easily observed that these are scant. Corpus work on the distribution of metaphor signals and its linguistic forms was virtually non-existent, as was corpus work on novel versus conventional metaphor. This type of research took off when MIP (Pragglejaz Group, 2007) and MIPVU (Steen et al., 2010) were published, and this research emerged at the same time as the first proposal of DMT (Steen, 2008). We therefore now have to turn to new data.

4.2. Data since DMT

The influence of deliberate and non-deliberate metaphor use on text comprehension was addressed by a range of studies. Jansen et al. (2010) examined the effects of two alternative deliberate metaphors in a text about HIV/AIDS and the immune system, which would require an army or fire brigade to defend itself; they found that aspects of deliberate metaphor recognition by the participants affected their text understanding, appreciation, and persuasion in comparison with a text version without such a deliberate metaphor. Krennmayr et al. (2014) tested whether deliberate metaphors about economic competition as auto racing (in the form of novel metaphors and signaled metaphors) had a greater effect on memory for various text versions than non-deliberate metaphors (conventional metaphors and non-signaled metaphors); they reported that novel metaphor had a greater influence on recall than conventional metaphor, and that metaphor signaling trended in this direction. Musolff (2016b) studied how students from 10 different countries interpreted the deliberate metaphor of their country as a body or a person and presented the variation in his findings as support for DMT.

A distinct line of research emerged in an exchange with Thibodeau and Boroditsky (2013), who found different framing effects of two diverging *A is B* metaphors in a text on crime (*crime is a beast/virus*) on the preferences expressed by participants for political measures against rising crime in a fictive town, Addison. Steen et al. (2014) critiqued this study on the grounds of its methods, ran an expanded version of it, and could not replicate the effect. As a result, Thibodeau and Boroditsky (2015) designed a new experiment and, again, were able to demonstrate the framing effect of the *A is B* metaphors. Since conventional *A is B* metaphors may be interpreted as deliberate, but not necessarily so since they can also be seen as ambiguous, this may be one reason why not all studies pointed in the same direction.

This in turn led to two further studies, which focused more explicitly on the effects of deliberate metaphor use on political preferences by means of their extension in the rest of the text. One was by Reijnierse et al. (2015), which did not find clear effects, although there was a trend in the right direction. The other was by Thibodeau (2016), which demonstrated a clear effect of extension when the political preferences in the response materials were consistent with those expressed in the text, but which did not have an effect when they were inconsistent. Deliberate metaphor by extension seemed to influence text comprehension when considering its application in executing the task of deciding on political preferences, but did not seem to work equally well in both studies. Again, further research is required to see when, precisely, deliberate metaphors have the predicted effects (see also Hart, 2017, 2020).

Other tasks than the completion of surveys can be found in Thonus and Hewett (2016), De Vries et al. (2018) and Werkmann Horvat et al. (2023), and Silvestre-López et al. (2021). Thonus and Hewett trained half of a group of writing consultants in student writing centers in the deliberate use of metaphor when giving feedback, while leaving the other half of the group of consultants without training; they found that training indeed did have an effect of deliberate metaphor use in the consultants' production of feedback. De Vries and her colleagues studied eye movements of participants reading two short stories and found that deliberate metaphors were awarded more time than non-deliberate metaphors, which in turn were given less time than non-metaphorical words. Ana Werkmann Horvat and her colleagues utilized eye-tracking in combination with a forced-choice semantic relatedness task to demonstrate that the source domain of conventional metaphorical expressions can be activated when they are supported by further source-domain material in the form of a simile in the rest of the sentence, in contrast with when this does not happen. Silvestre-López and his colleagues designed four conditions in guided meditations that included a contrast between deliberate and non-deliberate metaphor use (versus no metaphors versus no text at all), and found that the deliberate metaphor conditions influenced self-reports of metathinking activity and affective state. Experimental data for deliberate metaphor use are hence growing across a range of methods and techniques including tasks and materials.

The above processing data are a modest but promising basis for further behavioral research. When it comes to structural-functional data, the findings are more encompassing. This is because DMT may also be formulated as a matter of mandatory attention to the source domain as a result of the Grammatical Concordance Hypothesis (Cuccio, 2018). Thus, when metaphors are expressed at the level of discourse, or when they are direct, novel, or signaled, they demand the addressee's attention to the source domain as part of the referential meaning of the utterance. You cannot comprehend 'Shall I compare thee to a summer's day?' without awarding separate referential attention to the summer's day as a summer's day. As a result, DMT research on deliberate metaphor has focused on the distribution and purpose of deliberate metaphor expressed in these particular structures and functions in a wide range of studies (Steen, 2023).

Some of this research is based on the application of a reliable method for general metaphor identification, called MIP (Steen et al., 2010), but initially had to make do with more subjective operationalizations of deliberate metaphor. With the advent of DMIP (Reijnierse et al., 2018), however, the identification and analysis of deliberate and non-deliberate metaphor in the structures and functions of natural language use and discourse has become quite reliable and valid. Its relation to the processes and products of real deliberate and non-deliberate metaphor use remains an empirical issue, as noted before.

A review of the available data can be found in Steen (2023). Corpus work such as Tay (2016) and Reijnierse et al. (2019) has focused on associations between metaphor properties like signaling (language), conventionality (thought), directness (reference), and deliberateness (communication), and found the predicted tendencies back in general patterns of language use. Distributions of these patterns across word classes and registers were also described (Reijnierse et al., 2019), with different distributions for the interaction between metaphor and word class in various registers for deliberate metaphors versus non-deliberate metaphors. Other studies have focused on the connection between deliberate and non-deliberate metaphor, on the one hand, and aspects of discourse domain, on the other. For instance, in politics, several studies demonstrated how deliberate metaphors clearly did other jobs than non-deliberate ones (Perrez and Reuchamps, 2014; Heyvaert, 2019; Heyvaert et al., 2020). Mujagić (2018, 2022) and Mujagić and Berberović (2019) has shown the same point for metaphor in media coverage of the issue of immigration. Other domains that have been described in this way include science (e.g., Navarro i Ferrando, 2016) and education (e.g., Jiménez Muñoz and Lahuerta Martínez, 2017; Cuberos et al., 2019). This is just a selection of the available research.

The comprehension and understanding of these types of metaphor in this type of context needs further experimental work. This is where process theory and research meets with structural-functional theory and research. This is where variation in metaphor structure and function interacts with variation in metaphor processing. This is the heart of DMT.

5. Discussion: thinking by metaphor, fast and slow

The basic question asked in DMT is this: do language users intend their metaphor to refer to some source-domain concepts as distinct aspects in the situation they project from their utterance, or not? If they do, then the utterance requires analogical processing in order to integrate the source domain within the situation model, which is about the target domain. Such a source domain typically functions as an alien perspective in a comparison, "alien" because the comparison is deliberately figurative. To DMT, metaphor use is about intended comparison between unlike things.

When a cross-domain comparison is intended as part of the referential meaning of the utterance, we are dealing with deliberate metaphor use. There are plenty of data showing that this requires analogical processing and that this typically happens with signaled, novel, and direct metaphors within utterances (at the level of language use). This is metaphorical thinking. It probably always happens with metaphors that are expressed as metaphors across utterances, at the level of discourse, but experimental research is scant here. At the same time, this type of metaphor use is quite infrequent.

If language users do not intend to refer to some source-domain concepts as distinct entities in the situation they project from their utterance, then their use of metaphor is non-deliberate. They do use a metaphor, but it only emerges via polysemy in the surface text and as corresponding source-domain sub concepts in the text base. This may even trigger short-lived early source-domain activation in the brain, which may be called metaphoric thought. Then lexical disambiguation kicks in, however, and the situation model gets constructed in terms of referents that only pertain to the target domain. There are plenty of data showing that this typically happens with non-signaled, conventional, and indirect metaphors, and it probably never happens with metaphors that are expressed as metaphors at the level of discourse. This type of metaphor use is the rule.

There are many other factors that can clearly play a role in the intentions to use a metaphor as a metaphor. They for instance have to do with characteristics of the participants, who may be sensitive to specific ways of communicating about important topics, such as serious illnesses. They may also concern expectations about the discourse domain within which a metaphor occurs, such as the common idea that literary texts promote metaphorical language use whereas scientific texts do the opposite. These and other factors can be brought together in a theory of genre about discourse events, which is one separate but fundamental issue in coming to terms with the factor of level of cognition in DMT (Steen, 2023), which is all about the interaction between variation in structures and variation in processes during comprehension and understanding.

All in all then, DMT was motivated to solve a problem in metaphor studies that was called the paradox of metaphor, and it looks as if it is on course in successfully addressing this. This is also because DMT was grounded in the general factor of 'level of cognition', which assumes a general distinction between language use and discourse that can be applied to reveal distinct aspects of metaphor and its comprehension. It is therefore now time to turn to yet another factor in the framework, that is, speed of cognition. This was introduced to frame DMT as a theory that can break new grounds in metaphor research, and can lead to new applications of it by slowing metaphor down (Steen, 2023).

With the publication of Kahneman's (2011) *Thinking, fast and slow*, a new way of looking at human cognition was made more possible. He suggests that cognitive scientists should consider thinking from two perspectives, which he dubbed as two systems, one fast and automatic and one slow and controlled with more volition and sometimes awareness (Kahneman, 2011: 21):

> I describe System 1 as effortlessly originating impressions and feelings that are the main source of the explicit beliefs and deliberate choices of System 2. The automatic operations of System 1 generate surprisingly complex patterns of ideas, but only the slower System 2 can construct thoughts in an orderly series of steps. I also describe circumstances in which System 2 takes over, overruling the freewheeling impulses and associations of System 1.

Even though there has been criticism of Kahneman's proposal, his ideas have facilitated new ways of thinking that can also be fruitfully applied to metaphor comprehension (and its production and related processes). They moreover tally well with the independent elaboration of the CI model by Gambi and Pickering (2011), who also speak of an automatic versus an intentional system of cognition.

Metaphor can be comprehended fast and automatically. But it can also be comprehended a little less fast (Steen, 2023), and this raises the question when less fast becomes slow. Kahneman's theory of problem solving at different speeds and involving different systems of cognition can lead the way here to reconsider how speed of metaphor comprehension is important for theories of metaphor, and in particular for DMT. That metaphor processing can be related to problem solving was pointed out by for instance Kintsch (2008).

DMT holds that thinking by metaphor can be fast and slow (Steen, 2023). It is always fast when it relates to metaphor processing by lexical disambiguation, since that is typically a fully automatic and unconscious process. This would be the case for non-deliberate metaphor processing, which is the rule. It will involve metaphoric thought, in the surface text and text base, but it does not exhibit metaphorical thinking, in the situation model and context model.

Thinking by metaphor can be a little less fast but still automatic and unconscious when people successfully comprehend deliberate metaphors in otherwise neutral contexts. The data from the experiments comparing novel with conventional metaphors, or metaphors with similes, show that this is possible. Generally, analogizing and making comparisons can go fast and without shifting gears in cognition from automatic to less automatic. This is metaphorical thinking, as opposed to metaphoric thought, and it is fast. This is the exception to the rule.

Metaphorical thinking can slow down, however, in several cases. Some novel metaphors may be too difficult or complex to immediately make sense, for instance. Then people have to work harder to come to a satisfactory representation of the utterance, and this may slow them down. It may lead to metaphor awareness, in that people recognize the identity of the little puzzle they have run up against, which in turn may be related to stimulating metaphor recognition, interpretation, and appreciation. This may then even lead to people's realizing that they are 'doing metaphor', which is a form of metaphor consciousness. All of these options affect the content of their mental representation of a metaphor and what people can do with it. This is the exception to the exception to the rule.

Another way in which thinking by metaphor can slow down is when metaphors are not necessarily novel but ask attention for longer times. This will happen in particular when authors design their texts in such a way that a metaphorical mapping is extended across a number of utterances, or even an entire text. The obvious place where this may be expected to happen is literature. However, science communication also makes use of this device, as I have illustrated in my discussion of Susan Greenfield's *A day in the life of the brain* (Steen, 2023). But even in live interaction, such as therapy sessions or political debates, metaphor may be exploited at longer time intervals to explore the perspective it may generate on an important topic in the session. This is also an exception to the exception to the rule.

One special form of this type of metaphorical thinking that can be slow is people's resistance to metaphor. For various reasons, specific discourse participants may not like the use of a particular metaphor in a particular way in a specific discourse situation, and protest. Examples where this may or does happen have been collected at an increasing rate in recent research, in the above-mentioned corpus work as well as in dedicated case studies (e.g., Renardel de Lavalette et al., 2019; Finsen et al., 2021; Wackers et al., 2021). This type of research has potential implications for advice on how to communicate and how to design texts and conversations, and would eventually lead DMT into areas of production and interaction.

All of these are moments when metaphor is slowed down, at least for a while, for examining the purpose of its contribution to the discourse event. This probably does not happen very often, which also seems to be suggested by the data collected so far. But it can happen, it does happen, and the big question is when, how, and why it happens. Also, how does this relate to most moments of metaphor processing, where it does not happen? Moreover, the next question is how this can be exploited better, against the background of what we know about how people use metaphor in most cases. Slowing metaphor down would give people more power over their use of metaphor than has long been acknowledged.

Metaphor may have a lot of power over our thinking and actions, but this is not unlimited. Indeed, it seems possible that slowing metaphor down may give us back some of the power over our thinking by metaphor. It is one other fundamental aspect of DMT to show how this can be related to general structures and functions of metaphor as well as to the general mental processes and products of its comprehension and more broadly its use, deliberate or non-deliberate. In this context, the relation between comprehension and understanding and the possibility of post-comprehension use of conceptual metaphors, as well as the ambiguous status of many indirect conventional metaphors between deliberate and non-deliberate use are two exciting novel topics that have been newly generated by this line of inquiry.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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On choosing the vehicles of metaphors 2.0: the interactive effects of semantic neighborhood density and body-object interaction on metaphor production

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In a metaphor, such as *language is a bridge*, two distinct concepts known as the topic (i.e., *language*) and vehicle (i.e., *bridge*) are juxtaposed to produce figurative meaning. Previous work demonstrated that, when creating metaphors, participants choose vehicles that are concrete, rather than abstract, and are also a moderate semantic distance away from the topic. However, little is known about the semantic representations underlying metaphor production beyond topic-vehicle semantic distance and vehicle concreteness. Here, we studied the role of two semantic richness variables in metaphor production – semantic neighborhood density (SND), which measures the proximity of a word and its associations in semantic space, and body-object interaction (BOI), which reflects the ease with which a human body can motorically interact with a word's referent. In each trial, participants were presented with an abstract topic, such as *miracle*, and were instructed to make an apt and comprehensible metaphor by choosing a vehicle word (e.g., *lighthouse*). All of the topics were abstract but half were high-SND (from dense semantic neighborhoods) and half were low-SND (from sparse semantic neighborhoods). Similarly, half of the potential vehicle words were either high or low in SND and also differed on BOI such that half were high-BOI (e.g., *bicycle*), whereas half were low-BOI (e.g., *rainbow*). We observed a three-way interaction such that participants selected low-BOI, rather than high-BOI, vehicle words when topics or vehicles were high-SND. We interpret this finding to suggest that participants attempt to reduce the overall semantic richness of their created metaphors.

KEYWORDS

metaphor, embodied cognition, semantic richness, body object interaction, semantic neighborhood density

Introduction

The majority of psycholinguistic studies on metaphor focus on comprehension, leaving the important question of metaphor production poorly understood (Holyoak and Stamenković, 2018). Moreover, those few studies that examine metaphor production tend to focus on a variety of questions, such as pragmatic factors that promote metaphor production (Hussey & Katz,

2006); brain networks involved in metaphor production (Beaty et al., 2017); the role of working memory in metaphor production (Chiappe and Chiappe, 2007); individual differences in semantic networks in creative metaphors (Li et al., 2021); or the distinction between metaphor and simile production (Oka et al., 2022). While these studies characterize multiple facets of metaphor production, they do not address a more basic elementary question; namely, what kinds of concepts are chosen to produce good metaphors? That is, why is it apt to describe one's lawyer as a *shark*, and perhaps less apt (though conventional) to describe a faulty car as a *lemon*? In this paper, we characterize the semantic representations that make for producing comprehensible novel metaphors.

Katz (1989) employed a vehicle selection paradigm to bring metaphor production under experimental control. In his task he asked participants to complete metaphor frames (e.g., *Sociology is the _____ of sciences*) by choosing the single best word from a list to serve as a vehicle (e.g., *robin*, *hawk*, *USA*, *Switzerland*, etc.). Two primary semantic variables of the selected vehicles were analyzed, word concreteness and semantic distance to the topic. Both concreteness and semantic distance effects were observed. Participants chose concrete vehicles more often than they did abstract vehicles, and the vehicles that were chosen were a moderate distance from the topic, rather than near or far. Therefore, Katz showed that a vehicle's concreteness and its position among other concepts in semantic space both play a role in producing metaphors.

In this paper, we extend on the work of Katz (1989) by characterizing the semantic representations of topics and vehicles in metaphor production beyond semantic distance and concreteness. Again, a vehicle selection task was employed wherein participants were provided with abstract words that served as metaphor topics, and provided with a word-bank of concrete words to serve as vehicles. We focused on two semantic variables that are related to the variables studied by Katz (1989).

First, while Katz examined the semantic distance between topic and vehicle, we considered the semantic neighborhood density (SND) of the topic and vehicle words, which characterizes the proximity of a word and its neighbors in semantic space (Buchanan et al., 2001). Second, although Katz demonstrated that concrete words are preferred to use as metaphor vehicles, it remains unclear what aspects of concreteness are important. One aspect of concrete concepts is their motoric affordances (Gibson, 1979). Some concepts afford motoric interaction, such as *bicycle*, in as much as we interact with the referent motorically in many ways, whereas with others, such as *butterfly* we have less motoric interaction. Therefore, it is unclear if motoric interaction is the driver of concreteness effects in metaphor production. To investigate this, we considered body-object interaction (BOI), which characterizes the ease with which one can interact with a word's referent (Siakaluk et al., 2008). Below, we describe these variables in greater detail and how they may pertain to metaphor processing.

Body-object interaction

Body-object interaction has been studied in a number of lexical and semantic decision studies (Siakaluk et al., 2008), with the common finding that high-BOI words such as *bicycle* are responded to faster than low-BOI words such as *butterfly*. Concepts that are high in BOI are argued to be semantically richer, such that they contain more semantic information, which facilitates their relatively rapid activation. However, BOI effects are task dependent; Tousignant and Pexman (2012) reported that BOI behavioral effects are cancelled out when they are expected (see also Muraki et al., 2023). From an embodied cognition perspective, BOI concepts may be processed faster because they are more amenable for sensorimotor simulations (Siakaluk et al., 2008). This is consistent with neuroimaging findings indicating that high-BOI concepts activate kinesthetic brain regions (Hargreaves et al., 2012). Moreover, in tasks emphasizing motoric interaction (i.e., *does the word refer to something that is touchable*?), high-BOI and low-BOI concepts evoke distinct early electrophysiological effects (Al-Azary et al., 2022). The present study is the first to examine the role of BOI in metaphor processing, whereby participants created metaphors by choosing vehicles that, although are all concrete, vary on BOI. Focusing on BOI allows one to tease apart the aspects of concreteness that drive metaphor production; if high-BOI concepts are favored in metaphor production, it would suggest that motoric properties of vehicles are a primary source of metaphorical meaning. Conversely, if low-BOI concepts are favored in metaphor production, it would suggest that other modalities related to concreteness, such as visual imagery, play a primary role in constructing metaphorical meaning.

Semantic neighborhood density

In addition, to body-object interaction, we also considered semantic neighborhood density (SND), which is a measure of the average similarity between a word and its nearest associations (Buchanan et al., 2001). Semantic neighborhood density has been demonstrated to affect metaphor comprehension in a variety of online and offline processing tasks (Al-Azary and Buchanan, 2017; Al-Azary et al., 2019, 2021). In sum, the aforementioned studies on SND and metaphor comprehension demonstrate that words from sparser, rather than denser, semantic neighborhoods, result in more comprehensible metaphors. Al-Azary and colleagues argued that semantically dense words have little "room" to take-on novel metaphorical associations. Here, we examine if SND affects metaphor production in the same manner as metaphor comprehension. We focused on the vehicle's SND, in order to determine if this variable interacts with BOI. Moreover, we also considered the SND of the topic, as greater topic SND has been shown to negatively affect metaphor interpretations (Reid et al., 2020).

In the present study, participants were presented with abstract words to serve as metaphor topics (e.g., *secrecy*) and selected a vehicle word from a word-bank (e.g., *rat*) to create novel metaphors (i.e., *secrecy is a rat*). We opted to restrict the topics to abstract concepts because abstract concepts are typically grounded metaphorically with concrete concepts (e.g., Lakoff and Johnson, 2003; Barsalou, 2012). The topic words varied on semantic neighborhood density and the vehicle words varied on both semantic neighborhood density in addition to body-object interaction.

Method

Participants

Sixty people participated, each for a compensation of $10 CAD. Participants were recruited from poster advertisements around

campus, and the summer participant research pool at the University of Western Ontario. Participants reported being native speakers of English.

Materials

Topics

Abstract words, determined by their ratings in the Brysbaert et al. (2014) concreteness norms, were used as topics. Words were chosen from the lowest concreteness quartile and therefore are the most abstract. Semantic neighborhood density was derived from the WINDSORS database (Durda and Buchanan, 2008), a global co-occurrence model used in previous metaphor processing research (Al-Azary and Buchanan, 2017; Al-Azary et al., 2021), and was defined as the average semantic distance between a word and its neighbors within 3.5 standard deviations away. A median split value was used to categorize words as either high or low-SND. Eighteen of the topics are high SND whereas 18 are low SND. Furthermore, topics were low-frequency, ranging from 1–40 per million words, also defined in the WINDSORS database. The abstract-high SND and abstract-low SND topics did not differ significantly on abstractness, $t\,(34) = 1.0076$, $p = 0.32$, or frequency, $t\,(34) = 0.34$, $p = 0.74$ but as expected, differed on SND, $t\,(34) = 9.24$, $p < 001$. See Table 1 for the full list of topics.

Potential vehicles

The items chosen as potential vehicles are concrete nouns (all rated greater than 4.5 on a 5-point concreteness scale; Brysbaert et al., 2014) but differed on BOI. Body-object interaction is determined from normed studies; here, we used databases of multisyllabic (Bennett et al., 2011) and monosyllabic (Tillotson et al., 2008) nouns. To develop a suitable list of items, as a starting point, we rejected the use of any vehicles which were used in metaphors that were rated less than 2 on a 1–6 scale in previous norming studies wherein we randomly paired topics with words varying on BOI.[1] Lastly, each list of vehicles only had two animate items, which ought to further reduce unwanted variability that can occur with studying BOI, as low-BOI items tend to be animate while high-BOI items tend to be inanimate (Heard et al., 2019). The result was four conditions of vehicles, each with 12 items (i.e., high BOI-high SND; high BOI-low SND; low BOI-high SND; low BOI-low SND). See Table 2 for the full set of vehicle words.

One-way ANOVAs were conducted to ensure the four vehicle conditions only differed on BOI and SND. The vehicles did not differ in concreteness, ($p = 0.119$); or frequency, ($p = 0.952$). Critically, the manipulation of BOI is significant, ($p < 0.001$), with Tukey-HSD tests confirming that the high-BOI items, across SND, do not significantly differ ($p = 0.97$) nor do the low-BOI items, across SND ($p = 0.75$), but the high and low BOI items differ from one another (both p's < 0.001). The same can be said for the SND manipulation ($p < 0.001$), with Tukey-HSD tests confirming that high-SND items do not significantly differ ($p = 0.99$) nor the low-SND items ($p = 0.90$), but the high and low-SND items do (both p's < 0.001).

TABLE 1 Words serving as topics and their respective semantic conditions.

High SND	Low SND
Eternity	Luck
Euphoria	Legacy
Courage	Revenge
Loyalty	Irony
Repentance	Prestige
Honesty	Destiny
Epiphany	Imagination
Serenity	Betrayal
Empathy	Nostalgia
Patience	Temptation
Obsession	Innocence
Ambition	Persuasion
Sadness	Metaphor
Narcissism	Miracle
Guilt	Boredom
Sincerity	Secrecy
Hatred	Solitude
cowardice	Amusement

TABLE 2 Words serving as potential vehicles and their respective semantic conditions.

High-BOI High-SND	High-BOI Low-SND	Low-BOI High-SND	Low-BOI Low-SND
Typewriter	Shovel	Butterfly	Lighthouse
Flashlight	Umbrella	Submarine	Volcano
Violin	Balloon	Statue	Pillar
Pillow	Wheelchair	Medal	Tiger
Ant	Pencil	Anchor	Pendulum
Bicycle	Puzzle	Airplane	Rainbow
Cigarette	Rat	Cannon	Palace
Seed	Clay	Dinosaur	Eagle
Wine	Hammer	Rocket	Lightning
Sword	Vacuum	Castle	Prairie
Camera	Gate	Storm	Cloud
Fish	Cat	Mountain	Desert

Procedure

Participants were instructed that their task was to create metaphors by choosing a vehicle which, with the presented topic,

1 For example, in initial norming studies, the word *pelican* did not work in *Love is a pelican*, *Time is a pelican*, *Life is a pelican*, or *Diplomacy is a pelican*. It is likely that *pelican* may be an acceptable vehicle for a particular topic in an appropriate context, but we exclude its use for the current study. Moreover, vehicles in the BOI databases with somewhat similar meanings were reduced (e.g., *lion* and *tiger*) by choosing the one which satisfied other psycholinguistic constraints imposed on the stimuli (e.g., keeping frequency and concreteness matched). See Al-Azary (2018) Studies 1 and 2.

creates a comprehensible and apt metaphor. The instructions included *time is a river* and *time is a pickle* to demonstrate that not every topic-vehicle pairing is suitable. A practice trial involved the word *Time* along with the 48 vehicles. Participants were asked to choose a vehicle for the topic, and write out the entire metaphor on a provided sheet of paper. After this practice trial, the experimental trials followed. An experimental trial consisted of the presentation of a slide that included an abstract topic-word along with 48 vehicles presented below it. The order of the vehicles was pseudo-random such that each of the 36 slides contained a unique order of the vehicles. For each trial, participants were asked to choose a vehicle that, when paired with the presented topic, results in an apt and comprehensible metaphor, and subsequently wrote out the entire metaphor in the A is B format on their provided sheet in a numbered order from 1–36. In a subsequent task, participants were asked to interpret their metaphors, but this data is not included here as it was for a separate research question.

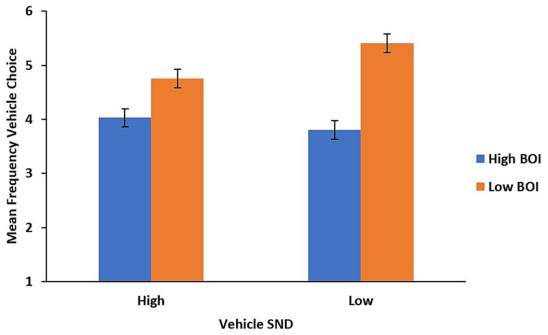

FIGURE 1
Vehicle SND by vehicle BOI interaction. Error bars represent standard error of the mean.

Results

The data from 11 participants were not included in the analysis, for one or more of the following reasons: they did not complete the study, created many similes despite the instructions given, or created extended metaphors. Thus, the analyses are based on 49 participants. The resulting participants created and interpreted nominal metaphors of the form A is B (although 5 of which each created a single simile – we included such participants because a single simile may not necessarily be strategic, but possibly accidental). A topic (high-SND vs. low-SND) by vehicle BOI (high vs. low) by vehicle SND (high vs. low) repeated measures ANOVA was conducted on the frequency of vehicles chosen from the four semantic conditions. A main effect of BOI was obtained, F (1, 48) = 31.297, p = <0.001, η_p^2 = 0.395; participants chose low-BOI vehicles (M = 5.1, SE = 0.104) 56.4% of the time whereas they chose high-BOI vehicles (M = 3.9, SE = 0.103) less frequently at 43.5% of the time; however, this main-effect was qualified by two interactions. First, a vehicle-BOI by vehicle-SND interaction was observed, F (1, 48) = 9.883, p = 0.003, η_p^2 = 0.171. As is depicted in Figure 1, the effect of BOI differs for high and low-SND vehicles: low-BOI vehicles were preferred for both high and low-SND items but this preference was greater for low-SND vehicles than high-SND vehicles.

Most importantly, a three-way, topic SND by vehicle BOI by vehicle SND, interaction was observed, F (1, 48) = 9.1, p = 0.004, η_p^2 = 0.159. As Figure 2 shows, the distribution of vehicle choices differs between high and low-SND topics. A simple-main effects analysis with vehicle BOI as the factor and topic and vehicle SND as the moderating factors revealed that, the low-BOI effect was present when the topic was high-SND and the vehicle was low-SND, F (1) = 40.74, p < 0.001 but not when the topic and vehicle were both high-SND, F (1) = 1.59, p = 0.21. Thus, for high-SND topics, participants relied more on low BOI – low SND vehicles to construct apt metaphors. We interpret this as an attempt by participants to reduce the overall semantic richness of the metaphor because the topic is already from a dense semantic neighborhood. Moreover, simple main effects analyses also revealed that when the topic was low-SND, the low-BOI effect was observed when participants selecting high-SND vehicles, F (1) = 8.27, p = 0.006, but no BOI effect was observed when both topic and vehicles were low-SND, F (1) = 2.17, p = 0.15. We interpret this to mean that when the topic is low SND, participants are drawn to low-SND vehicles, and higher semantic richness from BOI is tolerated. Moreover, when selecting a high-SND vehicle for a low-SND topic, participants preferred low-BOI words, again to reduce the richness from high-SND vehicles. Thus, when the topic is from a sparse semantic neighborhood, vehicle semantic richness does not matter as much as when the topic is from a dense semantic space.

In sum, participants did not choose the semantically richest vehicles when creating novel metaphors. Rather, our findings demonstrate that semantic richness is detrimental to metaphor processing, and that, on average participants aim to reduce semantic richness of the metaphor when selecting an apt metaphor vehicle to create a metaphor.

Discussion

While Katz (1989) showed that concrete words serve as better metaphor vehicles than abstract words, our results characterize the nature of vehicle concreteness further. In general, our results showed that semantically less-rich concrete concepts are more amenable for metaphorical abstraction. In particular, we observed that sensorimotor and linguistic richness variables interact in novel metaphor production, such that participants reduced the overall semantic richness of their novel metaphors. This finding observed in the metaphor production task is consistent with recent work demonstrating that semantic richness is detrimental to novel metaphor comprehension. For example, Al-Azary and Buchanan (2017) constructed various novel metaphors varying on topic-concreteness and semantic neighborhood density of the topic and vehicle words, resulting in four conditions varying in semantic richness (abstract – low SND; concrete – low SND; abstract – high SND; concrete – high SND). They found that concreteness and semantic neighborhood density interacted, with semantically less-rich metaphors (low SND metaphors) being the most comprehensible, followed by abstract – high SND metaphors, and concrete – high SND metaphors, the semantically richest condition, being least comprehensible. To interpret their results, they argued that semantic richness, coming from topic concreteness and semantic neighborhood density, is detrimental to constructing metaphorical meaning, as such

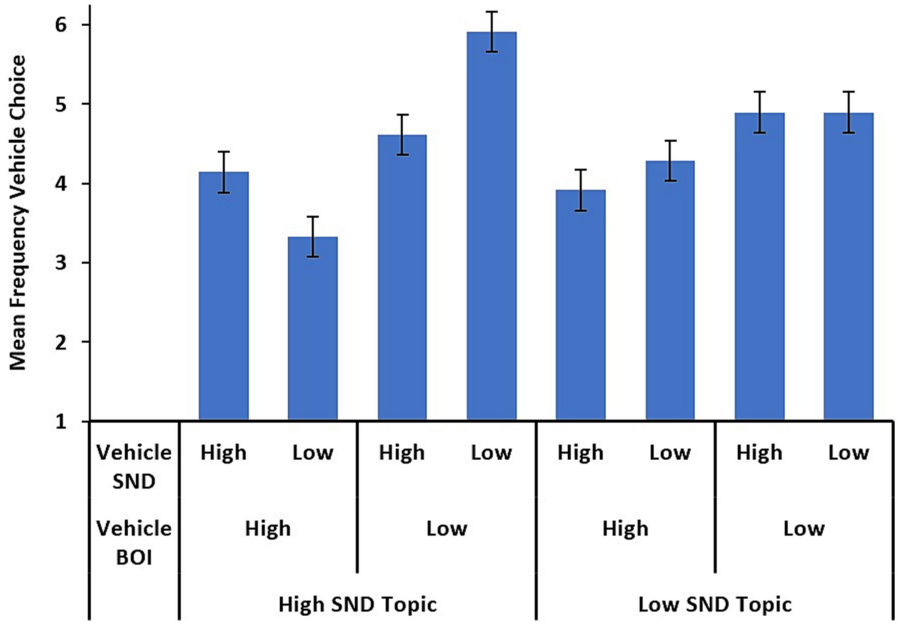

FIGURE 2
Condition means across levels of topic SND and vehicle SND and BOI. Error bars represent standard error.

rich semantic representations are too specific and less malleable to take-on novel metaphoric associations. Moreover, irrelevant semantic properties, of which semantically richer concepts will have more of, must be inhibited during processing (Kintsch, 2000). Subsequent studied have reported similar findings in both offline and online tasks, and in special populations (Al-Azary et al., 2019, 2021). The present study extends findings of semantic richness to body-object interaction, and to metaphor production (rather than sole comprehension). We interpret the current results in a similar fashion to Al-Azary and Buchanan (2017); namely, semantically rich representations are too specified to take-on novel metaphorical meanings during metaphor processing. This was apparent here with the three-way interaction, as participants chose vehicles that were both low-BOI and low-SND when creating metaphors for high-SND topics.

The finding that low-BOI words served as better metaphorical vehicles on average (and especially when topic and vehicle words were high-SND) may be interpreted as evidence against embodied cognition, as such words are less amenable to motoric simulations than high-BOI counterparts. However, one must be cautious in such an interpretation, as the low-BOI words used in our study are nonetheless concrete concepts, and as such, can evoke sensory imagery. For example, low-BOI concepts such as *lighting* or *tiger* can trigger embodied simulations wherein one creates scenarios involving such concepts, even though one may not directly motorically interact with those words' referents. Moreover, experimental work has demonstrated that bodily-actions related to concrete concepts are activated during metaphor processing (Al-Azary and Katz, 2021). Therefore, our results do not adjudicate between theoretical positions that necessitate a role for sensorimotor simulations in nominal metaphor comprehension (e.g., Gibbs and Matlock, 2008) or those that eschew sensorimotor simulations in favor of abstract representations (e.g., Glucksberg, 2008). However, our findings of low-BOI effects suggest that first-person motoric interaction, which BOI characterizes, is not the primary factor driving concreteness effects in metaphor production.

The semantic richness variables we considered – body-object interaction and semantic neighborhood density – characterize distinct sources of experience. Body-object interaction is learned through embodied experience whereas semantic neighborhood density reflects disembodied linguistic experience. The fact these two distinct variables interact in metaphor processing lends support to theoretical views that posit the presence of embodied and disembodied semantic representations that conjointly influence cognition (Paivio, 1971; Barsalou et al., 2008; Dove, 2011). Moreover, it has been argued that metaphor is a tool for building abstract representations from concrete concepts (Jamrozik et al., 2016). According to this "sensorimotor shedding" framework, novel metaphors are thought to be processed by sensorimotor simulations, and after repeated use, the sensorimotor properties begin to "shed," making way for more abstract meanings to acrue. For example, consider *lemon*, a conventional word that metaphorically refers to something of little value due to its faultiness (e.g., *my car is a lemon*). Initially, *lemon* would be processed concretely, evoking multimodal simulations of taste, smell and feel, and after repeated exposure in linguistic contexts, develops an abstraction that is the primary representation when used metaphorically (see Al-Azary and Katz, 2021 for experimental support for this hypothesis). We speculate that low-BOI concepts, having less motor richness, have a "head start" in shedding their sensorimotor properties, and for this reason, are more amenable for metaphorical abstraction, as demonstrated in our study.

Other work has demonstrated that metaphorical potential is captured in a word's relationality (Jamrozik et al., 2013). Accordingly, words such as *marriage* are more metaphorical than entity words, such as *knife*. Our work, however, demonstrates that among entities, there is considerable variation in metaphorical potential, which is predicted by word-level semantic representations such as semantic

neighborhood density and body-object interaction. However, future work ought to characterize further the nature of metaphoricity in concrete concepts. For example, although concrete concepts are often defined in relation to imagery, imageability and concreteness are related yet distinct dimensions (Paivio et al., 1968). That is, some words are imageable, yet low on concreteness (such as *ghost*). Moreover, our focus was on motoric interaction, but other modalities in concrete concepts may play a role in metaphor, such as concepts with salient auditory (e.g., *thunder*) or motion (e.g., *bullet*) properties (see Cardillo et al., 2017 for modality specific metaphors). Furthermore, other measures of semantic richness have yet to be explored in metaphor processing experiments, such as the number of semantic features (McRae et al., 2005; Buchanan et al., 2019). Some concrete concepts are semantically rich because they have a high number of features, such as *toad* whereas others, like *guppy*, have fewer features and are semantically less-rich. More broadly, however, we acknowledge that pragmatic context can, and often does, make virtually any concept metaphorical, and can also shape a word's intended metaphorical meaning (Gibbs et al., 2011; Haught, 2013). It should be the goal of future research to investigate the boundary conditions of semantic effects on metaphor processing, and how semantic representations interact with pragmatic contexts.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the University of Western Ontario Research Ethics Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

HA-A conceived and designed the experiment, collected and analyzed the data, and wrote the first draft of the manuscript. ANK played a supervisory role in every step of the process and supported the project with grant funding. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Multimodal artistic metaphors: Research on a corpus of Sardinian art

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The study aims to define an artistic metaphor and highlight the multimodal properties of metaphors in artistic environments. In this research, an artistic metaphor has a relevant aesthetic purpose and it conveys beauty. Interpreting a metaphor in Sardinian art requires time for contemplation, however the cognitive effort of understanding the meaning of an artistic metaphor is rewarded by the delight of those who contemplate it. This metaphor has some characteristics in common with a visual metaphor but differs from other types of images that have been more extensively analyzed in the literature: it is difficult to establish a specific directionality, and consequently, it is not easy to recognize the target and source domains; the way it is expressed makes its interpretation and classification problematic at times. A proposal is presented in the paper to describe artistic metaphors according to universal macro-categories, inspired by the knowledge of Aristotelian and Kantian categories and by studies in the field of aesthetics: (1) time, (2) space, (3) decontextualization of stereotypes, and (4) fusion of forms. These categories are applied to a corpus of artworks by important artists in Sardinia to show that the visual, tactile, and auditory components of the pictures can boost an effective comprehension of figurative meaning. Results suggest that the multimodality of Sardinian artistic metaphors orients the observer toward original possibilities of learning and stimulates knowledge of the "submerged" wealth of symbols and archetypes that characterize insularity.

KEYWORDS

artistic metaphors, figurative language, multimodality, metaphor, Sardinia

1. Introduction

Imaginative effects have been found in particular in the processing of metaphorical utterances and figurative ways of thinking. In *Philosophical Investigations* (1953), Wittgenstein contemplated the possibility of seeing and interpreting an image now as one thing and now as another (*sehen als*). For instance, the figure of Jastrow[1] can be seen as either a hare's head or a duck's head (Wittgenstein, 1953). "Seeing as" is an intermediate concept between seeing and thinking; it is not to be understood as a state of an exclusively intellectual nature (Voltolini, 1998; p. 144) and differs from the ordinary perception of an object because it has a voluntary aspect.

According to Davidson (1978), metaphorical language does not evoke concepts that are linguistically encoded but rather images that are not part of the encoded language. As a secondary effect of linguistic and pragmatic processing, the recipient often imagines visual content in their mind that is automatically activated *via* mental imagery.

Mental images are non-propositional effects of language (Carston, 2018). More specifically, this type of figurative or literary language is characterized by a variety of expressive nuances, their undefined aspect, and the possibility of their triggering perceptual, emotional, and sensorimotor processes (Wilson and Carston, 2019). Although they retain a

1 Image reference: <https://it.wikipedia.org/wiki/Illusione_anatra-coniglio#/media/File:Kaninchen_und_Ente.png> (09/01/2022).

trace of the literal meaning, imaginative effects are especially formed in the process of interpreting novel verbal metaphors (Carston, 2010). In addition, some properties that have been ignored or undervalued in the involved domains of metaphor may be highlighted when mental images are evoked (Indurkhya, 2006, 2016; Wilson and Carston, 2008), and also in the visual sphere (Bolognesi and Cavazzana, 2020).

When comprehending visual metaphors, multimodal mental imagery (Nanay, 2016) acts similarly to an inference in the verbal realm; it may be a "seeing" or a "hearing" despite the lack of appropriate immediate sensory input and is distinct from perception, which is instead the registration of a physically present stimulus (Kosslyn et al., 1995). Unlike compulsory and involuntary perceptual processing, the production of mental imagery derives from memory and the ability to imagine and acts under the control of the will (in the sense that it can be activated or not). Visual metaphors in advertising communication, which involve quick comprehension, often activate the observer's mental image.

The triggering of mental imagery is necessary to understand those visual metaphors in which one of the two domains is not visible. For instance, in the contextual visual metaphor, the image-demanding metaphor in Figure 1 requires an image of not only the object representing the source domain (the pregnant belly), but also the metaphorical action of caressing the pregnant belly (instead of embracing the tree) (Ervas, 2019).

Some visual metaphors are also used in education due to their communicative effectiveness. These metaphors show a vividness that carries new meanings and has a profound impact on our experience of the world (Contini and Giuliani, 2021; p. 10).

It is now necessary to define what is meant by artistic metaphors. In this research, an artistic metaphor has a relevant aesthetic purpose: it conveys beauty and enjoyment. Interpreting an artistic metaphor, in this particular case a metaphor in Sardinian art, requires time for contemplation and activation of the senses. However, the cognitive effort of interpreting the meaning of an artistic metaphor is rewarded by the delight of those who contemplate it. What is perceived is not neutral: it can imprint itself on the observer's memory, reinforce cultural identity, and trigger universally applicable thoughts.

An artistic metaphor has some characteristics in common with a visual metaphor: it can be a *monomodal metaphor* when the target and source domains are equally represented in the same modality, as is often the case in untitled works of art in which the visual component is dominant; or it can be a *multimodal metaphor* when the target and the source are exclusively or predominantly represented in different modalities, which may include not only the visual and verbal modalities—as in the title of the work or in verbal utterances placed within the visual framework, such as in street art—but also the acoustic, tactile, and olfactory modalities (Forceville and Urios-Aparisi, 2009).

An artistic metaphor can meet the conditions of homospatiality and non-compossibility (Carroll, 1994). It can show incongruent effects in the image and trigger surprising thought processes in the viewer. However, an artistic metaphor differs from other types of images that have been more extensively analyzed in the literature for the following reasons: (1) It is difficult to establish a specific directionality, and consequently, it is not easy to establish the target and source domains; (2) The way it is expressed through the realization techniques and color rendering makes its interpretation and classification problematic at times; and (3) The artist who creates an artistic metaphor often does not have to pursue a commercial goal (like an advertising graphic designer) and, therefore, projects their way of imagining and interpreting reality onto the image they create, possibly disorienting the interpreter in the stages of decoding meanings.

Finally, an artistic metaphor is different from metaphorical art: in an artistic metaphor, the metaphor is found in the visual structure of the artwork, whereas in metaphorical art, the metaphor can only be found in the titling of the artwork. For instance, in *The River of Life*, a work of landscape painting by William Blake,[2] the metaphor is only found in the caption (the textual content is conceptualized by the metaphor *Life is a river*) and is not found in the visual structure of the artwork (Wollheim, 1984).

In what follows, nine works of art produced on the island of Sardinia (Italy) are analyzed to show that artistic multimodality can orient the gaze of the recipient toward new perspectives of understanding.

2. Categorization of metaphors in art

Forceville (1996, 2008) categorized visual metaphors into four types:

1. *Hybrid visual metaphor*: when the objects representing the source and target domains are fused into a single object.
2. *Contextual visual metaphor*: when the object representing the source substitutes for the object representing the target or vice versa.
3. *Pictorial simile*: when the source and target domains are depicted by juxtaposed objects.
4. *Integrated metaphor*: when the object is represented in its entirety so that it resembles another object even without contextual cues.

Bolognesi et al. (2018) also cataloged a genre-structured corpus, taking into account the denotative and connotative dimensions of meaning. Observing the corpus, it seems more effective to frame images in specific categories that belong to advertising communication in specific categories. Indeed, target domains are easily distinguished from source domains because they reflect the promotional intentions of brands, and visual structures are persuasively devised because they are intended to achieve specific commercial purposes. Therefore, all "other" images that cannot be placed within a specific visual scheme need a different framing. Artistic metaphors are not often bound to such specific objectives to be pursued by the artist. Rather, these metaphors manifest a certain freedom of expression in the use of techniques, color rendering, and representation of subjects, suggesting multiple levels of interpretation to the interpreter. Therefore, a new and systematic categorization of artistic metaphors is needed.

2 Reference to the image: https://www.tate.org.uk/art/artworks/blake-the-river-of-life-n05887 (02/16/2023).

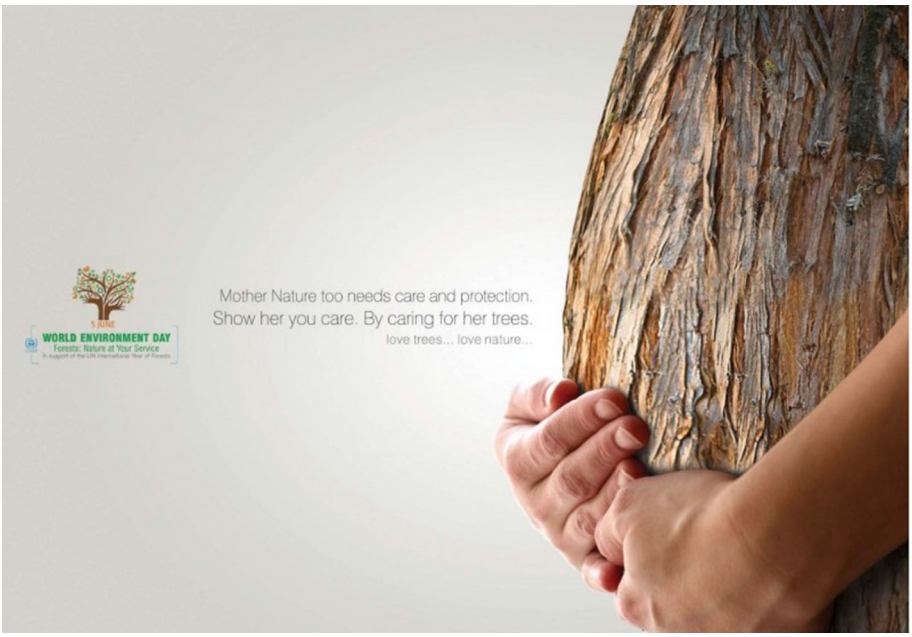

FIGURE 1
Example of contextual visual metaphor (World Environment Day, reproduced with permission from Creative agency: Valappila Communication, India).

3. Methodology

A proposal is presented in the study to describe artistic metaphors according to universal macro-categories, inspired by the knowledge of Aristotelian and Kantian categories and by studies in the field of aesthetics and philosophy of art (Walton, 1970): (1) time, (2) space, (3) decontextualization of stereotypes, and (4) fusion of forms (Table 1).

Only four categories are discussed: the category of decontextualization of stereotypes and one of the fusions of forms that, though universally recognized (such as those of space and time), have cultural implications. These categories help us identify the multimodal structure of artworks. The first macro-category is "time," which is divided into various sub-categories. Temporality is inherent in the creation of the artwork. For instance, performance works that need a time frame to be realized and/or to manifest themselves unexpectedly to the spectator. In the performance *Balkan Baroque*, Marina Abramović sat for 6 hours a day for 4 days on a pile of cattle bones, which she cleaned of flesh and cartilage to denounce the atrocities of the Balkan war.[3] The physicality shown and the metaphorical representation of the bodies (Wollheim, 1984) allow the observer to fully understand the meaning of the provocative action: the bones torn from the flesh of cattle can evoke in the mind of the beholder the atrocious imagery of people who died in the war (Settis and Montanari, 2019; p. 400). Works that arise only in a temporal dimension of immediacy are also available. The performance *The Artist Is Present*[4] in 2010 was generated when Abramović sat at a table and looked at the visitors to the MoMA in New York, activating unexpected perceptual experiences in herself and the audience. Thus, the temporal dimension can be expressed not only from

TABLE 1 Four categories to describe artistic metaphors.

Time	• In the creation (e.g., *Balkan Baroque*, Marina Abramović) • Immediacy (e.g., *The Artist Is Present*, Marina Abramović) • Point of view of the observer (e.g., *Stories of St. Francis*, Giotto) • Inside/outside the frame • With/without a caption
Space	• Inside/outside the frame (e.g., murals, Keith Haring) • Space within space (e.g., *La condition humaine I, II*, René Magritte) • Symbolic (e.g., *The Scream*, Edvard Munch) • With/without a caption
Decontextualization of stereotypes	• Surreal dimension (e.g., *The Persistence of Memory*, Salvador Dalí) • Inside the frame (e.g., *Guernica*, Pablo Picasso) • Outside the frame with unusual techniques of realization (e.g., *Sacco Rosso*, Alberto Burri) • With/without a caption
Fusion of forms	• Rendered using expressive techniques (e.g., *The Starry Night*, Vincent van Gogh) • Expressed through physicality (e.g., *The Broken Column*, Frida Kahlo) • With/without a caption

3 Critical references to the study are at the following link: <https://www.moma.org/audio/playlist/243/3126> (09/01/2022).

4 Critical references to the study: <https://www.moma.org/learn/moma_learning/marina-abramovic-marina-abramovic-the-artist-is-present-2010/> (09/01/2022).

the viewpoint of the artist who creates the work but also from that of the viewer. In other words, some artistic objects require a specific time of enjoyment to understand their innermost meaning. This is the case with the cycle of frescoes dedicated to the *Stories of St. Francis* painted by Giotto at the end of the 13th century in the Upper Basilica of Assisi, which is structured as a sacred representation with edifying effects that are articulated during the time of contemplative observation by the faithful.

In the fresco illustrating the *Dream of St. Francis*,[5] the saint (on the left of the image) is sleeping in a four-poster bed; next to him is an angel suggesting that he directs his gaze to the right, where an enormous palace with precious military friezes has appeared. The vision of the saint could be understood metaphorically and correspond to the celestial kingdom. The interpretation of this episode requires meditative observation time and knowledge of the events of the saint's life. The image also shows a temporal relationship that develops between an earlier situation (when the saint falls asleep) and a later one (the dream of the palace) (Girardi, 1999; pp. 38–39).

The abstract concept of time is expressed in metaphorical terms connected to the idea of space. Indeed, the metaphors of space are used to express the sense of time not only in the verbal but also in the visual and multimodal realms. In the decontextualized landscape of the work *The Persistence of Memory* painted by Salvador Dalí,[6] three clocks appear in a state of liquefaction, marking a different time that does not flow in a coherent manner. The "hyper-liquidity" of the clocks (inspired by the observation of melted Camembert cheese) symbolizes the four-dimensional space–time continuum envisaged by the theory of relativity. In such a theory, each body possesses its own time based on its movement and energy state and not on that measured by clocks, thus conforming to the energy states occasionally assumed by the body itself. If man-made time is transitory, then the "persistence of memory" that lies in the illuminated background of the rocky shores can survive (Weyers, 1999; pp. 28–29; Nicosia, 2002; p. 43).

The frame delimits the spaces of observation, inside and outside, and "separates the image from all that is non-image. It defines what it frames as the signifying world, as opposed to the outside frame, which is the world of simple experience" (Stoichita, 2018; p. 173). The observer can venture with their imagination beyond the limits of the frame until they cross the boundaries of the gaze and the threshold of an entirely new dimension. In fact, the second macro-category of "space" and its sub-categories focus on existing artworks within the limits of the frame and those that go beyond them to include the places of creation themselves. Examples of the latter are murals, often created to redevelop urban environments and public spaces, as in the art of Keith Haring,[7] or spaces redesigned through the participation of the audience, which is both the subject and object of the work of art along with the artist. The theme of the picture within the picture defines the space within the space, marking the boundary between reality and representation and between thinking in images and seeing. The painted image is an appearance that deceives the eye by passing itself off as the reality it represents, and the representation is substantially different from what is represented. Many examples come from the works of René Magritte,[8] which symbolically illustrate the condition of a person living in a misleading world as if suspended between real and illusory space (Argan, 1990; p. 379. Paquet, 2001; p. 67). Space is decontextualized and distorted in its features, evoking dreamlike images (as in *The Persistence of Memory*) and becoming a metaphor for human anxieties [as in Edvard Munch's *The Scream*.[9] (Settis and Montanari, 2019; p. 44)]

The third macro-category illustrates the subversion of stereotypical thinking when it is removed from its usual context. The use of stereotypes, that is, a set of certain properties characterizing a class of individuals, objects, or actions, is a way of categorizing reality and can help understand complicated situations (Domaneschi and Penco, 2016; p. 5). Therefore, "decontextualization of stereotypes" can subvert a pre-constituted way of thinking when the depiction shows a different place from the ordinary one known in our minds. Since the attribution of the meaning of a term implies the cooperation of a linguistic community and knowledge of the real world (Putnam, 1975), stereotypes, which are also conveyed through multimodality, can be misunderstood and lead us to errors in evaluation or reasoning, especially when they create a barrier to specific social categories. For instance, *The Persistence of Memory* subverts the stereotypical idea of time as a quantifiable and measurable category according to ordinary human rhythms. It intensifies unreal aspects in a surreal context. The subversion of stereotypes can be observed within the limits of the frame (understood as a sub-category), as in Pablo Picasso's *Guernica*,[10] which sets the horrors of the bombing of the city of Guernica (Argan and Oliva, 2017; pp. 233–236) and the lacerations of bodies in a domestic interior rather than on the war front, as expected based on our knowledge of the world. Decontextualization can also be expressed with unusual techniques of realization; for instance, re-used materials that mark the overcoming of the limits imposed by frames (understood as a sub-category), in which substance becomes space and space its opposition (Argan, 1990; p. 483, Argan and Oliva, 2017; p. 297), as in those works by Alberto Burri made by juxtaposing acrylic colors and jute.[11]

The fourth macro-category is the "fusion of forms", which is achieved through means of expressive technique or the use of color and can be compared to Forceville's fusion category (hybrid

5 An image of the artwork can be found at the following address: <https://it.cathopedia.org/wiki/File:Giotto_-_Legend_of_St_Francis_-_-03-_-_Dream_of_the_Palace.jpg> (09/01/2022).

6 Reference to the image: < https://www.moma.org/collection/works/79018> (02/12/2023).

7 Reference to murals: https://www.haring.com/!/genre/public_projects (02/12/2023).

8 Reference to *La condition humaine* (1933), https://www.nga.gov/collection/art-object-page.70170.html#provenance and La condition humaine (1935), https://www.wikiart.org/en/rene-magritte/the-human-condition-1935 (02/12/2023).

9 Image references: <https://artsandculture.google.com/asset/the-scream-edvard-munch/eQFdRTFKDtVQ1A> (09/01/2022).

10 Image references: https://it.wikipedia.org/wiki/Guernica_(Picasso)#/media/File:Mural_del_Gernika.jpg (09/01/2022).

11 Reference to the study *Sacco Rosso*: <https://www.tate.org.uk/art/artworks/burri-sacking-and-red-t00787> (09/01/2022).

metaphor), in which the elements of the images are merged (see also Phillips and McQuarrie, 2004). In Vincent van Gogh's *The Starry Night*,[12] the metaphorical representation of the stars rotating similar to endless whirlpools is achieved by the vibrant brushstrokes through a pictorial material that radiates in a circular manner and almost contrastingly blends ultramarine, cobalt blues (the hues of the sky), and Indian and zinc yellows (which tint the stars) (Cricco and Di Teodoro, 2012; pp. 1666–1669). The "fusion of forms" category is also expressed in corporeity, that is, the way of representing an image as an expression of emotions and thoughts about the body (Wollheim, 1984). In the work *The Broken Column*,[13] Frida Kahlo depicts an ionic column ruined in several places to symbolize her diseased spine due to a serious accident. The gashes on her body, the chasms in the barren, and the lonely landscape merge to confirm the physical suffering of the artist (Kettenmann, 2001; pp. 68–69).

In the following section, the above categories and sub-categories are used on a corpus of works to effectively understand a specific socio-artistic context, such as that of the island of Sardinia, and show that multimodality is a useful tool for learning artistic techniques in addition to stimulating the imagination and inventiveness of the viewer.

4. Categorization of artistic metaphors: A case study

This case study focuses on the context of Sardinia, an island in the Mediterranean Sea that presents unique characteristics: the layered beauty of its landscape, the richness of its cultural identity heritage, and the caring generosity of its inhabitants. In this land, artistic language is characterized by its expressive originality, and the variety of techniques used by the artists enriches the viewer's cognitive experience. The artworks, indeed, were selected according to the following criteria: originality and evocative expressive potential in the variety of techniques used (sculpture, weaving, mural, and poly-material art, architecture, and illustration), presence of metaphorical domains, ability to stimulate the formation of mental images in the viewer, and ability to express meaning in the territory in which they are placed.

From our point of view, the categorization based on the four categories of time, space, decontextualization of stereotypes, and fusion of forms can increase the understanding of the most hidden meanings of the Sardinian artistic inheritance.

4.1. Time category

The sound sculptures of Pinuccio Sciola (1942–2016) reveal several features that lead to their classification in the category of "time" and its sub-categories. Stone is usually connotated negatively because of its properties of stiffness and clarity. However, Sciola enhanced its nature by transforming it into the temporality of work and converting it into a musical instrument. Just as the art of Socratic maieutics "extracts" from the souls and minds of the interlocutors those truths that they themselves were unaware of, so does Sciola with his stones. Silvano Tagliagambe wrote as follows:

> "The artist does not impose on the stone a shape that he decides autonomously on the basis of his own intentions and choices but acts with cuts and incisions aimed at putting the material on which he is working in a condition to express its intrinsic potential to the fullest and in the most effective way, freeing the interior energy that it contains" (Tagliagambe, 2022; p. 142, our translation).

In the view of Sciola, the stone is to be understood as a human being and, therefore, can possess a soul and emit sparks when worked with the tool of the emery. When a stone is subjected to the heat of a blowtorch, its veins become so red-hot that they look similar to spurting blood. Such processes evoke the original conformations of basalts and expose primordial situations because weapons, cult stones, and shelters were built with stone.[14]

Therefore, the stones "contain" what the universe has produced since its very beginning. These stones are evidence of the geological vicissitudes of the island and become a metonymic tale of the earth itself because they are the guardians of ancestral sounds that have been articulated throughout history. The sounds can be "liquid" when emitted by limestone rocks or "deep" when coming from stones of volcanic origin.

Sciola's sculptures (Figure 2) are completely made in the place for which they are created and in the moment in which the artist plays them. Thus, a temporal *continuum* is established between what has been produced by history, the present of fruition, and the imagined future. Contemporaneity coexists "with its impetus toward the musical future; the prehistory with the archetypal and anthropological modes of meaning and communication through sound; the pre-cultural time of sonorous nature" (Favaro, 2011; p. 28, our translation) in these sculptures.

Non-verbal sound and music can play an important role in how a multimodal metaphor is structured and interpreted: these elements are useful in identifying the source domain of a metaphor, or they can serve to identify those features that are mapped from the source to the target (Forceville, 2009).

Considering an artistic metaphor in a sound sculpture, two domains are juxtaposed in an unusual manner: the stone could be understood as the source domain that the viewer can see, while the sound could be understood as the target domain, which is absent because it must be activated by the artist in this presence. In this way, the metaphorical component is so relevant that it enriches the interpretive process of the artistic work.

In fact, Sciola intentionally produces sonorities that stimulate the viewer's ways of observation and creativity (Wollheim, 1968). The comprehension of such a work occurs simultaneously with its instantaneous performance. The activation of the auditory

12 Image reference: <https://artsandculture.google.com/asset/bgEuwDxel93-Pg> (09/01/2022).

13 Image reference: <https://en.wikipedia.org/wiki/The_Broken_Column> (09/01/2022).

14 With reference to what Sciola said during an interview for *Born of Stone* (2016). *Born of Stone* is a short documentary about Pinuccio Sciola directed, edited and produced by Emilio Bellu. The movie is available on the ITsArt platform: https://www.itsart.tv/it/content/born-of-stone-2016/c42ca446-0224-4aaa-87b2-37ccf61dfc59?hl=en-IT, (03/12/2023).

FIGURE 2
Pinuccio Sciola and his sculptures (reproduced with permission from Archivio Fondazione Sciola, ph. Ettore Cavalli).

imagistic component is necessary to reconstruct the meaning of the sculpture understood as an image-demanding metaphor, that is, a metaphor whose comprehension requires the activation of an image, which may be visual, tactile, or auditory (Green, 2017). As in the case of visual contextual metaphor (Forceville, 1996, 2002), string instruments such as a cello or harp are not displayed but instead suggested by the context in which the work is placed. The musical score generated by Sciola is also conveyed by the tactile component and the intimate experience the artist has with the stones[15]:

> "The contact between the surface of the stone and the tactile surface of the fingertips and hands in all their extension, with their skin and its porosity between the outer and inner parts of our body, established a direct channel of communication that did not stop at the outer shell of the body itself, but, through the skin, penetrated inside, into the tissues and organs, extending to them the tactility of primary touch and involving them in this interaction" (Tagliagambe, 2022; pp. 118–119, our translation).

The sound sculptures are synaesthetic works that lead the performer to a multisensory experience capable of provoking a spiral of sensations, defined by the term *Gestaltkreis* (Read, 1956), from tactility to visual contemplation to auditory fruition (Ladogana, 2015; p. 11).

The time dimension of creating the work of art and observing it is also found in other works. In the production of the *Stitched Books* (*Libri Cuciti*) by Maria Lai (1919–2013), linguistic elements came from different fields: poetry, narration, and art. Time dedicated to the creation of the artwork and its observation can be found within the books. The artist redefines language through manual labor that is structured in the temporal dimension using a sewing machine. Maria Lai writes with a needle (instead of a pen) and thread (instead of ink); therefore, the fabric becomes a page, and the thread that joins the canvases becomes writing. The weaving is a visual score, that is, a rhythmic alphabet to be decoded with the eyes and the mind. The sewn books often drew their inspiration from a remote experience and the stories of an archaic civilization that had to be told and protected (Ciusa, 2017). The multimodality of these works is provided by the juxtaposition of "languages"; weaving meets writing, and the tactile component merges with the visual, making art performative (Alicata, 2019; p. 135). These works are imaginative experiences that have a considerable impact on the audience.

For instance, in the book *The Red Ants No. 5*,[16] the threads are placed freely on the page, almost as if to suggest a way of understanding the vision of the textile movement as something different (the Wittgensteinian "seeing as") (Wittgenstein, 1953). The observer does not find the known characteristics of a book and attempts to bridge the cognitive gap by activating an alternative image in the mind (visual mental imagery) (Nanay, 2016; p. 87) that enriches the creative experience of seeing. Thus, the usually printed character structure that identifies a book and that the observer expects to see represented is missing. The image of the book must be triggered by the occlusion shape (Hyman, 2006; pp. 75–76), which is generated by the tangled threads in the borders of the pages beyond the boundaries of the work (the source domain) and the typefaces of the book (the invisible target domain).

The tactile texture is occasionally a complex signifier to interpret, and a slow pace is required to read each page to decipher its deep meanings. Turning a cloth page is a slower gesture than turning a paper page or running the fingers over a screen. The consistency of the page can be felt between the fingertips (Anedda, 2019; p. 87).

Moreover, slowness evokes visions from the artist's past: as a child, she watched her grandmother mend the sheets. These threads that mended the tears fed her imagination and became narratives to be invented in the time frame of her story and ways of recreating childhood games.

15 Image and acoustic references in the short movie *Sciola, oltre la Pietra* (2009) directed, edited and produced by Franco Fais: <https://www.youtube.com/watch?v=lkq33RNZpL4> (03/12/2023).

16 Image reference: < https://marianneboeskygallery.com/artworks/20341-maria-lai-libro-delle-formiche-1991-1992/> (02/12/2023).

Holding the shadow by the hand[17] is a fairy tale made by sewing a thread onto pieces of cloth tied together to simulate the shape of a book. On the first page of the book, the caption "*holding the shadow by the hand*" is not only intended as a literal statement but also as a metaphorical expression, for its imaginative potential and the icastic power it evokes in the reader. This artwork narrates the formative journey of a "man-child", as the author calls him, and illustrates a small pink rectangle with stylized eyes, legs, and arms. The protagonist of the story unfolds his life journey from page to page, stimulating the imagination of the reader with the characters he meets (himself as a playmate, shadowy enemies, and the blue demon angel) and surprising himself with his visions (the spaces of the fairy tale that take on color and the shadows that expand and then flow into a garden of flowers).

The work is understood as "the path of an awareness of the human being, the metaphor in a "situation" of looking at oneself in the mirror, of putting oneself into play, and opting for an act of freedom and courage" (Cuccu, 2014, our translation).

Two dimensions are present in the fairy tale: the temporal dimension of the flowing narrative and the dimension of reflective enjoyment on the part of the viewers, who observe, touch the book, and contemplate how to adapt the fairytale story to their personal experience.

The protagonist of the tale continues his journey, holding the shadow by the hand, while the person who contemplates his story activates mental images (Carston, 2010, 2018) that lead to understanding the true meaning of the stitched work: becoming an adult means being aware of oneself and accepting human weakness. The book can be interpreted as a work that the viewer can see now as one thing, now as another (Wittgenstein, 1953); thus, the pictures illustrated can be interpreted metaphorically. The black-colored stitched figure, which expands out of proportion until it takes on the appearance of a dragon, represents the dark side of man, while the celestial-colored figure defies the darkness in the guise of a hero–warrior.

The work requires a close distance to involve the viewer: "The thread indicates a relationship that unites and the fabric, the intersection of opposites (warp and weft), the creative dimension par excellence, conveys touch, the utmost closeness (touching creates intimacy)" (Cuccu, 2014: introduction, our translation).

The words in a book must be revitalized by those who read them; this revitalization similarly applies to works of art, which seek the gaze of the observer for interpretation and to gain new meanings over time. The multimodality of the stitched fairy tale ("After all, life is a continuous stitching," as Maria Lai herself said) stimulates a path of identification in those who benefit from the vision and allows the emotional experience to be processed, no longer by the child but by the adult, as if it were a dream. Lai's stories are similar to variants of a single fairytale: that of art, which plays with archetypes (mystery, astonishment, fear, happiness, and magic) through the symbolic synthesis of materials, shapes, colors, and rhythms. These artworks entrust the reader with the role of the protagonist, who must elaborate on the meaning and gain awareness of his existence to understand them effectively (Cuccu, 2014).

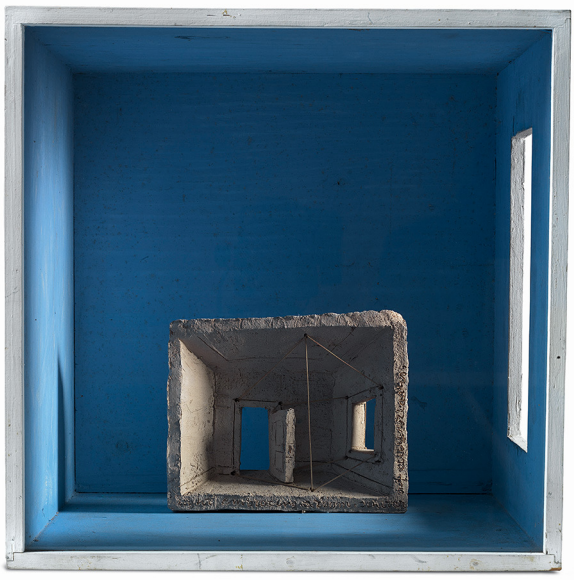

FIGURE 3
Costantino Nivola, *Light embracing a room, sinew of daydreams* (Orani, Museo Nivola)[19] (reproduced with permission from Fondazione Nivola).

4.2. Space category

As observed, Maria Lai's stitched narratives develop in a visual time that becomes a weaving space that can be touched, and they encourage an unprecedented imaginative learning experience in those who contemplate them. Sardinia is an island rich in open spaces in nature; the openness of the landscape inspires the sense of freedom and creativity of Sardinian artists.

The multifaceted artist Costantino Nivola (1911–1988) experimented with the uses of the category "space" in various drawings, paintings, and sculptures during his years of research on the topic of rooms. Rooms are seen as geometric forms of a simple nature, open on the front side and equipped with small windows through which light enters and "modifies" the space. In the *architectural model*[18] made in the 1980s, the title *Light embracing a room, sinew of daydreams (La luce abbracciando una stanza tende i sogni ad occhi aperti)* (Figure 3) determines the verbal–pictorial metaphor: the way spaces are constructed as the source domain and the symbolism generated as the target domain.

This work is presented as a kind of cube, open at the front, made of wood and glass painted in blue. Another geometric figure with a rough form is found inside, that is, a terracotta parallelepiped

17 Image reference: < https://catalogo.beniculturali.it/detail/SARDEGNA/HistoricOrArtisticProperty/2000220889> (09/01/2022).

18 Critical reference in Nivola (2010). 'L'investigazione dello spazio. Un itinerario', in *NIVOLA. L'investigazione dello spazio*, ed. C. Pirovano (Nuoro, TRIBU piazza Santa Maria della Neve, 22 dicembre 2009 - 21 giugno 2010), 160-163.

representing the interior of a room, whose perspective is investigated through the spatial directions suggested by the strings of ropes. The two rooms are structured according to the structure of the work within the work.

The entry of light through the window of the large room gives a diffuse luminosity that reverberates in the surrounding spatial configurations, modifying their nature. The window of the small room has received the light necessary for the new arrangement of its interior. The small open door, opening onto the blue background of the large wall, directs the gaze of the observer toward a wide vision and an imaginative construction comparable to a dreamlike horizon. These places constitute a symbolic space where one can find oneself and one's aspirations, or even recover memories of the past:

> "Inside this room, I shall find/what I have/Always searched for, all variants of the/Square and/of the cube. The infinite linear variations/Of/The vertical and horizontal./In all the degrees of the angle I shall/Find/Myself as sole organic form. In this/Temple/Of Cartesian structures suspended in the/Chaotic context/Of infinite rifts"[20].

The architecture of the spaces constructed in these rooms does not allow for an easy perceptual identification with the usual way of understanding and visualizing a room that is furnished and functional to our needs. The image has hidden properties because it evokes a dream world and triggers childhood memories in the observer. Thus, the observer activates the imagination to understand the meaning of the work and to discover those image properties that are not observed (Ervas, 2019). The taut cords connecting the lintels of the window and door to the ceiling and floor of the small room might suggest the idea of tending and turning in a direction; in a figurative sense, these cords trigger in the observer the mental image of "tending toward a goal, toward good or happiness".

The category of "space" can also be interpreted as the source domain of an artistic metaphor. For instance, in the work *Crocus* by Andrea Casciu (Figure 4), the cycle of life and death is expressed through the saffron flower (the target domain) and the arrangement of the murals in the urban spaces of San Gavino Monreale. On the right side, facing the town center, the crocus sprouts inside the face of a man with a beard (the artist himself). On the left side, facing the road leading to Sardara, the flower withers (Fois, 2016). Thus, the mural depicting the birth of the saffron flower is located in the entrance area of San Gavino, while the one showing the withering flower is located in the exit area of the village.

The meditation on the nature of human beings and their transience is metaphorized in the representation of the body (Wollheim, 1984), that is, the half of the artist's skull that blossoms and fades similarly to a flowering plant. The observer could see saffron, the symbol of San Gavino peasant culture, as an aspect that contributes to the experience of vision (Wittgenstein, 1953) and knowledge of the artistic world. The two parts of masonry are conceived as a unitary work: as an extended metaphor in a narrative that needs the mural marking the entrance to the town and that marking the exit from the town to be completed.

Thus, the spaces conceived are part of the tradition of Sardinian muralism, understood as a form of public art that is "highly civic" (Naitza, 1996) and as a form of multimodal and intertextual expression (Piga, 2021) in the redevelopment framework of urban contexts following the most recent trends in Italian street art (Serra, 2007).

Furthermore, spaces that have been made functional again can contribute to the rediscovery of agricultural traditions in small villages. The town of Escolca, which is located on the basaltic plateau of the Giara di Serri in the Sarcidano (south-central Sardinia), has used urban art to promote its traditions of olive and durum wheat cultivation.[21] The Fondazione di Sardegna, in collaboration with the Municipality of Escolca and the local associations, promoted the street art project *Codice colore 8015* (#codicecolore8015), in which five artists[22] were called upon to intervene with works that reflect the identity of the village and the colors prevalent in step with the landscape context.

In the work *Territoriality* (*Territorialità*) (Figure 5) created by one of the curators of the initiative, Manu Invisible, the artistic metaphor is presented in a multimodal format (a verbo-pictorial metaphor) (Forceville, 1996). The source domain is expressed in the representation of the visual space that encompasses the buildings and elements of the surrounding environment, whereas the target domain is made explicit by the concept of territoriality and verbally represented.

Territoriality reflects on the relationship between man and environment, focusing on the necessary rediscovery of balance between people and places, and is inspired by the reflections on human geography formulated by Claude Raffestin and centered on the concepts of society, space, and time (Klauser, 2012). The painted space emphasizes the elements of the cultivated land, expressed in the brown background, and the olive tree depicted in its symbols, olives, and leaves. The artwork is in a harmonious fusion with the individual, whose silhouette comprises remarkably thin threads as if superimposed in a criss-cross of layers to evoke the texture of the prized pasta from Nuoro, Filindeu. Thus, the artistic language incorporates important values (Gombrich, 1963), and those of rural tradition, such as the genuineness of flavors and the bond between the land and its inhabitants, are to be handed down to new generations. The action performed on a real territory closely involves the observer, who is invited to grasp the true essence of the meaning that the artist intends to convey. Near the mural, painted footprints are found on the ground to mark the point from which the spaces of the work can best be observed. Physical presence and an attentive gaze are important for the elaboration of the visual interpretative content; owing to their imagination, observers can overcome the limits set by the pictorial representation. The artist has also painted a lamppost and a road sign, becoming an integral part of the same territory that is the subject of the work.

19 Notation: painted wood and glass, 40.8 × 40.8 × 40.8 cm; inside: semi-refractory clay with cotton cord, 17 × 20.4 × 5 cm.

20 Homage to Marcel Proust, composition written by Costantino Nivola. Reference to the website dedicated to the artist https://museonivola.it/en/collection/ (09/01/2022).

21 See: Associazione culturale Asteras (2020). *Muri di Sardegna: luoghi e opere della Street art*. Palermo: Flaccovio editore, 131.

22 In addition to Manu Invisible, Davide Medda, Mavz, Lorenzo Murgia, and Davide Careddu participated in the initiative.

FIGURE 4
Andrea Casciu, *Crocus* (reproduced with permission from Andrea Casciu).

FIGURE 5
Manu Invisible, *Territorialità*[23] (reproduced with permission from Manu Invisible).

4.3. Decontextualization of stereotypes category

The category of "space" can be expressed in a decontextualized way and with re-used materials that subvert the pre-constituted way of thinking of the observer: thus, a context such as the mines of Sulcis Iglesiente can be understood as a stereotypical space to be associated with Sardinia and as a real place to be represented beyond the boundaries set by figurative customs.

In the triptych *From Darkness to Light* (*Dall'oscurità alla luce*) by Paolo Piria,[24] the re-used materials[25] from the Monteponi mine are placed in a decontextualized canvas space. The access ladder to the shafts protrudes from the provided space and leads nowhere, the ice axe is dirty from use, and the helmet with the light bulb has lost its function (Guerrieri, 2021). In terms of an artistic metaphor, the objects and materials representing the mining world could be understood as the source domain, while the unframed canvas could be observed as the target domain. Therefore, these objects produce a particular viewing experience in the observer, who does not expect to see the symbolic elements of the mining collective imagination outside the confined landscape of the mines themselves. To provide a correct assessment of these elements, observers can bring their imaginative abilities into play and perform a critical process that leads to the discovery of those properties present in the image but ignored, such as the tactility of the materials. Even the reduced correspondence to the functions for which the objects are intended can invite the viewer to make explicit further components of the image's meaning, such as the dreamlike association between the color of the helmet and the gold symbol of every mineral seeker's dream. In the work, the three-dimensional component of the sign and the chromatic research suggest a unique fruition that

23 Notation: (silossanica) paint and spray on wall, electrical box and pole 45 mq.

24 Image reference in https://issuu.com/planumnet/docs/esplorazioni_narrative_artistiche_e_videoludiche./s/15183014 (02/12/2023).

25 Earth, stones, pink mud, ladder to access the wells, ice axe, helmet with bulb.

FIGURE 6
Toni Demuro, *Untitled* (reproduced with permission from Toni Demuro).

amplifies the gaze and involves the external observer in the mining narrative.[26]

The category of decontextualization of stereotypes can also be observed within the boundaries of the painting, as in the illustration by Toni Demuro (Figure 6). In this artistic metaphor, the source domain could be represented by the Idols of Porto Ferro, the archaeological artifacts depicting the mother goddesses, while the target domain could be represented by the lunar setting. The two domains are unpredictably juxtaposed in an incongruous context; thus, the observer does not expect to find the artifacts in a context other than the museum. In the second stage of observation, the interpreter can make a visual-mental association between the arrangement of the idols as a flock and the presence of a shepherd guiding them; thus, the sheep can be understood as an aesthetically relevant property in the image (Nanay, 2016; p. 67). In this prototypical sense, sheep as animals stereotypically identified with Sardinia activate another mental image connected to the idea of holiness. Simultaneously, the layering of hidden and implicit meanings in the work can generate a further interpretive process linked to the construction of (decontextualized) stereotypes. The mental image of the sheep can be oriented in a stereotypical sense and lead the mind to an erroneous perception of a specific community: the Sardinians belonging to the category of shepherds are usually (and wrongly) interpreted from an outside perspective as a condition of subservience and backwardness. Even the depiction of idols extracted from their sphere of reference can activate stereotypical interpretations linked to the socio-historical imaginary. Idolatry toward these objects could suggest a deep identification of the Sardinian people with their archaeological heritage, almost as if this was the only one worthy of being divulged outside the territory of the island. The identification is also with its (false) myths, that is, the predominant presence of a sort of "female element" in all the historical and social expressions of Sardinia (Melis, 2015). The perception of the difficulty in imagining a different way of representing oneself and making oneself known outside one's own borders emerges and could also lead to closure within oneself and to that "lunar" feeling of loneliness with a "dechirican" air that permeates the work of Demuro.

4.4. Fusion of forms category

In the fourth macro-category, the "fusion of forms" is achieved through an expressive technique or the use of color.

In the artistic metaphor by Salvatore Aste,[27] the source and target domains are merged to reveal the metaphorization of physical forms. The artist paints the curves on the outside of the figure with shaded brushstrokes in black, purple, and burgundy. In addition, this painted surface includes the pearl-colored inner section, which the interpreter assimilates in shape and color to a bivalve (to be understood as the source domain).

In the physicality (Wollheim, 1984) of the latter, the observer can identify a humanized figure with delicate feminine features, an elongated face, and narrow eyes (similar to the long-necked women portrayed by Amedeo Modigliani), to be understood as the target domain of the metaphor.

26 Audiovisual reference: https://www.youtube.com/watch?v=bg6UHeySJ7U (09/01/2022).

27 Image reference: https://www.isoladisanpietro.org/cnm/pennellate_tabarchine/salvatore_aste/quadri/07.htm (09/01/2022).

Associating the female gender with the mussel, commonly called "cozza" in Italian, is not meant to be derogatory, as clichés often invite one to do, but rather to identify in the canvas a sophisticated symbiosis between the individual and nature. Indeed, both come from the same matrix.

Identifying new elements in the image is possible by analyzing the title of the work. Some studies have shown that titles are not mere identification tags but rather have the function of orienting the interpretation of the observer (Fisher, 1984; Levinson, 1985) or guiding the gaze of the viewer in a different way, especially in the case when the titles of certain works are subject to variation (Franklin et al., 1993)[28]. Thus, the canvas painted by an artist from the Island of San Pietro (Carloforte) and titled *Woman in the Mirror* directs the gaze: the pearly-colored figure with eyes, mouth, nose, and flowing hair is clearly a woman looking into the mirror and perhaps turning into something else, as the black background could be interpreted as a mysterious vortex in which the figure appears to be enveloped.

5. Conclusion

The multimodal power of metaphor in art has been investigated in this study *through* four categories: (1) time, (2) space, (3) decontextualization of stereotypes, and (4) fusion of forms. Of course, this is a first attempt to categorize artistic metaphors, which might be limited, and further categories may be added in future research.

The evocative power of Sardinian art expressed through sculpture, weaving, painting, mural and poly-material art, architecture, and illustration proves that an island is a fertile place of creativity. Therefore, the visual component stimulates knowledge of the "submerged" wealth of symbols, archetypes, and myths that characterize insularity.

By contrast, the term "image" can encompass a range of meanings: it extends to the domain of material images on a specific media support or to that of immaterial images, on whose borders live dreams, ideas, and metaphors; image as a product of a mind that thinks, remembers, or dreams; as a synonym of the artistic image; and as an element that triggers connections between subjects and dialogical relations (Crescimanno, 2019; pp. 24–25).

The multimodality expressed by the categorization of artistic metaphors experimented on a small corpus of Sardinian works can distance observers from erroneous or stereotypical perceptions regarding the island context and direct them to surprising learning perspectives.

28 In this research, it was shown that the images presented to observers (those of the paintings *The Terrace at Sainte-Adresse* by Claude Monet and *Agony* by Arshile Gorky) are described differently when they have different titles (*Imminent Storm* and *Carnival*, respectively).

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

AG wrote the article. FE and EG supervised the work. All authors provided feedback on the draft and approved the final version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The landslide's conceptualizing economic decline and its framing effect: Mandarin evidence

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Conceptual metaphors are essential for explaining and understanding social concerns. Natural disaster metaphors are commonly employed to access the abstract and negative impacts of social issues. Five of the top 10 most prevalent natural disaster frames in the Center for Chinese Linguistics (CCL)—earthquake, flood, fire hazard, drought, typhoon, landslide, volcano, sandstorm, tsunami, and debris flow—share a common economic target domain and show economic recession. Additionally, corpus-based research has revealed that the landslide frame is the most salient in figuratively representing economic declines. An experimental study derived from the corpus analysis has found that the landslide-framed economic crises posed more severity to participants and exerted a notable influence on their opinions and judgments. Therefore, when effective communication of economic hazards is to be realized, metaphorical representation of economic crises demands great consideration.

KEYWORDS

corpus, metaphorical framing, economic decline, natural disasters, landslide frame

1. Introduction

Recent years has seen a focus on risk warning and communication as the COVID-19 epidemic and periodic extreme weather have shown the effects of these events on humanity. The study and communication of risk have received increasing attention from academics and organizations (e.g., World Health Organization, 2020; Hyland-Wood et al., 2021; Tang, 2022). Scholars concur that in the case of rising dangers, effective, concise, clear, and official communication of risk sources, symptoms, and confident solutions is urgently needed (Hyland-Wood et al., 2021). Generally, communication about risks or crises is carried out through language, whether it is verbal or non-verbal.

More than just a literary device, metaphor is a method of thinking that permeates all aspects of our lives and structures our thoughts (Lakoff and Johnson, 1980). Metaphors are occasionally used in risk communication to grasp abstract ideas in terms of more concrete ones. According to conceptual metaphor theory and embodied philosophy (Johnson, 1987), understanding and reasoning are realized through mappings from concrete concepts (source domains) to abstract ones (target domains), particularly from perceptible concepts and sensorimotor experiences derived from daily life such as spatial orientation, containment, force, and temperature to imperceptible ones such as time, emotions, and power. According to prior research, metaphorical frames such as *organisms* and *natural disasters* are typically used to communicate economic crises or declines (e.g., Charteris-Black and Ennis, 2001; Charteris-Black and Musolff, 2003; de los Ríos, 2010; Wang et al., 2013; Piromalli, 2021; Zeng et al., 2021). Recent psychological research has implied the exertion of metaphorical framing effects on reasoning, i.e., the persuasive power of metaphors (e.g., Thibodeau and Boroditsky, 2011, 2013, 2015; Thibodeau,

2017; Thibodeau et al., 2017; Thibodeau and Flusberg, 2017; Joris et al., 2019; Hart, 2021; Benczes and Ságvári, 2022; Brugman et al., 2022; Tao et al., 2023). Some psychological researchers argue that metaphors shape reasoning in the way that metaphor frames appear to instantiate frame-consistent knowledge structures and invite structurally consistent inferences, thus affecting reasoning and opinions (e.g., Charteris-Black, 2011; Thibodeau and Boroditsky, 2011, 2013, 2015; Landau et al., 2014; Thibodeau et al., 2017). In this study, we seek to identify the metaphorical framing effect of the most salient natural disaster—landslide frame (elicited from corpus analysis) in Mandarin—when conceptualizing economic decline or crises. A metaphorical framing study into economic decline may reveal the persuasive power of metaphors, thus providing earlier warning of risks and better communication for the wellbeing of the general public.

1.1. Metaphors of economic crises

Clusters of metaphors render economic concepts graspable, accessible, and vivid. Many scholars show great interest in such linguistic phenomena. Charteris-Black (2000) summarizes metaphors of the economy through a corpus analysis of *The Economists* and reveals that *organization, people, and animal* are the most frequent metaphors. More economic crises metaphor analysis is revealed by scholars such as Charteris-Black and Ennis (2001) and Charteris-Black and Musolff (2003). They made comparative economic crises metaphor studies in English and Spanish, as well as English and German financial reporting, respectively. Based on their investigation, English and Spanish share metaphorical mappings from *organism, physical movements, and natural disasters* to the economy and market movements. English and German share mappings from *up-and-down movements* in trading to health frames. Furthermore, de los Ríos (2010) wraps up metaphors for the economic crises with images from *The Economist*'s seven covers, including *weather, natural disasters, and end-of-the-world* scenarios. The metaphors in play are as follows: *The economic crises is an earthquake shaking Wall Street; the savings bank economic woes are twin tornadoes; the economic crises is a whirlpool, a credit drought,* and *climatic conditions*. Piromalli (2021) conducted a thorough analysis of the two main metaphors for the economic crises: *metaphors for illness and metaphors for natural disasters*. Under the same conceptual mapping, ECONOMY IS ORGANISM, Wang et al. (2013) compared metaphors used to describe the economic crises in 2008 in British and Russian economic discourse: an *economic crises is a living or sick organism.* As seen from the above studies, the following frames for economic crises stand out: *organism, object, and natural phenomenon*.

1.2. Metaphorical framing

The frame needs clear clarification when it comes to the metaphorical framing effect. According to Ritchie (2013), a frame is a pattern of language use and a cognitive schema. The definition of framing, which is frequently cited, is as follows:

> Framing essentially involves *selection* and *salience*. To frame is to *select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation* for the item described. (Entman, 1993, p. 52)

Frame emphasizes frame-congruent features in communication (Entman, 1993). For instance, the COVID-19 pandemic's antagonistic, evil, hazardous, and urgent nature is highlighted when the pandemic is depicted as a war. A dramatic war scenario would inspire a sense of urgency and community and successfully persuade people to abide by rules and regulations (Charteris-Black, 2021). Entman (1993) does point out that metaphorical frames would leave out metaphorical targets' frame-incongruent characteristics. Thus, when COVID-19 is metaphorically framed as a battle, the necessity of finding the source, the recovery phase, and maintaining social distance are all left out (Semino, 2021). According to Semino et al. (2018), framing is a function of metaphor and has roots in psychology and sociology (Pan and Kosicki, 1993). These perspectives are cognitive, discursive, and practice-based (Semino et al., 2018). Meanwhile, metaphorical framing echoes the views of de Severino et al. (2001) concerning the functions of metaphor: (1) to manipulate readers' minds through the inference patterns and value judgments generated by metaphors and (2) to give a more concrete representation of the situation at hand, making it clearer.

Metaphors are found to be 6% more influential and persuasive than literal language in persuasion tasks when metaphorical framing is observed in practice (Sopory and Dillard, 2002). Recent psychological studies suggest that metaphorical frames affect people's opinions and judgments by eliciting knowledge structures that are consistent with the frame and inviting structurally consistent inferences (e.g., Robins and Mayer, 2000; Schlesinger and Lau, 2000; Charteris-Black, 2011; Thibodeau and Boroditsky, 2011, 2013, 2015; Landau et al., 2014; Thibodeau et al., 2017; Thibodeau and Flusberg, 2017; Joris et al., 2019; Hart, 2021; Benczes and Ságvári, 2022; Brugman et al., 2022; Tao et al., 2023). People may propose different solutions to the same social issue—crime—in studies with a framing effect of significant difference (Thibodeau and Boroditsky, 2011, 2013). Participants have a strong tendency to think that it is best to strengthen law enforcement and punishments for criminals when a crime is referred to as a beast. When crime is portrayed as a virus, reforming social administration is frequently suggested. When cancer is metaphorically framed as a journey and a battle, patients adopt different emotions and mindsets. When cancer is incurable, the battle metaphor would make patients feel more guilty than the journey metaphor (e.g., Hendricks et al., 2018). However, a follow-up study by Steen et al. (2014) was conducted due to inconsistent results with the earlier study. Similar-sized but modest metaphorical framing effects would result from metaphors in various communication modalities (Flusberg et al., 2020). When examining the impact of COVID-19's war and sports metaphors on feelings and thoughts in the era of pandemics, de Saint Preux and Blanco (2021) note a weak metaphorical framing effect. Even so, the difference is not statistically significant.

In an economic discourse, Joris et al. (2019) discuss participants' attitudes toward the Euro crises when it is metaphorically framed as war and disease. The results demonstrate that participants take on a metaphorical frame-congruent evaluation of the Euro crises. Participants in war conditions significantly more often refer to war

when answering the open questions. On the contrary, when the Euro crises is framed as a disease, participants tend to use words and sentences containing disease-frame elements. In the case of anti-telefraud communication, when telefraud is framed as disease, war, or issue, the war-framed telefraud poses more severity than the issue-framed one to participants without fraud experiences. However, this study also showcases the metaphorical framing effect as well as potential factors influencing the framing effect (Liu and Chen, 2023).

A comprehensive study of the aforementioned metaphors of different frames for crime (Thibodeau and Boroditsky, 2011), depression (Reali et al., 2016), cancer (Hendricks et al., 2018), COVID-19 (de Saint Preux and Blanco, 2021; Zhang et al., 2022), migration (Benczes and Ságvári, 2022), anti-immigration (Hart, 2021), climate change (Flusberg et al., 2017), telecom fraud risk (Liu and Chen, 2023), price trend (Morris et al., 2007), and their respective strong, weak, or non-existent framing effects demonstrates that the results of metaphorical framing effect can vary and are inconsistent, which necessitates further research into this linguistic and psychological phenomenon.

1.3. Current research

Departing from the gist of embodied cognition, natural phenomena are the most familiar ones for their omnipresence in weather conditions, our dependence on nature, and our interaction with nature over the years since our human being's existence. However, previous studies limited their research to economic metaphors in English, German, Russian, etc. There is a shortage of systematic analysis of economic decline or crises metaphors framed by natural disasters in Mandarin. Therefore, our first research question goes as follows: Are natural disaster frames equally and frequently employed in comprehending economic conceptions in Mandarin? If so, what is the most frequent natural disaster frame in the economic crises metaphor? To achieve the end, we focused on the economic crises metaphors of natural disaster frames in Mandarin by carrying out a corpus-based analysis in the next section.

Given that the high frequency of economic crises metaphors framed in natural disasters prevails in Mandarin contexts based on the corpus analysis, we were questioning whether economic crises metaphors of different frames would have an impact on people's psychology and judgments and even alter their behavior, which is of great importance in risk warning and communication in the economy field and the general public's economic behavior. Therefore, our second research question is whether differently framed economic crises metaphors influence participants' conceptualization and judgments of economic crises. To find the answer, an experiment was designed to investigate whether economic crises in a literal and one specific natural disaster frame would give rise to different conceptualizations and lead to different opinions, behaviors, and judgments. The natural disaster frame involved in this part was the one with the highest metaphorical frequency emerging from the corpus analysis in the first research question. Based on the metaphorical framing effect hypothesis, we hypothesized that literal and natural disaster-framed economic crises would shape participants' reasoning about economic crises differently and lead to different economic behaviors and judgments.

2. A corpus analysis: study of natural disaster-framed economic decline in CCL

According to the theories of embodied cognition (Lakoff and Johnson, 1980; Johnson, 1987; Lakoff, 1987), metaphors that are framed in the context of natural phenomena are prevalent. Examples include brainstorming, a shiny person, a depressing mood, and a financial tsunami. According to research on the conceptualization of economic crises in English, Russian, German, and Spanish (e.g., Charteris-Black and Ennis, 2001; Charteris-Black and Musolff, 2003; Morris et al., 2007; de los Ríos, 2010; López and Llopis, 2010; Wang et al., 2013; Piromalli, 2021), natural disaster frames are frequently used. In this section, we adopted corpus-based analysis to identify which specific natural disaster frame was most frequently used to discuss ideas of economic decline in Mandarin Chinese.

2.1. Methodology

2.1.1. Data sources

We selected CCL as the research corpus to identify the top 10 natural disaster frames. CCL, an unprocessed corpus with 783,463,175 tokens made up of raw material from networks, books, and news reports, offers a comprehensive database from the 11th BC to the present for the study of Chinese. This corpus acts as a precise and thorough database for the study of Chinese language phenomena. The 22 most frequent natural disaster frames in China were entered into CCL as follows: storm (暴风雨), earthquake (地震), tsunami (海啸), cold wave (寒潮), flood (洪水), volcano eruption (火山), hurricane (飓风), tornado (龙卷风), typhoon (台风), debris flow (泥石流), landslide (滑坡), drought (干旱), hail (冰雹), sand storm (沙尘暴), snowstorm (暴雪), fire hazard (火灾), red tide (赤潮), frost damage (霜冻), sleet (冻雨), haze (雾霾), thunderstorm (雷暴), and heat wave (热浪) (Wang, 2006). After ranking all the frequencies of 22 natural disaster frames, the following 10 frames were the most frequently used in Mandarin and would go through our detailed corpus-based analysis: *earthquake, flood, fire hazard, drought, typhoon, landslide, volcano, sandstorm, tsunami, and debris flow*.

2.1.2. Data analysis procedures

Prior to the corpus analysis, we consecutively went through the following procedures concerning 10 natural disaster frames: (1) entering and searching a natural disaster frame into CCL; (2) downloading all the hits to a text file; (3) uploading the text file into the corpus analysis tool AntConc; (4) extracting the collocation and KWIC of the natural disaster frame; (5) excluding all the literal usage of the frame; (6) identifying the metaphorical target domain based on the Metaphor Identification Procedure (MIP) developed by the Pragglejaz Group (2007) and referring to context and the *Comprehensive Dictionary of Chinese Language* (汉语大词典). Despite the linguistic data of CCL starts in the 11th BC, all the sentences, including these 10 natural disaster frames, were downloaded, whether they originated from ancient times or contemporary days, going through the above procedures.

TABLE 1 Overview of 10 natural disaster frames by overall, metaphorical frequency, and percentage of metaphorical use; provided with illustrative examples in CCL.

Frames	Total hits	Metaphorical freq.	% metaphorical	Target domain frequency and examples
Earthquake (地震)	12,515	106	0.85%	Turmoil in politics (39), sports (7), **economic and financial (16)**, human resources (22), relationship (22)
Flood (洪水)	10,615	269	2.5%	crowds and emotion eruption (116), **shock in economy (17)**, politics, disease and science development (136)
Fire hazard (火灾)	7,498	1	0.01%	Problems (e.g., end the awkward situation of relying on America to put out the fire hazard.)
Drought (干旱)	5,222	1	0.02%	Industrial development (e.g., shortage in capital and drought in industries)
Typhoon (台风)	4,008	21	0.5%	Turmoil in politics and society (10), **new trends in economy** (1) and thoughts (6), rapid execution of the plan (4)
Landslide (滑坡)	3,763	2013	53.5%	**Decline in: economy (1372)**, health and environment (44), quality and management (125), morality and values (188), arts and education (284)
Volcano (火山)	2,829	198	7%	Emotions, desires, and passions eruption (123); volume of voice and crowds (34), **economic risks** and **chances (41)**
Sandstorm (沙尘暴)	1877	8	0.43%	Erosion of morality (3), erosion of cultural values (3), blame and abuse (2)
Tsunami (海啸)	1,592	128	8%	**Financial crises (60)**, mental struggle (21), big volume of voice (43), political turmoil (4)
Debris flow (泥石流)	1,473	6	0.41%	**Downward movements of economy (3)**, loss of intellectual talents (3)

The bold terms in table highlight the shared target domain for these ten natural disaster frames.

2.2. Findings and discussion

Metaphors serve as a great bridge between perceptible phenomena and imperceptible notions, say natural disasters and economic decline. As shown in Table 1, apart from their literal use, natural disaster frames take on metaphorical uses in various fields such as health, management, economy, politics, society, education, relationships, mindsets, and emotions, which literally cover every aspect of humanity's life. After careful mapping identification between natural disasters and various target domains, the metaphorical use of natural disaster frames in the economy domain stands out for its prominence and high frequency of occurrence in 7 of the 10 frames of Chinese contained in Table 1. A more specific target domain of economic decline can be metaphorically understood in five natural disaster frames (earthquake, flood, landslide, tsunami, and debris flow), which again illustrates the gist of embodied philosophy that abstract concept understanding is deriving from daily embodied experiences (Lakoff and Johnson, 1980).

Aside from their similar metaphorical mappings in the economic domain, it is important to note that each of these five natural disaster frames represents a different degree of negative economic impact, with the landslide and tsunami frames, according to context analysis, being the ones closest to an economic crises. In spite of the shared economy domain between the seven frames, the TYPHOON frame shows a chance for economic growth, and the VOLCANO frame represents money entering and exiting the stock market, showcasing its neutral characteristics. In order to demonstrate a metaphorical economic decline in natural disaster frames and identify the most prominent metaphorical frame of economic crises, these two frames (TYPHOON and VOLCANO) would be excluded from our analysis of the frames that came after them.

2.2.1. Earthquake frame

以石油为主要经济来源的海湾国家遭受了一场严重经济"[地震]", 经济形势严峻。【文件名:\当代\报刊\人民日报*1998*年人民日报】.

Translation: Gulf States, whose petroleum is the main source of their income, suffered from an economic ***earthquake*** *and were confronted with severe economic situations (File Name:\Contemporary\Newspapers\China Daily\China Daily, 1998).*

地震 (dì zhèn) "earthquake," a prominent natural disaster with its biggest frequency in the CCL corpus, attacks the whole world with shaking of the ground caused by seismic waves, threatens the earth inhabitants with its suddenness and unpredictability, and causes great loss and casualties every year all over the world. In this example, the economic turbulence in the Gulf States is framed as an earthquake in the metaphor "ECONOMIC TURBULENCE IS EARTHQUAKE." The suddenness and unpredictability, as well as the losses, and casualties caused by the earthquake, are perfectly mapped into the economic losses and turbulence in the Gulf States.

2.2.2. Flood frame

现有的垄断就会受到新进入者或该行业中原有边际厂商扩张引起的[洪水]般的冲击。【文件名:\当代\CWAC\CPB0223.txt】.

Translation: The existing monopoly is then subject to a [flood] of shocks caused by new entrants or by the expansion of the original marginal players in the industry. (File name:\ Contemporary\ CWAC\ CPB0223.txt).

洪水 (hóng shuǐ) "flood," featured by enormous overflowing of water soaking or drowning the land, usually bringing destructive influence on crops and properties. In the quoted example, the massive scale of shock and damaging features of the flood are mapped onto the

great negative economic shock received by the existing monopoly in the metaphor "ECONOMIC SHOCK IS FLOOD."

2.2.3. Landslide frame

工业生产总值已大大超过了农业生产总值，农业开始呈现出*[滑坡]*的趋势。【文件名:\当代\史传\晚年蒋经国】.

Translation: Total industrial output exceeds agricultural ones greatly, and agriculture is taking on a tendency toward ***landslides****. (File Name:\Contemporary\Historical Biography\Jiang Ching-kuo in his later years).*

滑坡 (huá pō) "landslide" refers to a downward movement of earth, rocks, debris, and so on, which usually brings danger to lives right below the landslide and causes blocking and traffic congestion. The landslide frame in this example conveys downward and dropping features perfectly for the production of agriculture. Therefore, "BUSINESS RECESSION AND DECLINE IS LANDSLIDE" serves as a metaphor for natural disaster landslides and agriculture production.

2.2.4. Tsunami frame

在这场危及世界金融安全的全球性金融*[海啸]*面前, 每个国家都会把捍卫本国的金融利益放在首位。【文件名:\当代\网络语料\网上面试笔试题】.

Translation: Faced with a financial ***tsunami*** *threatening global financial security, safeguarding financial interests would be the top concern of every country (File Name:\Contemporary\ Network Corpus\ Questions for Network Interview).*

海啸 (hǎi xiào) "tsunami," a catastrophic ocean wave usually caused by a submarine earthquake, an underwater or coastal landslide, or a volcanic eruption, brings great danger and even drowns and ruins to the coastal areas with enormous waves. In the above sentence, the aftermath of the tsunami is conferred on global finance so as to give rise to a financial crises in the economic field, with the metaphor "ECONOMIC CRISES IS TSUNAMI."

2.2.5. Debris flow frame

这是一场脱离基本经济因素倾向的市场投机力量所造成的"*[泥石流]*冲击"【文件名:\当代\报刊*1995*年人民日报】.

Translation: This is a ***debris flow/mudslide*** *shock derived from the force of market speculation deviating from economic fundamentals (File Name:\Contemporary\Newspapers\ China Daily\China Daily, 1995\June).*

泥石流 (ní shí liú) "debris flow" is defined as slurry flows consisting of sediment-water mixtures incorporating fine material (sand, silt, and clay), coarse material (gravel and boulders), and a variable quantity of water (Elias and Alderton, 2020). Debris flow is more like a flood than a landslide and may knock down and wash away trees, houses, and even villages. In the above-quoted example, the features of debris flow are mapped onto the economic blow with the metaphor "ECONOMIC SHOCK/BLOW IS DEBRIS FLOW."

Prior studies have shown natural disaster frames prevalent in English (de los Ríos, 2010), Spanish (Charteris-Black and Ennis, 2001), and German (Charteris-Black and Musolff, 2003) economic crises metaphors. The findings of the current study reveal that metaphors for economic decline in Mandarin have a similar tendency to use natural disaster frames. We could infer a concluding metaphor for economic crises or decline based on the five specific mapping analyses between natural disaster frames and economic decline presented above: ECONOMIC DECLINE/CRISES IS NATURAL DISASTERS.

First, it is reasonable to believe the metaphor that "economic decline/crises" refers to "natural disasters" because of the sudden, unpleasant, and sometimes catastrophic nature of natural disasters. This metaphor helps to remind us of the actual harm done by such events. These views confirm the following reality: Selection and salience are the two main components of framing (Entman, 1993). Five of the 10 frames for natural disasters mentioned above illustrate the metaphor that economic decline and crises is understood through natural disasters' mapping. The destructive aspects of the five metaphorical frames in the economy domain are chosen and become prominent in their respective contexts, making the metaphors for economic decline accessible through frames of natural disasters.

Second, with all these five natural disaster frames employed to elaborate economic decline, different frames accentuate different aspects of the economy, which help compose a larger, if not all, picture of economic activities. For example, the earthquake frame emphasizes the shock on the economy; tsunami and flood emphasize the velocity of impact on the crises-stricken areas; landslides and debris flow imply the recessed and downward qualities of an economic crises. Semino (2021) has pointed out that metaphors can be deceptive and prevaricating, and they can also be enlightening and comforting. Therefore, the appropriateness of a metaphorical frame depends greatly on the communicator, context, purpose, and audience (Semino et al., 2018) and also depends on different frames to construct every complicated aspect of the target, especially in the case of constantly developing and multifaceted economic activities. It is exactly the diverse frames and diversity of language that display the complexity of the target. Moreover, the complexity of targets also calls for various metaphorical frames and linguistic expressions.

Third, as observed from Table 1, the following five frames could be adopted to describe economic decline, primarily economic crises: earthquake, flood, landslide, tsunami, and debris flow. The "LANDSLIDE" frame has the highest percentage among the five frames, with 2013 metaphorical frequencies (53.5%) and 1,372 (36.5%) economic crises metaphors in the collocation of "经济滑坡" (economic landslide). 海啸 (hǎi xiào) "TSUNAMI" frame comes in second when framing economic crises, with 60 (3.8%) frequencies in total 1,592 frequencies in CCL. The landslide frame is overwhelmingly higher than the tsunami frame in metaphorical economic uses. The reason for the prominent salience of the landslide frame in framing metaphorical negative impact among other natural disaster frames might lie in the fact that a landslide provides us with a vivid picture of sliding from a slope in sudden and downward movements of land in Mandarin, with severe damage caused to landslide-stricken areas. Metaphorically, a landslide's rapid downward movements and its aftermath are perfectly mapped onto the decline and plummet of the economy, which might be the result of its salience in conveying economic crises, and that is in line with embodied cognition and conceptual metaphor theory (Lakoff and Johnson, 1980; Johnson, 1987; Lakoff, 1987).

As 滑坡 (huá pō) "LANDSLIDE" frame takes up the overwhelmingly biggest percentage of its total usage, we decided

to involve it in the following experimental study: whether literal and landslide-framed economic crises bring different conceptualizations and lead to differences in opinions and decision-making.

3. An experimental study: opinions and decision-making in literal and landslide frames

3.1. Methodology

As the aforementioned discussion shows, among the above 10 discussed natural disaster frames, both overall metaphorical (53.5%) and economic metaphorical usages (36.5%) of landslide frame rank the highest, overwhelmingly and significantly higher than the second highest in economic crises metaphor—tsunami frame (3.8%). Based on the overwhelming percentage and difference between these two frames, we intended to further our metaphorical framing effect study by comparing landslide and literal frames in this section. We had conducted a pilot study and received desirable results before we carried out this experimental study.

3.1.1. Participants

We had Chinese native speakers as our participants for the high percentage of landslide frames elicited from a Chinese corpus CCL. Given this metaphorical frame that prevails in our daily news and reports, we decided to recruit participants of various ages and walks of life, including students from majors closely related to economics and participants from various jobs such as doctors, teachers, office workers, and businessmen. A total of 416 Chinese with complete Mandarin literacy and comprehension (132 males and 284 females; age range from 18 to 58 years) recruited online from China participated in the experiment for monetary compensation, with 207 (M_{age} = 31.8, SD = 8.1) participants under the literal-framed condition and 209 (M_{age} = 28.5, SD = 7.4) under the landslide-framed condition. They were randomly assigned to either condition. Participation was voluntary, and the experimental protocol was approved by the independent ethics committee of Yangzhou University.

3.1.2. Materials and procedure

This study adopted a self-paced reading paradigm. The participants were presented with an online survey on the platform Wenjuanxing (an equivalence to Qualtrics). Participants' socio-demographic details, such as gender, age, or educational level, were collected. They were presented with a short Chinese paragraph of economic crises descriptions (either in the frame of literal or landslide; see Appendix). Each participant was randomly presented with literal or landslide-framed texts and required to finish a Likert scale with several questions to elicit opinions and decision-making. The two versions of the text were identical except in the literal and landslide frames in describing the shared topic: the economic crises. It was worth noting that the fabricated texts and questions prove to be credible, logical, and not self-contradictory, according to professionals in economics.

Every participant was asked three questions in Mandarin concerning their opinions and decision-making after reading the text: *(1)* Will you save more? *(2)* Will you worry about your financial situation? *(3)* Will factories face closure? *Provide a number from 1 to 5 (1 = "strongly disagree" and 5 = "strongly agree").*

3.2. Results and discussion

In this section, we aimed to look at the possible effects of the use of literal and landslide frames in expressing economic crises and to see whether the use of these two frames would lead to different financial opinions, judgments, and behaviors.

To the first question, (1) *Will you save more?*, we intended to investigate participants' future behaviors when confronted with an economic crises in two different frames. The participants who read the text with the landslide frame seemed to respond more positively (M = 3.93, SD = 0.83), than the participants who read the text with the literal (M = 3.81, SD = 0.96), as shown in Figure 1. However, when comparing the scores with Student's t-test to the independent samples, we observed that this difference was not statistically significant (p = 0.15).

Regarding the second question, (2) *Will you worry about your financial situations?*, we aimed to explore participants' psychological states when confronted with an economic crises in two different frames so as to elicit corresponding judgments and behaviors. As shown in Figure 1, the participants who read the text with the landslide frame seemed to be more likely to worry about their financial situation (M = 3.92, SD = 0.89) than the participants who read the text with the literal frame (M = 3.80, SD = 0.96). However, this difference was not statistically significant (p = 0.22).

With regard to the third question, (3) W*ill factories face closure?*, we wanted to find out whether there was any difference in participants' judgments toward financial trends when encountering two differently framed passages concerning the economic crises. As shown in Figure 1, the participants who read the text with the landslide frame seemed to be more likely to believe that more factories would face closure (M = 3.58, SD = 0.95) than the participants who read the text with the literal frame (M = 3.50, SD = 1.00). However, this difference was not statistically significant (p = 0.40).

In prior studies, it was confirmed that metaphorical frames shape reasoning and thought and affect people's opinions and decisions by instantiating frame-consistent knowledge structures and inviting structurally consistent inferences (e.g., Charteris-Black, 2011; Thibodeau and Boroditsky, 2011, 2013, 2015; Boeynaems et al., 2017; Thibodeau et al., 2017; Hart, 2021; Benczes and Ságvári, 2022; Brugman et al., 2022; Tao et al., 2023). Landslide, as a natural disaster frame, is characterized by downward gestures at great velocity, severe mud and rock congestion in traffic, and bringing damage to areas nearby and underneath. Meanwhile, the landslide frame activates and embraces landslide-congruent qualities and landslide-consistent opinions, decisions, and even solutions.

For the severe and damaging qualities conferred by a landslide, a landslide-framed economic crises increases participants' estimation of severity, manifested in their decisions and judgments

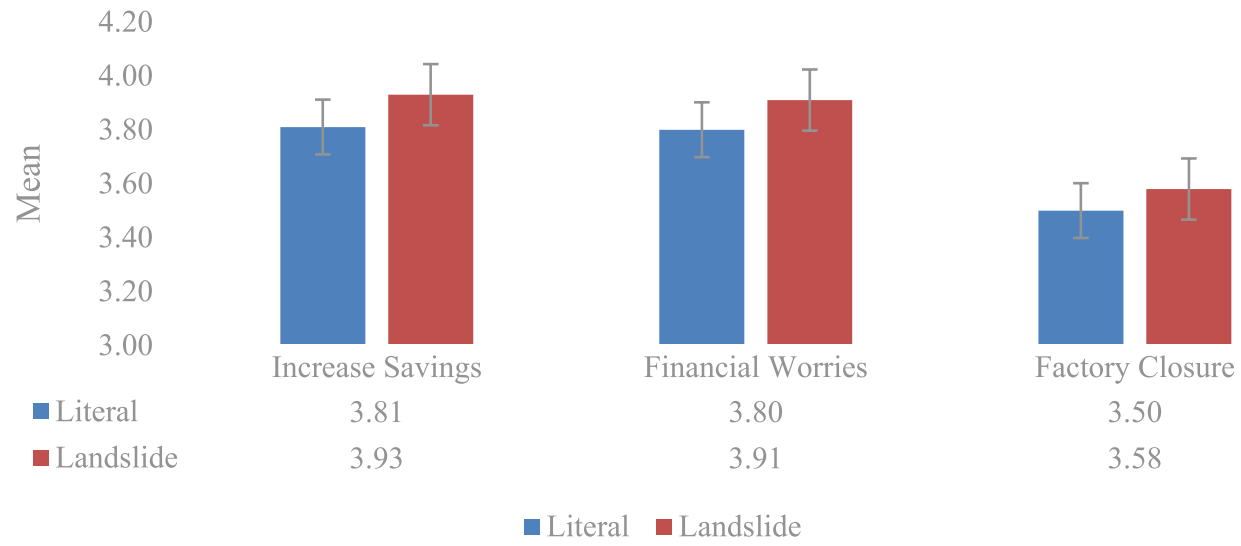

FIGURE 1
Mean of opinions and decisions in literal and landslide frames.

regarding savings, financial worries, and factory closure estimation. Although the difference between literal and landslide-framed texts is not statistically significant, the metaphorical frame in this case indeed affected the way people perceived and felt about the economic crises, which is in line with the weak metaphorical framing effect.

4. General discussion

This study detailed concrete natural disaster frames frequently employed in economic crises metaphors in Mandarin. It is confirmed that five natural disaster frames (earthquake, flood, landslide, tsunami, and debris flow) played a great role in understanding economic decline to varying degrees, among which the landslide frame ranked the highest in Mandarin. Landslide frame stood out in the 10 frames for its highest overall metaphorical uses (53.5%) and metaphorically framed economic crises (36.5%) in the total frequency in CCL. These corpus-based findings contribute to the following three aspects. First, it provides a detailed and systematic combing of natural disaster frames of economic decline metaphors in Mandarin, which is in contrast to prior studies of frames such as *drought, whirlpool,* and *tornadoes* in English, German, Russian, etc. Evidence from both Mandarin and other languages draws a larger picture of humanity's metaphorical language. Second, the natural disaster-framed economic crises is in line with conceptual metaphor theory and embodied philosophy (Lakoff and Johnson, 1980; Kövecses, 1986; Johnson, 1987; Lakoff, 1987). Humanity's languages are teemed with metaphorical frames deriving from perceptible concepts and sensorimotor experiences of daily life, such as weather phenomena and natural disasters. Third, corpus-based findings provide a credible statistical analysis of the language database for the following metaphorical framing effect exploration of this study.

When confronted with landslide-framed and literal-framed economic crises texts, the vignette of the landslide-framed economic crises aroused more perceptions of its severity in economic crises. Therefore, participants demonstrated more willingness to save, more worries about their own financial situation, and a higher estimation of factories being closed. In spite of the statistically insignificant differences in opinions and decisions, the landslide-framed economic crises did confer a different way of perceiving and feeling about the economic crises when compared with the economic crises in the literal frame. The comparisons between two differently framed text responses demonstrated that participants tended to respond and behave in accordance with the metaphors they were exposed to. When the economic crises is framed in terms of a landslide, features of the metaphorical source domain (landslide) are mapped onto the target (economic crises). The target (economic crises) takes on features of the source (landslide): downward movement with great velocity and the great damage caused, which vividly depicts the aftermath of an economic crises.

Theoretically, the weak metaphorical framing effect exhibited in the landslide-framed economic crises is in line with prior studies that metaphorical frames would indeed influence reasoning, emotions, judgments, and behaviors to a certain degree (Thibodeau and Boroditsky, 2011, 2013, 2015; Boeynaems et al., 2017; Thibodeau et al., 2017; Hendricks et al., 2018; Hart, 2021; Benczes and Ságvári, 2022; Brugman et al., 2022; Tao et al., 2023). Practically, given that risk communication in different metaphorical frames influences the audience's reasoning, decisions, and even behavior because of the framing effect (Gibbs and Cameron, 2008; Ervas et al., 2021), governments, reporters, and experts should be more cautious about metaphor choice in risk warning and communication. Semino (2021) has pointed out that metaphors can be deceptive and prevaricating, and they can also be enlightening and comforting. Therefore, the appropriateness of a metaphorical frame depends greatly on the communicator, context, purpose, and audience (Semino et al., 2018). In the moment of upcoming crises, effective, concise, clear, and official communication of risk sources, symptoms, and confident solutions is urgently needed (Hyland-Wood et al., 2021), and the metaphors used in risk reports should be in the service of effective and clear risk or crises communication.

There are certainly a couple of limitations to this study. The corpus-based analysis is limited to CCL, which might lead to the omission of some interesting metaphorical uses of natural disaster frames. Moreover, although the severity of the economic crises posed by landslide was greater than the literal frame and some weak metaphorical framing effects were detected and identified, the severity and framing effect were not significantly different. In light of these limitations, a venue for future research could be proposed. Further studies could consider investigating other factors functioning in metaphor processing, judgments, and decision-making, such as the role of age, gender, and socio-economic status. Meanwhile, the comparative study of metaphorical frames of economic crises in English and Mandarin is worth our further research. Moreover, to gain a clearer understanding of the metaphorical framing effect, some comparisons of economic crises metaphors in landslide and the oft-mentioned DISEASE frames could be further carried out to identify a greater and more comprehensive metaphorical framing effect. Meanwhile, the role metaphors play in risk communication deserves further and comprehensive study.

5. Conclusion

To conclude, our study confirmed a great number of natural disaster frames conveying an understanding of economic decline in Mandarin and offered a detailed analysis of the top 10 natural disaster frames in the corpus in question. Moreover, the landslide frame stands out in conceptualizing economic decline from all the 10 frames for its highest overall metaphorical uses (53.5%) and metaphorically framing economic crises (36.5%) in the total uses in CCL. The metaphorical framing effect exhibited in comparison between the Mandarin literal-framed and landslide-framed economic crises showcases that metaphorical frames impact the audience's opinions, judgments, and even behaviors. The results inform government, journalists, and experts of the metaphor choices in risk warning and crises communication. We personally believe that metaphorical frame choice should depend on the degree of severity of the risk or crises and be honest with reality to avoid sending the general audience into panic and making rapid and extreme decisions. Furthermore, both communicators and the audience should be aware that metaphors are not mere figurative devices. Rather, metaphors, in various possible frames, might have the power to influence the way we think and behave in different ways.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

YZ: Writing – original draft. WY: Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

Literally-framed economic crises description (English translation is not presented in the experiment)

过去5年来, 谷城地区的经济持续发展。但是近一年来, 谷城地区经济增长缓慢, 经济状况很不乐观, 地区生产总值同比下降了7%, 成为GDP出现负增长的地区之一。经济增长缓慢影响着各行各业, 导致生产和消费下降。而且销售业绩不佳, 商品过剩, 市场流动性较差, 人们生活水平下降, 某些行业影响较大, 发展减缓, 经济面临巨大挑战。.

(Translation: *Over the past 5 years, the economy of Gucheng Region has continued to grow. However, in the last year, the economy of Gucheng has been growing slowly and the economic situation is very bleak, with the regional GDP falling by 7% year-on-year, making it one of the regions with negative GDP growth. The slow economic growth has affected all sectors, leading to a decline in production and consumption. And with poor sales performance, a surplus of goods, less liquid markets and a much lower standard of living for people, certain sectors are more affected, growth is slowing and the economy is facing huge challenges*).

Landslide-framed economic crises description (English translation is not presented in the experiment)

过去 5 年来， 谷城地区的经济持续发展。但是近一年来, 谷城地区正经历着经济大滑坡, 地区生产总值同比下降了7%, 成为GDP出现负增长的地区之一。经济像滑坡一样整体下滑, 冲刷着各行各业, 导致生产和消费下跌。而且商品销售停滞不前, 产品堆积, 市场的流动受到阻塞, 人们生活水平下滑, 某些行业受灾严重, 损失惨重, 经济或将跌至谷底。.

(*Translation: Over the past 5 years, the economy of Gucheng Region has continued to grow. However, in the last year, Gucheng is experiencing a major economic* downturn, *with GDP falling by 7% year-on-year, making it one of the regions with negative GDP growth. The economy as a whole has* slumped like a landslide, *violently* washing *over all sectors and causing production and consumption to* keep falling. *Moreover, sales of goods are* stagnant, *products are* piling up, *the flow of markets is* blocked, *people's living standards are in* decline, *certain sectors are affected and* losses *are heavy, and the economy may hit* rock bottom).

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Metaphor analysis meets lexical strings: finetuning the metaphor identification procedure for quantitative semantic analyses

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Recent years have witnessed the development of the Metaphor Identification Procedure (MIP/VU), a step-by-step protocol designed to identify metaphorically-used words in discourse. However, MIP(VU)'s merits notwithstanding, the procedure poses a problem to scholars intending to use its output as the basis for a semantic field analysis involving a quantitative component. Depending on the research question, metaphor analysts may be interested in chunks of language situated above the procedure's standardized level of analysis (i.e., the lexical unit or lexeme), including phrases and sentences. Yet, attempts to decenter the method's exclusive focus on metaphor-related words have been the target of critique, among others on the grounds of their lack of clear unit-formation guidelines and, hence, their inconsistent unit of analysis and measurement. Drawing on data derived from a Spanish-language US-based newspaper's coverage of the migration program known as DACA (Deferred Action for Childhood Arrivals), this article describes challenges that analysts can run into when attempting to use a dataset containing atomized metaphor-related words as the input for subsequent quantitative semantic analyses. Its main methodological contribution consists in a proposal and illustration of three possible methods to extend the existing MIP(VU)-protocol in such a way as to allow it to capture metaphorical strings, on top of lexemes, in a reliable and systematic manner. The first two methods are procedural, and entail formulating *a-priori* grouping-directives based on the research question(s). One departs from semasiological criteria (Method 1) and the other takes an onomasiological approach (Method 2). The third method works bottom-up, involving the *ad hoc* grouping of lexemes and adding a descriptive parameter meant to keep track of grouping-decisions made by the analyst, thereby safeguarding transparency at all times.

KEYWORDS

metaphor analysis, metaphor identification, lexical units, lexical strings, unit boundary demarcation, quantitative analysis, semantic field analysis, methodology

1. Introduction

The cognitive turn of the 1980s ushered in an era of intensified (Psycho)Linguistic interest in metaphors (e.g., Ortony, 1993; Kövecses, 2010). As the popularity of metaphor research surged, a concern with developing an empirical method for detecting metaphors in naturally occurring speech and writing ensued. This concern was fed by a number of methodological critiques leveled to existing Conceptual Metaphor scholarship, which had tended to use

pre-established lists of conceptual metaphors to identify linguistic expressions taken to instantiate them, thereby becoming vulnerable to confirmation bias (Krennmayr, 2013). In the wake of these reproaches, various initiatives to systematize metaphor identification stepped up to the challenge,[1] among which one of the most impactful one has been the Metaphor Identification Procedure (Pragglejaz Group, 2007).

The Metaphor Identification Procedure – or MIP for short – entails a step-by-step protocol designed to identify metaphorically-used words in discourse. It was created by Pragglejaz Group (2007) and further refined under the acronym "MIPVU" (Steen et al., 2010). In brief, the procedure requires the analyst to establish for individual lexical units whether they possess a more basic, concrete sense than their contextual one, and whether both meanings can be understood in contrast and comparison with one another (see Section 2.1). If the response is affirmative, the unit is marked as metaphorical. Contrary to top-down approaches to metaphor analysis, MIP(VU) works from the language data upwards (Krennmayr, 2013) and reserves the semantic annotation of metaphor mappings (e.g., SOCIETY IS A BODY) for a consecutive stage of analysis (Pragglejaz Group, 2007; Steen et al., 2010, p. 8; Krennmayr, 2013; Steen, 2017).

However, MIP(VU)'s[2] merits notwithstanding, the procedure also poses different challenges. The focus of this paper is concerned with the output of MIP(VU) as the basis for quantitative semantic analyses, which are far from evident (also see Glynn, 2010; Jansegers et al., 2015). Specifically, the problems for such analytic ends boil down to MIP(VU)'s standardized unit of analysis, called the lexical unit, as relevant linguistic items do not always neatly overlap with lexemes (*cf.*, Cameron and Maslen, 2010; Charteris-Black, 2014; Perrez and Reuchamps, 2014; Silvestre-López and Navarro i Ferrando, 2017). Depending on the research question, metaphor analysts may be interested in chunks of language situated above the level of the lexical unit. These may range from compositional phrases (1) over non-compositional phrases (2)[3] or even complete sentences (3).

> (1) His mother's death hit him hard[4] (Lakoff and Johnson, 1980; cited in Deignan, 1999, p. 22).
>
> (2) [feeling] on top of the world[5] (Pinker, 2015, p. 396).
>
> (3) Two people are chasing the same world title[6] (Sullivan, 2007, p. 108)

In the context of their Discourse Dynamics Framework to metaphor analysis, Cameron and Maslen (2010) developed an alternative identification procedure which is attuned to the identification of larger stretches of metaphorically-motivated language, called *vehicle terms*. An example of a multiword expression identified as a vehicle term is the phrase *flaw in the system*, the basic meaning of which can be paraphrased as "a mechanical breakdown caused by some physically incorrect item" and its contextual meaning in a text on terrorism being "failures in security service tactics and procedures" (Cameron and Maslen, 2010, p. 107).

Steen (2017), however, has voiced a methodological concern about the protocol, in particular, how to decide where vehicle-boundaries fall. First, the decision of where to place unit boundaries seems to rely on the idea of 'metaphorical coherence', i.e., coherence of the metaphorical image evoked by the items within the vehicle (Steen, 2017, p. 83). Problematically, this tacitly requires the analyst to postulate underlying mappings of the string's constituent elements, thereby lumping together metaphor identification and semantic analysis, which is exactly the methodological problem that MIP(VU) was meant to avoid. Second, the method's lack of clearly defined guidelines to orient grouping decisions translates into an inconsistent unit of analysis. And, it is well known that the arbitrary nature of unit formation brings into jeopardy the comparability of obtained quantitative results (*cf.*, Steen et al., 2010).

Against this backdrop, the aim of this paper is threefold. First, drawing on concrete examples extracted from a corpus-based discourse study on a Spanish-language US-based newspaper's metaphorical framing of the Deferred Action for Childhood Arrivals (DACA) debate, we seek to paint a nuanced picture of the challenges that the lexical unit (which we will later refer to as 'lexeme,' for disambiguation's sake; *cf.*, Section 2) can pose to metaphor analysis. Namely, what if the relevant metaphorical image for a particular research interest is triggered by a lexical string, broken up into multiple units according to MIP(VU)? The second objective consists in illustrating two methodological difficulties that metaphor scholars may encounter when using the output generated by MIP(VU) as the starting point of their quantitative semantic analysis. These methodological challenges relate to (i) the semantic annotation (e.g., WAR, DISEASE) and (ii) quantification of metaphorically-motivated strings. Specifically, how do we annotate and count their component parts? Finally, we wish to contribute to the methodological debate sketched above by proposing some guidelines to further finetune MIP(VU) for academics who (also) want to capture metaphorical expressions which stretch beyond the boundaries of the lexical unit. Concretely, we will present three alternative methods to achieve this: Method 1 and 2 are procedural, and consist in formulating *a-priori* grouping-directives based on the research question(s); while Method 1 departs from semasiological (i.e., 'form-first') criteria, Method 2 takes an onomasiological ('concept-first') approach. Method 3 is

1 For an overview, see: Pragglejaz Group (2007, pp. 32–34) and Steen (2007).

2 Note on terminology: in contexts where it is important to differentiate between the original and the updated protocol, we will, respectively, employ "MIP" and "MIPVU" to signal this distinction. On all other occasions, we will use the acronym "MIP(VU)" to refer to the procedure.

3 As will be touched upon in Section 2, *(non-)compositionality* denotes the idea that the meaning of an expression as a whole cannot be derived from the sum of the meaning of its parts. Importantly, (non-)compositionality is a matter of degree rather than implying a categorical distinction between *compositional* and *non-compositional* expressions (e.g., Cuenca and Hilferty, 2007).

4 According to Deignan (1999), the collocation *hit hard* possesses a non-literal meaning related to the domain of PHYSICAL VIOLENCE, which is mapped onto the target domain of EMOTIONS (p. 22).

5 Pinker (2015) foregrounds that the locative meaning encoded by the entire prepositional phrase *on top of the world* is mapped onto the more abstract domain of EMOTIONS. Interestingly, as Pinker highlights: such "use of prepositional phrases as if it was an adjective to describe a mental or emotional state follows a common pattern in English" (p. 396).

6 Sullivan (2007) posits that it is the sentence *Two people are chasing the same world title* as a whole which evokes the Object Event-Structure metaphor TRYING TO ACHIEVE A GOAL IS HUNTING (p. 108).

bottom-up, involving the *ad hoc* grouping of units and adding a descriptive parameter meant to keep track of grouping-decisions made by the analyst, thereby safeguarding transparency at all times.

The structure of this paper breaks down in five main parts. Section 2 will provide an overview of the different steps that make up MIP(VU), paying special attention to the lexical unit and its proposed way to deal with (non-)compositional multiword expressions and other linguistic multiword realizations of cross-domain mappings (such as similes and analogies). We do so to familiarize uninitiated readers with some of the procedure's features and terminology, thereby laying the foundation for the remainder of the paper. Section 3 starts with a brief introduction of the case study from which the data used to illustrate our main methodological points stems (3.1), before setting out the core problem and related methodological challenges that metaphor scholars may face when holding onto atomized lexical units as the input for subsequent semantic field- and quantitative analyses (3.2). We then present three methods which allow to sidestep these difficulties in section 4, after which we offer some concluding remarks in the final section.

2. Introducing the MIP(VU) method

2.1. A brief introduction of MIP(VU)

At its core, the Metaphor Identification Procedure (MIP) comprises four main steps[7]. The first consists in reading the entire text to get a sense of its meaning as a whole. The second step requires the analyst to divide the text's strings of verbiage into their constituent lexical units. Lexical units are generally understood as individual words (Pragglejaz group, 2008, p. 2), with the exception of multi-word clusters whose "meaning of [the] whole expression cannot be arrived at *via* the composition of the meaning of the parts" (Pragglejaz Group, 2007, p. 4). In this way, the sentence "For years, Sonia Gandhi has struggled to convince Indians that she is fit to wear the mantle of the political dynasty into which she married, let alone to become premier" would be composed as (Pragglejaz Group, 2007, p. 4):

> /For / years /, Sonia Gandhi / has / struggled / to / convince / Indians / that / she / is / fit.
> / to /wear / the / mantle / of / the / political / dynasty / into / which / she / married /, let.
> alone / to / become / premier / (Pragglejaz Group, 2007, p.4).

The next step involves inspecting each of these lexical units to distinguish their contextual meaning, bearing in mind the surrounding context, and to check whether there exists a more basic, concrete and/or bodily action-related interpretation. To decide on a lexical unit's basic meaning, MIP prescribes the use of a dictionary (Pragglejaz Group, 2007).

In the last step, a lexical item is marked as metaphorical when (i) the consulted dictionary mentions a more concrete sense than the contextual one observed in the corpus and when (ii) both senses can be understood in contrast and comparison with one another. Consider the analysis that Pragglejaz Group proposes for the lexical unit *wear* taken from the example sentence (Pragglejaz Group, 2007, pp. 7–8):

wear.

> "(a) *contextual meaning*: In this context, the idiomatic expression "wear the mantle" means to have a leading role within a family whose members have recently occupied positions of high office in a particular democratic system. The contextual meaning of "wear" is have or bear, and the contextual meaning of "mantle" is the familial responsibility.
>
> (b) *basic meaning*: The basic meaning of "wear" in "wear the mantle" is defined as the first sense of the word in the Macmillan dictionary as follows: "to have something on your body as clothing, decoration or protection" (p. 1,622). The SOEDHP indicates that this meaning is also historically prior (p. 1,274).
>
> (c) *contextual meaning* versus *basic meaning*: The contextual meaning contrasts with the basic meaning and can be understood by comparison with it: We can understand the process of following family members in having a prominent political role in terms of physically wearing the item of clothing that symbolizes royal power.
>
> *Metaphorically used?* Yes."

In a next phase, the MIP-identification instrument was further adapted and expanded under the acronym MIPVU (Steen et al., 2010). Probably its most pivotal extension relevant for this paper involves MIPVU's incorporation of the analytical category of *direct metaphor*. This type is defined as language use potentially realizing a cross-domain mapping (Steen et al., 2010, p. 10), and encompasses most (metaphorical) similes (e.g., *her harlequin dress like some angry restless dragonfly*; Steen et al., 2010, p.93), analogies (e.g., *The DNA can be regarded as a set of instructions for how to make a body, written in the A, T, C, G alphabet of the nucleotides;* Dawkins, 2016, p. 28) and other explicit invitations for comparison (e.g., *Shall I compare thee to a summer's day*; Steen et al., 2010, p. 10). This category of language use is set apart from the linguistic realizations of metaphor that MIP was designed to capture, which MIPVU's architects have baptized *indirect metaphors*. Consider examples (4) and (5):

> (4) He defends his claims well (Steen et al., 2010, p. 13).
>
> (5) Sometimes it's like someone took a knife, baby, edgy and dull, /And cut a six-inch valley through the middle of my soul (Steen et al., 2010, pp. 10–11).

Whereas in example (4) the metaphor-related word[8] *defends* realizes an indirect contrast and comparison between the word's basic and contextual meaning (physical defense vs. rhetorical defense), the

7 Note that it is not our intention to give an exhaustive display of the protocol.

8 The technical term 'metaphor-related word' is introduced in the MIPVU procedure to encapsulate both 'direct' and 'indirect' manifestations of metaphor in language. It is used interchangeably with the original MIP procedure's notion of 'lexical unit' (which, as we will see in Section 2.3, is operationalized within MIP(VU) as individual lexemes).

metaphor-related words in example (5) (*took*, *knife*, *edgy*, *dull*, *cut*, *six-inch*, *valley*, *through*, *middle*) do not stage this incongruity (their basic and contextual meanings are identical). Conversely, their metaphorical force derives from a semantic transfer between the conceptual domains of physical and emotional pain, which is expressed "directly."

To accommodate their procedure to such direct realizations of cross-domain mappings, MIPVU devised a separate set of guidelines (see Steen et al., 2010, pp. 14–15 for the complete exposition). For now, it is important to highlight that word-clusters realizing a cross-domain mapping in a direct manner are detached into their constituent lexical units and treated as an array of discrete direct metaphors within the procedure, to be admitted separately in the database (e.g., *summer's / day*).

2.2. MIP(VU)'s standardized level of analysis: the lexical unit

The rationale behind choosing the lexical unit as standardized level of analysis is twofold.

A first rationale is theoretical, and relates to the assumption that there exists a functional relationship between words, concepts and referents, in the sense that "most words may be assumed to activate concepts in memory which postulate referents in discourse" (Steen et al., 2010, p. 12). The second motivation is more pragmatic in nature, and involves the creators' desire to adopt a "maximal approach" to metaphor identification (Pragglejaz Group, 2007, p. 2), and to capture as many layers of metaphorical meaning as possible. Hence their decision to split word-clusters into their component parts, so that all of them may be considered for potential metaphoricity (Pragglejaz Group, 2007, p. 2).

One can readily appreciate the promised advantages that come with a standardized level of analysis. For one, a stable unit of analysis is said to facilitate across-language and study comparison (e.g., Steen, 2017, p. 80). Furthermore, it is taken to guarantee the reliability of subsequent quantitative analyses of the data (Steen et al., 2010, p. 27; Steen, 2017, p. 83).

However, a major issue concerns the aspect of non-compositionality. That is, the recognition that on many occasions the meaning of word-clusters does not derive from the sum of the meanings of its constituent elements but is evoked by the schema which brings them together (see also Fillmore et al., 1988; Goldberg, 1995, 2006; Croft, 2001; Sullivan, 2007). The idea of non-compositionality is recognized to some extent within the protocol (*cf.* Section 2.1), as it is meant to define the demarcation of the lexical unit. Yet, paradoxically, in practice many multiword configurations traditionally considered non-compositional (e.g., Boas, 2005; Stefanowitsch, 2006) – such as classical idioms,[9] collocations, sayings and other kinds of *listemes* (Di Sciullo and Williams, 1987) – are broken down and dealt with as discrete lexical units within the procedure. For instance, idioms of the type *to wear the mantle* (*cf.*, supra, Section 2.1) are spliced into word-atoms, and treated as individual lexical units (e.g., *to / wear / the / mantle*). This begs the question: how does the MIP(VU) identification-instrument factor in the idea of non-compositionality when dividing multiword segments into lexical units? And what are the reasons for splitting up seemingly non-compositional lexical strings?

2.3. Dealing with non-compositionality

When confronted with lexical strings generally considered non-compositional, MIPVU roughly deals with them in one of the following two ways.

In cases where the multiword expressions designate a single referent and are considered sufficiently conventionalized as one unit (Pragglejaz Group, 2007), they recognize the non-compositionality of the string and code is as one lexical unit. A multiword unit is taken as sufficiently conventionalized when it (i) receives a separate POS-tag in the corpus of choice, (ii) is admitted as a single entry in their chosen reference dictionary and, as is the case for compound nouns, (iii) when it conforms to a particular stress pattern (*cf.*, Steen et al., 2010, pp. 27–32). Examples of multiword expressions treated as a unique lexical unit include a finite set of polywords such as *by means of* (Steen et al., 2010, p. 27) and *let alone* (Pragglejaz Group, 2007, p. 4), as well as compound nouns found in the dictionary which carry a primary stress on the first word and a secondary stress on the second, like *power plant* (Steen et al., 2010, p. 31).

On other occasions, the non-compositionality of a lexical string is acknowledged but it does not affect grouping-decisions. Examples include idioms (e.g., *to/ spill / the / beans*; Steen, 2017, p. 80), proper names (e.g., *New / York / Herald / Tribune*; Steen et al., 2010, p. 31), frequent collocations (e.g., *staking / a / claim*; Pragglejaz Group, 2007, p. 27) as well as a great many compound nouns[10] (e.g., *nuclear/power*; Steen et al., 2010, p. 31). Besides the assumption about the functional relationship between words, concepts and referents, reference is made to the existence of psycholinguistic evidence (i.e., Gibbs, 1994) that, even in such non-compositional expressions, people can find metaphoricity at the word-level (Pragglejaz Group, 2007, p. 27).

In summary, and to conclude Section 2, up until now we have seen that MIP(VU) requires metaphor scholars to divide lexical strings that sit on a continuum ranging from non-compositional (e.g., idioms and frequent collocations) to compositional (e.g., analogies, similes and phrases), and to treat their constituent parts as individual lexical units. Therefore, to disambiguate MIPVU's idiosyncratic operationalization of "lexical unit" as "metaphor-related words" from the more conventional lexicographer's interpretation, we will henceforth refer to these as "lexemes." These units, in turn, are then to be judged for the presence of metaphorical meaning.

However, the identification of linguistic metaphors represents for many scholars only the starting point for subsequent analyses. Often times this includes a semantic-field analysis, with the intention to detect which semantic frames are evoked by the identified metaphor-related words (e.g., Sullivan, 2007), and to be able to answer a wide

9 Important to point out is that a growing body of linguistic and psychological literature has nuanced this assumption, drawing attention to the fact that idioms constitute a heterogenous group of expressions whose members can be placed on a *continuum* of compositionality (*cf.*, Cuenca & Hilferty, 2007, pp. 116–121).

10 Compound nouns which are admitted in the dictionary as a unique entry are to be broken down if they do not match a specific stress pattern, even though they stand in for a unique referent (*cf.*, Steen et al., 2010, p. 31).

variety of research questions which require postulating underlying conceptual (Deignan, 2016) or systematic metaphors (Maslen, 2017). In addition, scholars often wish to quantify the results of this semantic analysis (e.g., Catalano and Mitchell-McCollough, 2019), so as to obtain a general picture of frequencies and distributions of detected metaphorical domains, and/or for comparison purposes (e.g., between different languages, language varieties, or speech communities, or between distinct discourse genres, registers, sources, etc.). However, when using the identified metaphorically-motivated words as the input for a subsequent quantitative semantic field analysis, the analyst may run into a host of problems, related to the default level of analysis: the lexeme. These problems are further specified in the next section.

3. Problematizing the lexeme

To illustrate the difficulties which the lexeme may cause, we will draw on corpus examples derived from a case study exploring the metaphorical representation of the Deferred Action For Childhood Arrivals (DACA) policy issue in the US written press. Before moving on to the crux of this section (3.2), we will therefore first briefly introduce the case study from which our data stems (3.1).

3.1. Research context: introduction of the DACA-case study and data

3.1.1. Aim of the study

The case study which informs this paper encompasses a corpus-based analysis of the news discourse of El Diario, a Spanish-language US-based newspaper. In concrete we are interested in its coverage of the migration debate surrounding the DACA-program, a policy issue which has attracted a great deal of media attention in recent years.

Short for "Deferred Action for Childhood Arrivals," DACA entails an Obama-era migration program conferring temporary social and legal rights to an undocumented segment of the US-population brought to the country as children, including protection from deportation and a work permit (Walters, 2017). In the public sphere its beneficiaries are known as *Dreamers* (Chávez, 2013). While widely enjoying popular and bipartisan support (Krogstad, 2020), the program has been dragged to Court numerous times by conservative-leaning politicians ever since the Trump administration announced its plans to phase out DACA in 2017. Particularly after a conservative judge (judge Hanen) ruled DACA "illegal" (Aug. 2021) and the Fifth Court of Appeals followed suit (Aug. 2022), the prospects for the program's future and the Dreamers have never looked more grim[11].

Our case study's general aim can be encapsulated by the following research question: how does El Diario use metaphors to frame the DACA-debate? More specifically, which metaphors are deployed to refer to or characterize recurrent referential categories – i.e., discourse actors (e.g., Dreamers, Biden, Trump, judge Hanen, etc.), entities (e.g., DACA), actions (e.g., deportation, regularization, restrictive migratory actions and court rulings), attributes (e.g., legal status) and relationships (e.g., Trump vs. Dreamers) – in this debate?

The research design incorporates a qualitative and a quantitative component. From a qualitative point of view, it seeks to chart which semantic fields (e.g., WAR, MOVEMENT) are used to frame the DACA-debate and how these fields are used situationally[12] (Van Teeffelen, 1994). From a quantitative perspective, it aspires to measure which metaphorical fields are most productive. This research fits within a rich tradition of (critical) discourse scholarship concerned with the metaphorical representation of social questions in the press (e.g., Arrese, 2015; Nerlich, 2015), such as migration (e.g., Charteris-Black, 2006; Musolff, 2015; Piñero Piñero et al., 2015; Mujagić, 2018; Arcimaviciene, 2019; Montagut and Moragas-Fernández, 2020).

3.1.2. The data

In total, our corpus bundles 25 DACA-related articles published in El Diario during the presidency of Joe Biden (November 3, 2020 - present), amounting to 14.343 words in total. From these 25 articles, 9 were published in the El Paso edition of the newspaper (6,002 words) and 16 in the Juárez version (8,341 words).

The metaphors were identified by running a reduced version of MIP(VU) (Pragglejaz Group, 2007; Steen et al., 2010; *cf.*, supra), meaning that only content words were considered for analysis (7,772 words). As prescribed by MIP(VU) (*cf.*, supra), we selected two dictionaries to aid us with the disambiguation of lexemes basic meanings, namely: *Diccionario del Español de México* (El Colegio de México, A.C, n.d.) and *Diccionario De Uso del Español* (Moliner, n.d.)

After running the MIP(VU) procedure, all linguistic metaphors along with their extended contexts were migrated to a separate spreadsheet in Excel. Our final DACA-database envelops a total of 1,353 (potentially)[13] metaphor-related words (see Table 1 below).

3.1.3. Data analysis

This dataset, in turn, served as the input for the (manual) annotation of relevant linguistic and context-related variables, such as "semantic field" and "referent/topic."

11 For an overview of DACA's history and the context of its creation, we direct the reader to Chomsky (2014, pp. 152-180) and Chávez (2013, pp. 181–208). For a timeline detailing more recent developments of the program, see: American Immigration Council (2021).

12 Following Van Teeffelen (1994), the notion *situational use* is adopted to refer to a single metaphor's variable usage, meaning and function depending on the context in which it is deployed. For example, WAR-metaphors may convey either a negative or, alternatively, a positive, empowering meaning depending on their discursive context (*cf.*, Boeynaems et al., 2017; Semino et al., 2017; De Backer and Enghels, 2022).

13 In line with Cameron and Maslen (2010), we adopt the term "potentially" to emphasize that no claims are made about the metaphorical value of the identified linguistic expressions for actual speakers/writers and listeners/readers (*cf.*, Cameron and Maslen, 2010, p. 102).

TABLE 1 Breakdown of the number of analyzed and (potentially) metaphor-related words per local edition.

Edition	# Cases analyzed (content words)	# (Potentially) metaphor-related words
El Paso	3,270	570
Juárez	4,502	783
	Total: 7772	Total: 1353

The semantic-field analysis of the identified items proceeded inductively, and was carried out at two levels of inference (*cf.*, LeCompte and Schensul, 2013). In the first round of analysis, low-inference descriptors were formulated. At this stage, we remained as close as possible to the words used in the news texts (*cf.*, Cameron et al., 2010). Consider example (6):

> (6) … exigió que el Congreso encontrara un camino a largo plazo, como un camino hacia la ciudadanía para inmigrantes indocumentados y beneficiarios de DACA (Diario de El Paso [García], 2021).
> (*'.. demanded that Congress find a long-term pathway, such as a pathway to citizenship for undocumented immigrants and DACA recipients'*)

In (6), the linguistic metaphor *camino ('pathway')* was annotated as *Pathway* during the first round of inductive, low-inference coding (as opposed to coding it using a high-inference descriptor, say, *Journey*).

In the second round of coding, and in an additional parameter, we attempted to formulate high-inference descriptors, based on generalizations which were warranted by emerging patterns in the data. For instance, the same token *camino* (*pathway*) was coded as *Journey* after observing that a set of semantically-related, low-level codes such as *Movement toward a destination*, *Trajectory*, *Movement toward a source*, *Destination* were used systematically to frame the DACA-debate.[14]

For the annotation of the linguistic metaphors' referents, a list was composed (inductively) after reading through the news texts which enumerates recurrent discourse actors, entities, actions, attributes and relationships within the DACA-debate[15] (referred to henceforth as 'referential categories'). This list was then used to code the linguistic metaphors (e.g., *a pathway to citizenship*) in our database (for a similar approach, see Cameron et al., 2009; Cameron and Maslen, 2010). Importantly, given that a single metaphor can be used to frame multiple relevant referents simultaneously, we multiplied such metaphors in our database to capture all layers of meaning (*cf.*, 'multidimensional analysis'; De Backer and Enghels, 2022).

3.2. The lexeme as starting point for metaphor analyses: setting out the core problem and related methodological challenges

In what follows, we will sketch the contours of the key problem that the lexeme may pose to metaphor analysis (3.2.1), after which two related methodological challenges will be put at display which can arise when intending to use a database containing atomized metaphor-related words as the starting point for a semantic-field analysis with a quantitative component (3.2.2).

3.2.1. The problem: when the relevant metaphorical image is evoked by a lexical string

The following question emerges: how do we deal with contexts in which the relevant metaphorical image for a particular research topic is evoked by a lexical string, consisting of multiple lexemes?

For clarity's sake, we have distinguished in our dataset three scenarios in which this tension between lexeme and string is foregrounded: (1) the lexemes involved in a string are individual metaphors; (2) metaphorical lexical strings whose constituent lexemes are not metaphorical in isolation; and (3) metaphorical similes and analogies made out of (in) direct metaphors and non-metaphorical lexemes.

The point of this overview is not to be exhaustive, nor is it to offer individual solutions or an alternative taxonomy to categorize metaphorical lexical strings. Rather, it is meant to report in a structured way some of the contexts in which MIP(VU)'s focus on metaphor-related words is confronted with difficulties. Simultaneously, it aims to show that this problem does not limit itself to a handful of isolated cases, such as classical idioms of the sort *to wear the mantle* (*cf.*, Section 2), but can instead affect a wide range of multiword units, varying greatly in terms of their length, internal composition and degree of cohesion.[16]

3.2.1.1. Scenario 1: the lexemes involved in a string are individual metaphors

The first scenario embraces linguistic contexts in which the pertinent metaphorical image is elicited by a string of lexemes whose constituent items are different metaphors according to MIP(VU).

An example is the phrase *punto intermedio* in (7), which comments on recent attempts of Democrats to reach a political agreement with the Republican party on the thorny issue of migration reform:

> (7) En busca de un [punto intermedio], los demócratas incluyeron una versión inmigratoria "Light" (Diario de El Paso [Zamorano], 2021)
> (*'In search of a [middle ground],[17] the Democrats included a "Light" immigration version'*).

14 For an overview of the annotation scheme used to code our linguistic metaphors in terms of their semantic fields (low and high inference labels), including examples from our corpus, see the Supplementary materials.

15 For an overview of the annotation scheme used to code our linguistic metaphors in terms of their referent/topic, including examples from our corpus, see the Supplementary materials.

16 The point made in this section calls to mind Geeraerts (2002, 2009) prismatic model for the description of semantic specialization in composite expressions (i.e., idioms and compounds). Similar to the argumentation presented here, Geeraerts draws attention to the fact that not all elements of the figurative meaning of composite expressions may be mapped transparently onto the literal meanings of its constituent parts (a principle referred to as "isomorphism"). In contrast to Geeraerts' taxonomy, which primarily focuses on idioms and compounds, the classification presented here is broader in its scope, extending to a wide range of decompositional multiword expressions (such as analogies, similes and collocations).

17 Note that the English equivalent of *punto intermedio* ('middle ground') – while admitted as a single entry into MIP(VU)'s reference dictionary (Macmillan) and control dictionary (Longman) – is not counted as one single lexical unit according the MIPVU-guidelines, since it does not conform to the required stress pattern. The Spanish expression *punto intermedio* (literally translated: 'middle point') is also not counted as one single lexical unit, given that it is not taken up as a whole in the chosen reference dictionaries.

Here, *punto* and *intermedio* are marked as metaphor-related words according to MIP(VU), as both of them possess a sense related to physical space when inspected on a word-by-word basis, which is then mapped onto the more abstract domain of politics. *Punto* evokes the concept of a point on a road, while *intermedio* (*middle*) stirs the mental representation of a physical position in between two points or objects. However, the metaphorical image elicited by the whole differs subtly from that of its individual components. Indeed, the entire expression (*punto intermedio*) calls on the mental picture of a particular *class* of points. That is, not just a point (*punto*) situated anywhere but a point located in *the middle* of a road (un punto *intermedio*).

In the above example, the string *punto + intermedio* thus construes the domain of MIGRATION POLITICS as a PHYSICAL JOURNEY, in which political antagonists (Democrats and Republicans) are presented as occupying a position at opposing ends of the path, and reaching a political consensus on migration reform is presented as meeting each other halfway, on *middle ground*.

The point that we wish to bring home with this example is that – though possible to examine the words on an individual basis – such an analysis is not necessarily relevant for our research purpose. For it is the string *punto intermedio* in its entirety that informs us about how metaphor is used to represent one of the referential categories of interest, namely, the political debate surrounding migration reform.

3.2.1.2. Scenario 2: metaphorical lexical strings whose constituent lexemes are not metaphorical in isolation

The second scenario involves situations in which the metaphorical image is evoked by a lexical string whose constituent parts are not metaphorical in isolation according to MIP(VU), as in (8):

> (8) Osmán es un "dreamer" que ha esperado con paciencia el estreno de la carretera que lo lleve de su estado de incertidumbre al de la certeza de la legalización migratoria. Pero no ha [(esperado) con los brazos cruzados]: Obtuvo con mucho esfuerzo y sacrificio una licenciatura, y actualmente se desempeña profesionalmente en una importante empresa de comunicaciones para la comunidad hispana (Diario de El Paso [Zamorano], 2021).
> *('Osmán is a "dreamer" who has waited patiently for the opening of the road that will take him from his state of uncertainty to the certainty of immigration legalization. But he has not [(waited) with his arms crossed]: He obtained with much effort and sacrifice a bachelor's degree, and is currently working professionally at a major communications company for the Hispanic community').*

In example (8), the lexemes which make up the string *(esperar) con los brazos cruzados (waiting with his arm crossed)* are not metaphorical according to MIP(VU), as the contextual meaning of the words *con* (*with*), *brazos* (*arms*) and *cruzados* (*crossed*) cannot be understood in comparison with their more basic meaning (i.e., they are identical; *cf.*, step 4).

However, the string *(esperar) con los brazos cruzados (waiting with his arm crossed)* as a whole can, in fact, by interpreted as metaphorical. As such, it can be said to possess a non-literal meaning related to the realm of mental processes, and is called upon to cast the pro-active attitude of Osmán as a physical action.

At this point it is worth pointing out the affinity of this class of metaphorically-motivated expressions to a particular kind of 'idiom-like collocations'. These are typically grounded in bodily experience and gestalts, rather than being rooted in analogy, and derive their "metaphorical force from their meaning as a whole, which explains why they cannot be decomposed and why they are relatively fixed syntactically and lexically" (Deignan, 1999, p. 33). An example discussed by Deignan includes the collocate *(take) a deep breath*, which aside from referring to a physical action is said to stand in for a more abstract, psychological sort of preparation. This type of 'non-intellectual' mapping gives rise to lexical strings whose metaphoricity is powered by the expression as a whole, not by any of the lexemes in isolation or the sum of its parts.[18] Hence, all such expressions will inevitably fall within this second scenario, and thus need to be examined in their entirety if we wish to capture their metaphorical quality.

3.2.1.3. Scenario 3: metaphorical similes and analogies made out of (in)direct metaphors and non-metaphorical lexemes

The third scenario includes two types of lexical strings which merit a special mention, namely (metaphorical) similes and analogies. These linguistic realizations of cross-domain mappings can be decomposed, in the terminology of MIP(VU), in a number of discrete *direct metaphors* (*cf.*, Section 2.1). Yet, the metaphorical image of interest might (only) be summoned by the entire expression.

In (9) the Dreamer Osmán uses an analogy to express what it is like to be a DACA-holder:

> (9) Algunos activistas consideran que es un pequeño avance, es decir lograr permisos de trabajo y protección contra las deportaciones por cinco años, es mejor que nada. Pero para muchos de estos cientos de miles de jóvenes que han esperado pacientemente, la opción intermedia no es un consuelo. "Para mí no lo es. Es una resolución que tiene fecha de expiración. [Como ir pintando rayas en la pared cada día que pasa]," nos dice Osmán (Diario de El Paso [Zamorano], 2021).
> *('Some activists believe that it is a small breakthrough,* i.e., *getting work permits and protection from deportation for 5 years, is better than nothing. But for many of these hundreds of thousands of young people who have waited patiently, the in-between option is no consolation. "For me it's not. It's a resolution that has an expiration date. [Like painting stripes on the wall with each passing day]," Osmán tells us').*

The expression *(Como) ir pintando rayas en la pared cada día que pasa* is made up of six direct metaphors (if only counting content words), if we apply the MIPVU method (i.e., *ir*, *pintando*, *rayas*, *pared*, *día*, *pasa*). However, it is the string as a whole which evokes the wall-painting scenario and which is mobilized by Osmán to frame the situation of Dreamers as an emotionally-straining experience. One

18 As a careful reviewer observed, a compositional analysis of the collocate *(take) a deep breath* is also defensible, where *(take) a breath* is mapped onto the concept of 'regeneration / recovery' and *deep* specifies that the regeneration / recovery takes time and should be thorough. This observation calls attention to the fact that '(de-)compositionality' is not a binary notion, and that more often than not different analyses of the complex linguistic reality are possible.

could even defend the claim that the entire expression calls to mind a PRISON-frame, in which Dreamers like Osmán are cast in the role of prisoners on death parole, condemned to count down on the wall of their cells the days remaining until their execution date.

However, there exists an additional layer of analytical complexity, highly frequent among similes and analogies. That is, some units functioning as *direct metaphor* at a higher level of analysis (*ir, pintando, rayas, pared, día, pasa*) can be interpreted simultaneously as *indirect metaphors* at the level of the lexeme (*cf.*, Section 2.1). A case in point is the lexeme *passing* (*…each passing day*). Aside from participating in the PRISON-scenario, it can be interpreted as a movement-metaphor framing the abstract concept of TIME (instantiated by the lexeme *day*) in concrete terms of MOVEMENT. As evidenced by the cognitive linguistics literature, this comprises a highly-conventionalized manner to think and speak about the progression of time (e.g., Lakoff and Johnson, 1980; Kövecses, 2010). And although this secondary interpretation is also correct and might be of interest for some research endeavors, we might ask ourselves how relevant results obtained at this scale are for the research question at hand ('How is metaphor used to frame the DACA-debate'?). To what extent does considering analogies and similes at the level of the lexeme comprise a worthwhile enterprise across the board, or does it simply produce noise?

This question concerning the decision of the relevant unit of analysis – which can be said to apply to the whole inventory of lexical strings put at display in Section 3.2.1 – becomes all the more pertinent when we move on to the semantic annotation of the metaphors contained in our dataset and the subsequent quantification of the results, as will be argued in the following section.

3.2.2. Methodological implications: the semantic annotation and quantification of metaphorically-motivated strings built out of multiple lexemes

What are the implications of using lexemes as the default starting point for linguistic analysis, if any? This section shows that the choice of the analytical unit may have several important methodological implications for metaphor scholars intending to use the output of MIP(VU) as the basis for a quantitative semantic analysis. Concretely, these methodological challenges relate to practical decisions that the researcher needs to make regarding the semantic annotation (3.2.2.1) and the quantification (3.2.2.2) of lexemes incorporated in a metaphorical lexical string.

3.2.2.1. Semantic annotation

The first methodological difficulty concerns the semantic annotation of lexemes belonging to metaphorically-motivated lexical strings, which – conform to MIP(VU) – are marked as individual metaphor-related words and thus included separately in the database.

Consider the following sentence from our corpus, which captures a journalist's evaluation of the situation of the DACA-program (10).

> (10) En otras palabras, DACA [pende del hilo] de la incompetencia de la administración Trump (Diario de El Paso [Wilkinson], 2021). (*'In other words, DACA [hangs on the thread] of the Trump administration's incompetence'*).

In accordance with the guidelines spelt out by MIP(VU), the metaphorically-motivated idiom *pender del hilo de …* can be decomposed into its constituent lexemes, *pender* and *hilo*. Both lexemes, then, are admitted as separate entries into our database, and thus require an individual semantic analysis.

The question arises as how best to carry out a semantic field annotation of such units? The analyst could opt for one of two strategies:

(A) They may decide to focus on the direct-associated meaning of the lexemes in isolation and annotate them accordingly.

For *pende + hilo*, this could mean that *pende* – whose basic meaning denotes a manner of being positioned in physical space – is assigned the semantic field of LOCATION and *hilo* – a thin thread commonly used for sewing – is categorized within the field of TEXTILE:

- *pende*: LOCATION
- *hilo*: TEXTILE

However, such an atomistic annotation does not prove to be very instructive for the research question guiding our case study. Hence, a case can be made for the idea that, on this occasion, the metaphorical expression *pende del hilo* as a whole comprises the most relevant level of analysis. For it is the phrase in its entirety which underscores the peril of DACA's situation and evokes the image of a dangerous location in the mind's eye of the reader: DACA is presented as an object hanging on a thread, which can fall to the ground and burst at any moment. This reading is reinforced by surrounding discourse cues, most notably the description of *the thread* as being made of *the Trump administration's incompetence*.

This insight may lead the analyst to adopt an alternative, more context-sensitive, strategy:

(B) The analyst may retain the analytical decomposition of metaphorical expressions in their database but choose to annotate their constituent elements consistently, taking into consideration the meaning of the expression as a whole.

For *pende + hilo*, whose collective, non-literal meaning could be paraphrased as TO BE IN A DANGEROUS LOCATION, this could look like:

- *pende*: TO BE IN A DANGEROUS LOCATION
- *hilo*: TO BE IN A DANGEROUS LOCATION

Even though far from transparent in the dataset, it is this (second) more context-sensitive road, we submit, that yields the most useful results for the purposes of our study.

It may be tempting to conclude, then, that the decomposition of lexical strings into their constituent lexical units can be maintained in the database, at least in practice, as long as the researcher adopts the second analytical strategy. However, things get more complicated when we seek to integrate a quantitative component in our analysis, for then we face a new methodological problem: the risk of distorted quantitative results.

3.2.2.2. Quantification

Regarding the quantification of the annotated semantic fields (or 'source domains'), several scholars have called attention to the

problems that derive from installing the lexeme as the unit of measurement for their particular research aims, as mandated by MIP(VU) (e.g., Charteris-Black, 2014, p. 176; Vogiatzis, 2019, p. 132). To illustrate using our case study, consider a hypothetical scenario in which the semantic annotation has been conducted exclusively at the level of the lexeme. What happens if we want to compute which metaphorical fields are most productive – a central concern for quantitatively-oriented metaphor scholarship (e.g., Charteris-Black, 2014; Arrese, 2015; Catalano and Mitchell-McCollough, 2019)? The issue we then face is: how do we count?

Take once more the example of *pende* + *hilo* (i.e., *pende* = LOCATION; *hilo* = TEXTILE), marked in the MIP(VU) protocol as two discrete linguistic metaphors. During the analysis stage, do we count these items as individual metaphors realizing different semantic fields? And are these numbers significant to the research question of interest? In what way is it telling that El Diario uses one LOCATION- and one TEXTILE-related metaphor to frame the DACA-program? This does not seem appropriate.

Alternatively, if we have opted for the second, more context-sensitive annotation strategy (i.e., *pende* = TO BE IN A DANGEROUS LOCATION; *hilo* = TO BE IN A DANGEROUS LOCATION), how do we proceed in this scenario? Do we count them double, as two unique linguistic realizations of the same domain? Once more, this seems hardly ideal.

Another example illustrating this difficulty is the collocation *asestar un golpe* (*'to strike a blow'*) which in (11) comments on conservative judge Hanen's restrictive track record. Note that, following the MIP(VU) procedure, *asestar* and *golpe* are analyzed as two discrete metaphor-related words, and thus constitute separate entries in the database:

> (11) A pesar de que Hanen ya [asestó un golpe (contra)] las medidas de protección de inmigrantes al fallar en contra de un programa parecido que cobijaba a los padres de los "dreamers" (Diario de Juárez [Agencias], 2021).
> ('*Although Hanen has already* [*struck a blow (against)*] *immigrant protection measures when he ruled against a similar program that covered the parents of "dreamers"*).

The string *asestó* + *golpe (strike a blow)* as a whole evokes the image of a VIOLENT ACTION, and in this case it is used to reference judge Hanen's restrictive court decision concerning immigrant protection measures (*medidas de protección de inmigrantes*). However, conform to MIP(VU), the expression is made up of two violence-related lexemes: *asestar* and *golpe*. Does this mean we count them as separate metaphors, although the expression as a whole stands in for a unique referential category (which may be paraphrased schematically as: "a restrictive migratory action")?

One may argue that the quantification dilemma sketched above should not pose a problem as long as the analyst is transparent about their quantification protocol and remains consistent. However, this stance becomes harder to maintain if the study involves a comparative or variationist aim (e.g., between different languages, or between texts produced by distinct sources or speech communities; e.g., Perrez et al., 2019) – and, hence, finding the most adequate manner to count becomes increasingly important.

When we extrapolate the implications of this discussion beyond our case study, an important issue emerges for metaphor scholars who wish to run a quantitative analysis. If the analyst observes that the studied source draws significantly on a particular domain (e.g., Journey) to frame a unique referential category (e.g., DACA), how can he/she be sure that the observed frequencies reflect real tendencies? It may as well be so that seeming evidence for the existence of a particularly salient domain in reality results from a high share of multiword expressions, such as phrases (e.g., *curvas cerradas ['sharp turns'], trincheras de combate ['combat trenches'], pende del hilo ['hangs on a thread'], creciente oleada ['growing wave']*, *preparar el terreno ['prepare the terrain']*, *mirar de reojo ['glance sideways'], continua operación ['continuous operation']*) and sentences (*… DACA ha pasado por una montaña rusa… ['DACA has gone through a rollercoaster']*), which have been categorized multiple times within the same semantic domain. This quantification dilemma connects to broader challenges within empirical, quantitative approaches to the study of (cognitive) semantics (*cf.*, Glynn, 2010; Jansegers et al., 2015, p. 383), in the context of which it has been pointed out that observed quantitative patterns can sometimes hide or even distort underlying realities.

To conclude, in this Section the case has been made that using a dataset containing atomized lexemes as the input for subsequent quantitative semantic analyses can give rise to methodological difficulties. Granted the wide diversity in research aims and heterogeneity of datasets existing among metaphor research, we therefore posit that it may be more useful for metaphor researchers to take metaphorical strings – on top of, or instead of, metaphor-related words – as their unit of analysis and measurement. From this observation the following question emerges: given the methodological concerns raised in the introduction (*cf.*, Section 1), is it possible to capture relevant metaphorical strings, composed out of multiple lexemes, in a systematic and transparent way? This is the issue which will be covered in the next section.

4. Solutions

As the methodological debate reconstructed in the Introduction established: deciding on where to place unit boundaries is a tricky issue (*cf.*, Section 1). In this section we therefore wish to exhibit three methods metaphor scholars may adopt if their research project mandates the analysis and quantification of above-the-word-level units (4.1). Which methodology to choose will ultimately depend on the judgment of the analyst. Methods 1 and 2 are procedural, and consist in fixing *a priori* guidelines to establish where the unit boundaries will fall. As will be shown below for Methods 1 (4.1.1) and Method 2 (4.1.2) respectively, the formulation of these grouping-directives can start from either a semasiological ('form-first'; = Method 1) or an onomasiological ('concept-first'; = Method 2) approach (*cf.*, Glynn, 2010, p. 19). Method 3 is bottom-up, and encompasses the post-hoc aggregation of units, in conjunction with the integration of a descriptive parameter meant to document the analyst's grouping-decisions (4.1.3). Finally, in Section 4.2, two possible orders to incorporate these grouping-procedures within the metaphor identification and analysis cycle will be presented along with their advantages and drawbacks.

4.1. Lexical string formation: three methods

4.1.1. Method 1: procedural, semasiological approach

The first method entails formulating at the onset of the project a set of explicit guidelines detailing which combinations of units will be grouped together.

The criteria underlying the specification of which above-the-word level units will be formed can be of various types. For some research designs, it may be sensible to base the grouping-directives on *semasiological criteria*.

For example, the researcher could be interested in capturing a discrete set of formally definable metaphorical strings, on top of, or instead of, lexemes. Take our case study on El Diario's coverage of the DACA-debate. Based on our knowledge of our research questions and the nature of our data, we might be interested in lexemes for most of the time, but choose to deviate from this default option in a number of formal contexts. The key would then be to establish objective criteria for each of these configurations to decide which lexical strings instantiate them, and can thus be analyzed as a single unit, rather than as a set of atomized lexemes. Take the notion of *collocation*, which can be generally defined as words that tend to co-occur more often than would be expected by chance (e.g., Firth, 1957; Gries, 2013).

- Collocations (e.g., *punto intermedio, asestar un golpe*, *pende del hilo*, *trincheras de combate, (esperar) con los brazos cruzados*)

The notion of 'collocation' is notoriously nebulous (*cf.*, Gries, 2013, p. 138) and difficult to operationalize. One way to establish in a more objective manner (i) which word-clusters count as collocations and (ii) where the collocation-boundaries fall is by running a statistically-founded collocational/collostructional analysis (*cf.*, Stefanowitsch and Gries, 2003) using corpus software like SketchEngine and AntConc.[19] By looking up in a reference corpus of the target language (i.e., Spanish) whether there exists a strong collocational strength (i.e., a significant degree of association; Stefanowitsch and Gries, 2003, p. 217) between certain lexemes, and by implementing a minimum threshold to establish which values can be considered "strong," this approach could serve as a reproducible benchmark to operationalize this concept. Applied to the expressions *punto + intermedio* and *asestar + golpe* from our case study, for example, this procedure would render the following results. Provided that we set the minimum collocation-threshold at a value of 3 (*cf.*, Ferraresi and Gries, 2011; Treffers-Daller, 2022), the collocational strength between *asestar* and *golpe* would be considered strong (15, 10) and between *punto* and *intermedio* as extremely strong (51, 28).[20] Hence, these results would warrant the decision to analyze both multiword expressions as strings.

However, while this first method could be well-equipped for some research questions, it is not adequate for the current case study. This is due to the fact that our research is concerned with the metaphorical framing of specific 'referential categories' (e.g., Trump, DACA, restrictive migration measures, etc.), and not all lexical strings instantiating one of these categories necessarily manifests a high collocational strength (or vice versa – not all strings qualifying as collocations instantiate categories relevant for our research question). For this reason, the next approach (Method 2) is our preferred strategy.

4.1.2. Method 2: procedural, onomasiological approach

When relevant concepts and categories are clearly defined in advance, it may be more fruitful to fall back on *onomasiological criteria* to formulate grouping directives. This seems to be particularly so for scholars planning to use the output of the identification procedure as the starting point of a metaphor-led discourse analysis (*cf.*, Cameron et al., 2009; Maslen, 2017). For instance, some scholars could be interested in discerning which linguistic metaphors are used to portray a select array of 'key discourse topics' (Kittay, 1987; Cameron et al., 2010). To cite an example, some key discourse topics in Cameron (2010) study on responses to the risk of terrorism in the context of the UK included: terrorism (including risks, causes, perpetrators), communication about terrorism (by authorities and the media), and responses to terrorism (by the authorities and other social groups) (Cameron, 2010, pp. 595–596). Research driven by such an objective could use a list of *a-priori* selected 'key discourse topics' as a guide to decide on unit-boundaries, fulfilling in this way the function of tertium comparationis. That is, they can serve as objective external categories that allow for comparison across studies and languages. For instance, certain categories might be expressed in one language or corpus by a single lexeme, while in others a lexical string might be employed. By establishing relevant categories in advance for particular research ends (for instance: DACA, Dreamers, restrictive migration measures), the metaphor researcher gains clear guidelines for when to deviate from the MIP(VU) protocol's directive to focus solely on lexemes (i.e., 'metaphor-related words'). As mentioned above, this approach is therefore also best suited for the current research design, where certain *a-priori* defined referential categories are the central focus of the analysis. It would run as follows.

Recall that in our case study we wish to uncover how specific referential categories – i.e., recurrent discourse actors, entities, processes, actions, etc. in the DACA debate (*cf.*, 3.1.3) – are framed through metaphors. Before executing the unit grouping operation, we could therefore start by reading through our corpus of news articles to identify common referents, and compile them in a list as in Table 2.

This collection of referential categories will then be employed to steer the demarcation of analytical units in the stretches of news discourse under scrutiny. The prime directive for deciding how to carve up linguistic utterances is that the unit boundaries should correspond to one of these predefined referential categories. Consider example (12) from our corpus, in which a commentary is made about a restrictive court ruling (*el fallo*) affecting the DACA-program:

> (12) El fallo es "una sirena de alarma" para los Demócratas (Diario de Juárez [Associated Press], 2021a)

19 For inspiration on corpus-linguistic approaches to metaphor analysis, see Deignan (2005). For more information on the notions of 'collocations' and 'collostruction', and (quantitative) corpus-driven approaches to collocational/collostructional analysis, see, e.g., Stefanowitsch and Gries (2003).

20 These measures are based on a 200-token sample of V+N (*asestar+golpe*) and a 200-token sample of N+ADJ (*punto+intermedio*), which were gathered from the Spanish reference corpus of the corpus-software SketchEngine. The collocational strength analysis was carried out in R. The association measure used was the Fisher-Yates exact (one-tailed). See the Supplementary materials for the samples and script used.

> *('The ruling is "an alarm siren" for the Democrats').*

In this case, it is the metaphorical string *una sirena de alarma* ('an alarm bell', or, literally translated, 'an alarm siren') in its entirety that is likened to judge Hanen's negative court ruling (*el fallo = una sirena de alarma*). An analysis of this string at the level of the lexeme (i.e., *sirena / de / alarma*) would therefore yield no interesting results. Given that one of the pre-defined referential categories in our list includes that of *unfavorable migration actions* – which houses judicial actions such as court rulings that are not in the favor of Dreamers – we consider the phrase *una sirena de alarma* as one unit.

One may appreciate an additional benefit coming with this onomasiologically-oriented grouping strategy: it allows the analyst to capture various layers of meaning at work on different levels of linguistic organization simultaneously. Consider example (13), first discussed in section 3.2.2.1:

> (13) En otras palabras, DACA pende del hilo de la incompetencia de la administración Trump (Diario de El Paso [Wilkinson], 2021).
> *('In other words, DACA hangs on the thread of the Trump administration's incompetence').*

Here, the metaphor functions on two scales to frame referents found in our list: the DACA-program (instantiated by *DACA*) and President Trump (realized by *the Trump administration's incompetence*). On the one hand, the Verb Phrase *pende del hilo* frames DACA as an object that is at risk of falling (*DACA hangs on the thread…*). On the other hand, the NP *thread* (*hilo*) – of which it is said that DACA hangs – is presented as a fine thread of poor quality which symbolizes the incompetence of the Trump administration (*…the thread of the Trump administration's incompetence)*. We can thus divide the stretch of text into the following units:

- VP: *hanging on the thread* (used to frame DACA)
- NP: *the thread* (= the Trump administration's incompetence)

4.1.3. Method 3: bottom-up approach

It may not be equally feasible or desirable for all investigations to predict which types of linguistic configurations will best be inspected at a level above that of the lexeme, and to formulate straightforward grouping-directives. Moreover, some projects might require more flexibility in their grouping-procedure, allowing the analyst to move between different levels of analysis as they see fit. This seems to be particularly so, for example, when confronted with multiword units of which the operationalization is more complicated (e.g., analogies), or in the case of bottom-up research projects where relevant categories are not defined at the outset but, rather, emerge throughout the coding procedure. For these reasons, the researcher

TABLE 2 List with common referential categories and discursive actors, entities, processes, actions and states in El Diario's news coverage of the DACA-debate.

Referential categories	Discursive actors, entities, processes, actions and states	Description
Immigrants and immigration	Dreamers	Mention of or reference to Dreamers
	Other migrant groups	Mention of or reference to other groups of migrants, including the parents of Dreamers or other undocumented youngsters
	(Im)migration	Mention of or reference to (the topic of) immigration
	Process of (im)migration	Mention of or reference to the process of migrating
Social, political and legal actors	President Trump/Obama/Biden	Mention of or reference to President Trump, Obama or Biden, and their respective administrations
	The Republican or Democrat Party	Mention of or reference to the Republican or Democrat party and the politicians pertaining to them
	Legislative Branch	Mention of or reference to the legislative branch. Includes legislative bodies (Congress, Senate) and their members (Senators, etc.).
	Judicial Branch	Mention of or reference to legal power. Includes legal bodies (such as the Court) and their members (judges, etc.).
Favorable migration measures	DACA	Mention of or reference to the DACA-program
	Favorable migration laws	Mention of or reference to favorable migration laws, real or hypothetical.
	Favorable migration actions	Mention of or reference to favorable migration actions, real or hypothetical. This includes political decisions and judicial actions that are in the advantage of the migrant population (e.g., an advantageous court ruling)
Unfavorable migration measures	Deportation	Mention of or reference to deportation
	Unfavorable migration laws	Mention or reference to unfavorable migration laws, real or hypothetical.
	Unfavorable migration actions	Mention of or reference to unfavorable migration actions, real or hypothetical. This includes political decisions and judicial actions that are in the disadvantage of the migrant population (e.g., a restrictive court ruling).

may think it to be more appropriate to adopt an alternative, analytically more open-ended, method.

This third method involves the post-hoc aggregation of units, coupled with the incorporation of a descriptive parameter meant to keep stock of the DNA of these freshly-formed strings. An application of this workaround could run like follows.

We take the lexeme as the default level of analysis, just as MIP(VU) prescribes. At the moment of diverging from this standard, we document the (formal) composition of our chosen unit of analysis.

Consider the following excerpt from the DACA-corpus:

> (14) El Gobierno de Joe Biden propuso este lunes una norma que trasladaría (…) a unos 700 mil inmigrantes que llegaron ilegalmente a Estados Unidos cuando eran niños (…) al final de la fila para ser deportados (Diario de Juárez [Associated Press], 2021b).
> *('The Government of Joe Biden proposed this Monday a rule that would move (…) some 700 thousand immigrants who arrived illegally in the United States when they were children (..) to the back of the line to be deported').*

In the above example, we want to analyze the string *(trasladaría) al final de la fila* in its totality, as it instantiates a relevant referential category within our research project (a *positive migration action*) and conforms to a recurring pattern in our data (*DACA-holders are systematically presented as being moved by a third party to a physical location*), and thus decide to group its constituent elements together. When pursuing approach 3, this decision would then need to be followed-up by documenting the composition of the newly-formed string, like so:

- *(trasladar) al final de la fila*: VP > (dis)placement verb + loc. Prep. phrase

The addition of such a descriptive variable does not only safeguard the transparency of this strategy, but will also generate interesting results in their own right. As such, it may provide insight into the levels of linguistic organization at which the majority of metaphors finds itself (e.g., the level of the lexical unit, the phrase-level, the sentence-level, the discourse-level), and allow for the calculation of separate frequencies for each of these levels if the researcher requires a stable unit of measurement (*cf.*, Sections 1 and 2). Likewise, it can grant us some sense of the formal constitution of the metaphorically-motivated expressions stored within a dataset. A drawback, however, is that the inclusion of an additional descriptive parameter makes metaphor identification (even) more time-consuming, and might render extra data superfluous for the research objectives of interest.

4.2. Integrating the methods within the metaphor identification and analysis cycle: two possible orders

What does the incorporation of one of these methods (procedural-semasiological vs. procedural-onomasiological vs. bottom-up) look like in practice? As mentioned in the introduction, MIP(VU) was initially designed to be methodologically distinct from subsequent semantic coding and quantification procedures. Recognizing that there exists no one-size-fits-all answer suitable for the whole gamut of metaphor scholarship, two possible approaches to integrating the formation of above-the-word level units within the metaphor identification and analysis cycle will be exhibited. To orient the reader in selecting the strategy which will prove most appropriate for their analytical ends, we will signal the advantages and disadvantages attached to each option.

The first possibility is to conduct the above-the-word level aggregation of lexemes *after* performing the MIP(VU) procedure. Concretely, this means grouping the output of MIP(VU) (which includes metaphorical and non-metaphorical lexemes) into metaphorical strings using one of the three methods presented earlier (see Figure 1). In this approach, the creation of metaphorical strings can be integrated into MIP(VU) as an optional extension, serving as a bridge between metaphor identification and the quantitative semantic analysis of detected linguistic metaphors (i.e., metaphorical lexemes and strings).

Aside from being easily compatible with MIP(VU), an advantage of this strategy is that it uses high-quality metaphor-related words and unmetaphorical lexemes, obtained in a statistically reliable fashion (*cf.*, Steen et al., 2010), as the input for subsequent string-formation. One important disadvantage, however, is that this option does not allow the researcher to capture metaphorical strings of which the component parts are not metaphorical in isolation (*cf.*, Section 3.2.1.2; scenario 2 > e.g., *(esperar) con los brazos cruzados*). The time–cost is another obvious drawback.

The second option involves determining relevant units of analysis (i.e., lexemes *and* strings) *before* running the MIP(VU)-protocol, as visually rendered in Figure 2. Within this strategy, the analyst would adopt one of the three grouping-procedures (procedural-onomasiological vs. procedural-semasiological vs. bottom-up) to establish relevant units of analysis, and use the resulting lexical *and* multiword items as the basis for running MIP(VU). Like the core principle underpinning the MIP(VU) procedure dictates, this implies checking whether a more basic meaning can be established which can be understood in contrast and comparison with the unit's contextual meaning (*cf.*, Section 2).

The edge that this strategy has over the first one is that it enables analysts to capture metaphorical lexical strings whose component parts are not metaphor-related when inspected on an individual basis (*cf.*, Section 3.2.1.2; scenario 2 > *(esperar) con los brazos cruzados*). Moreover, this option is probably more time-efficient as well, given that it collapses step 2 of the MIP(VU)-protocol ('divide the text under analysis into its constituent lexemes'; *cf.*, Section 2.1) and the above-the-word-level grouping procedure into one single operation.

However, being that the metaphor identification would no longer part exclusively from lexemes, a downside is that dictionaries cannot always serve as a benchmark to establish analytical units' basic (and potentially contextual) meanings. In case of multiword strings, particularly those which have not been conventionalized (e.g., similes, analogies), researchers would need to rely on a paraphrase test to determine whether the unit under examination can be considered metaphorically-used or not: i.e., is it possible to formulate a more basic meaning of this multiword unit which manifests a similarity and incongruity with the string's

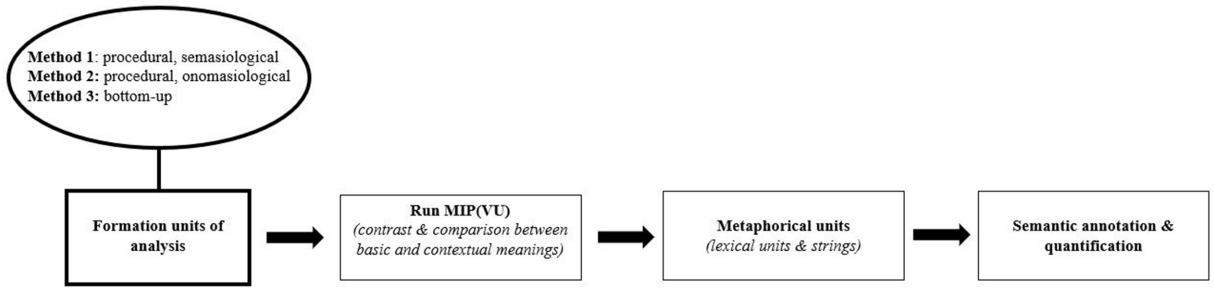

FIGURE 1
Order 1. lexical string formation after running MIP(VU).

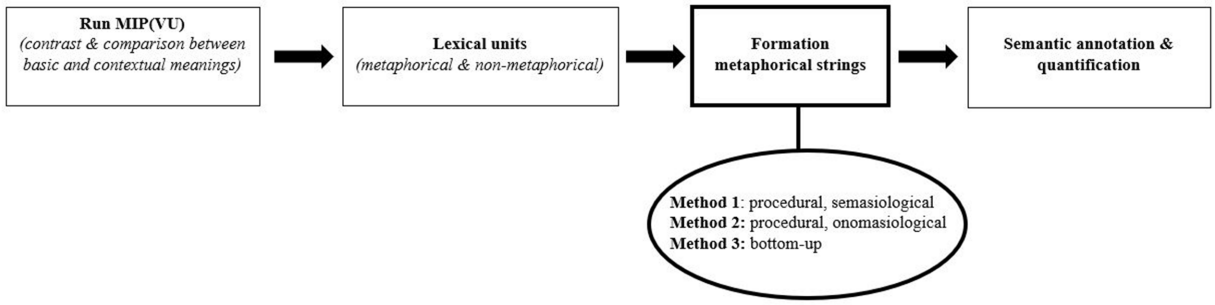

FIGURE 2
Order 2. unit formation before running MIP(VU).

contextual meaning?[21] Once more, to enhance transparency of the procedure, researcher can choose to record their coding decisions.

5. Conclusion

In this paper, we have set out several challenges that the metaphor identification instrument MIP(VU) poses to scholars who are interested in stretches of (metaphorical) language reaching beyond the boundaries of the procedure's standardized unit of analysis, i.e., the lexeme (Section 2). The main methodological contribution consists in its proposal of a series of flexible guidelines to modify MIP(VU) in such a way as to enable metaphor researchers to (also) capture above-the-word level units in a systematic and transparent fashion (section 4).

In particular, we exhibited three methods which allow for the grouping of above-the-word level units; one is procedural and semasiological (4.1.1), another is procedural and onomasiological (4.1.2) and the final one works bottom-up (4.1.3). Furthermore, two possible orders were presented to incorporate these methods (procedural-semasiological vs. procedural-onomasiological vs. bottom-up) into the metaphor identification and analysis cycle, along with their advantages and drawbacks. As proposed in Section 4.2, metaphor scholars can either carry out (multiword) unit-formation *before* running the MIP(VU) procedure or, alternatively, perform this operation *after* implementing MIP(VU) so as to bridge metaphor identification and analysis.

The adaptable guidelines presented in this paper are both illustrated with data and inspired by insights derived from a case study of a Spanish-language US-based newspaper's coverage of the migration debate surrounding the Deferred Action for Childhood Arrivals (DACA) program (*cf.*, 3.1). However, we anticipate that these guidelines can be extrapolated to other research contexts where it is important to (also) capture above-the-word-level metaphorical units as well, a need brought to the fore in a multitude of studies (e.g., Sullivan, 2007; Cameron and Maslen, 2010; Charteris-Black, 2014; Vogiatzis, 2019).

As for the limitations of this paper, space constraints prevented us from delving more extensively into the proposed methods and individual strategies (e.g., the collocational strength analysis suggested as part of Method 1, *cf.*, 4.1.1). Future research could explore the

21 At this point it is important to set aside a red herring. Using a paraphrase test to probe whether it is possible to formulate a more basic (and potentially, a contextual) meaning which can be understood in contrast and comparison with one another does *not* mean that the metaphor identification and analysis stage are lumped together (*cf.*, Section 1). For it does not require the analyst to make a final decision about the nature of the underlying mapping. Note that the MIP(VU)-procedure similarly does not require the researcher to make a decision concerning which of the sense description detailed in the reference dictionary can be considered as its basic meaning (and contextual meaning). Words are marked as metaphor-related if the researcher can detect *one or more* basic meanings that *could* be understood in contrast and comparison with the contextual sense of the word. The annotation of semantic domains is reserved for a subsequent stage of analysis, and falls outside the purview of MIP(VU) (*cf.*, Steen et al., 2010; Nacey et al., 2019). The same holds true for the proposed paraphrase test to test for the (potential) presence of metaphorical meaning.

different strategies more in-depth, and evaluate empirically how they work out in practice and across languages.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

LB conceptualized the original idea, analyzed the data, and wrote the manuscript. RE provided important conceptual contributions, gave thorough feedback on different versions, and reduced the wordcount of the final draft of the manuscript. PG pre-processed the data (e.g., the lemmatization and automatic POS-tagging) and gave valuable feedback. All authors contributed to the manuscript and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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'Vaccine as a *cheat sheet*': a metaphor gone awry on Facebook

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COVID-19 vaccine-related conspiracy narratives skyrocketed in social media in the first year of the pandemic. Science communicators have tried to debunk false information as did Vlad Mixich, a Romanian public health expert, who tried to explain on Facebook why the vaccine cannot modify the human DNA. Drawing on the literature on metaphor as a discourse phenomenon, this paper uses a discourse-led approach to metaphor analysis to identify and analyze the metaphors used by Mixich to explain how vaccines work and the mRNA technology underlying the COVID-19 vaccine. A particular metaphor is then given special attention: 'vaccine as a *cheat sheet*'. The author of the Facebook post seems to use this metaphor deliberately both to clarify vaccine-related information and to mock people susceptible to false information about the vaccine. This paper shows that while the 'cheating' metaphor simplifies abstract knowledge and allows the audience to engage with a complex topic, it also has potential to amplify vaccine-related polarization.

KEYWORDS

COVID-19 vaccine metaphor, deliberate metaphor, discourse strategy, conceptual clarification, mockery

Introduction

On February 15, 2020, at the Munich Security Conference, WHO's Director-General Tedros Adhanom Ghebreyesus declared that "we are not just fighting a pandemic, we are fighting an infodemic" (WHO, 2020). Thus, in addition to acknowledging the global health threat posed by the coronavirus outbreak, the WHO Director also recognized and warned about the flood of COVID-19 related disinformation, misinformation and conspiracy theories that infiltrated the public discourse. Recent studies have shown that social media have been crucial in polarizing the COVID-19 vaccine discourse (Mønsted and Lehmann, 2022; Ojea Quintana et al., 2022) or in rapidly propagating vaccine-related conspiracy theories (Ginossar et al., 2022) and false information (Carrieri et al., 2019; Scannell et al., 2021). Conspiracy theories on the COVID vaccines (e.g., 'monitor the world's population,' '5G implants,' 'change human DNA' as proxies for popular conspiracy theories) are, in essence, global narratives built to appeal to emotions rather than scientific-based knowledge; such narratives may determine greater resilience to persuasion (Scannell et al., 2021) and may contribute to issue and affective polarization (Dan and Dixon, 2021) in society. One of the global conspiracy narratives that had gained the strongest momentum in Romania was that the COVID-19 mRNA vaccines modify the human DNA. Many medical professionals and health communicators have tried to debunk this idea and have engaged in consistent communication efforts to address Romanians' lack of confidence in the efficiency and safety of the vaccines. An advocate of COVID-19 vaccination, Vlad Mixich[1]

1 A Romanian health expert and communicator, Vlad Mixich is fairly known to the Romanian public, due to his active involvement in the popularization of medical science and the promotion of health-related topics both in mainstream and social media (mainly via his blog https://www.mixich.ro and Facebook page

provided a lot of vaccine-related information on social media, including one long Facebook post (791 words)[2] published on December 29, 2020 (2 days after the official start of the vaccination campaign in Romania). Mixich's post contains a 6-paragraph detailed explanation of the science behind the use of messenger RNA technology in COVID-19 vaccines, including a paragraph describing a school-related scenario in which the author metaphorically frames the mRNA vaccine as a *cheat sheet* in an attempt to simplify the complex scientific information and debunk the false idea that the mRNA vaccine modifies our DNA. This paper seeks to analyze the use of the 'vaccine as a *cheat sheet*' metaphor as a discourse strategy in the naturally occurring online interaction between the author of the Facebook post and his readers.

In addition to conceptual simplification, Mixich's choice of metaphor seems to have been motivated by a subtle ridicule of people who are not good at science (and who may be more likely to give an ear to vaccine myths), which, in the ensuing Facebook conversation, allows mockery to be interactionally achieved. Drawing on previous work on metaphor as a discourse phenomenon (Wee, 2005a,b; Semino, 2008; Cameron et al., 2009; Steen, 2011, 2015) and on interactional pragmatics approaches to mockery (Drew, 1987; Haugh, 2010, 2014; Arundale, 2010, 2013), this paper aims (a) to examine how the 'vaccine as a cheat sheet' metaphor works as a discourse strategy to achieve conceptual clarification, and (b) to show to what extent the use of this metaphor in conjunction with mockery leads to a polarizing conversation, which in turn undermines the basic discourse assumption underpinning objective (a) above, namely that by using this metaphor the author of the Facebook post is engaged in science communication and seeks to debunk public misunderstandings of the mRNA vaccine.

The paper is structured as follows: it starts with a brief review of key approaches to metaphor use in discourse. Then, the methodology and the corpus used are described followed by an examination of conceptual clarification and mockery uses of the 'vaccine as a cheat sheet' metaphor. Finally, the overlapping simplification and mockery functions are discussed in the context of the online conversation. It is suggested that the use of this metaphor and the activation of the problematic source domain may contribute to increased polarization around the topic of vaccination in Romania.

Metaphor as a discourse phenomenon

Metaphors are a precious commodity of human cognition because they allow us to think and talk about complex and abstract ideas in terms of simpler, more concrete concepts (Lakoff and Johnson, 1980). Lakoff and Johnson's Conceptual Metaphor Theory (CMT) seems to best describe the role of metaphor as a cognitive device as suggested by the rich body of literature that CMT has generated and by the subsequent refinements of the theory. However, CMT has also attracted a good deal of criticism (see Gibbs, 2017, for a thorough review of both supporting evidence and criticism of CMT), much of which targeted the lack of proper attention given by the theory to the communicative aspects of metaphor use in everyday discourse (Cameron, 2002, 2003, 2007; Charteris-Black, 2004; Ritchie, 2004, 2006; Semino, 2008; Steen, 2008, 2015, 2017; Cameron et al., 2009; Musolff and Zinken, 2009; Semino et al., 2013). Previous work on metaphor from a discourse perspective has shed valuable insights into the functions of metaphor use in politics (Charteris-Black, 2004; Chilton, 2004; Musolff, 2010), education (Cameron, 2002, 2003; Deignan et al., 2019), health communication (Semino et al., 2018; Semino, 2021), business communication (Koller, 2004), reconciliation talk (Cameron, 2007), racism and discrimination (Santa Ana, 1999; El Refaie, 2001).

Undoubtedly, COVID-19 vaccines and the vaccination campaigns across the globe are an important topic of the pandemic discourse. As with the pandemic in general, militaristic metaphors were frequently used to explain what vaccines are and how they work in equipping our immune system with the necessary antibodies against the COVID-19 disease. Thus, vaccines are *magic, silver bullets* (Silverman et al., 2020), a *sniper* (Chefneux, 2021), *vital arrows in our epidemiological quiver* or *a weapon* in our *arsenal* to *combat* the virus (Charteris-Black, 2021). However, many source domains other than war have also been used to convey information about the vaccine and vaccination, including fire [individual shot as *a cup of water that can put out a stove fire* (a single case of COVID) and mass vaccination as *a fire hose,* – Silverman et al., 2020], (vaccines as *sprays of flame waylay fire on the move, while also shielding vegetation from the worst of the burn* – Wu, 2021), travel (vaccination as *a train journey*, vaccine shots as *train seats* – Charteris-Black, 2021), *safe delivery and receipt* of the vaccine – Silverman et al., 2020), race (second *sprint* for vaccines, *high-speed* vaccine *rollout* – Charteris-Black, 2021), *awarding the gold medal* to countries for purchasing the vaccines – Chefneux, 2021), chess (vaccine supply and distribution as a *chess game* – Silverman et al., 2020), fairy tales (vaccine as *Prince Charming* – Chefneux, 2021).

Given the novelty and originality of the 'cheating' metaphor, this paper aims to provide a detailed examination of its function as a discursive strategy in an asynchronous Facebook interaction. Furthermore, this metaphor is an alternative to warfare rhetoric that was largely (ab)used during the pandemic (Olza et al., 2021), although some scholars doubted the aptness of war metaphors to talk about the pandemic (Semino, 2021).

Metaphor and conceptual clarification

In science communication, authors (e.g., scientists, journalists, educators, pundits) oftentimes build their own metaphor sources instead of drawing on conventionalized, pre-existing analogies when describing and explaining abstract concepts. When constructing a metaphorical source, the speaker foregrounds that source to capture reader's attention so that the latter understands the target via a source with which it shares relevant structural correspondences (Wee, 2005a,b). Examples include: Kosslyn and Koenig's neural network computation as 'intertwined octopi' (Wee, 2005a), Dennett's consciousness as 'fame in the brain' (Semino, 2008), the Human Genome as 'the book of life' (Hellsten, 2005) or as 'a draft' (Bostanci, 2010). Metaphors with constructed sources tend to fulfill specific discursive goals when processed as class inclusion (e.g., blurring the distinction between the

https://www.facebook.com/vlad.mixich). He has worked for the Romanian Ministry of Health (former senior advisor to the Minister and former Vice President to the Romanian Agency for Medicine and Medical Devices), the Romanian Health Observatory NGO (former director), and has extensive experience as health policy expert working for the European Commission, the World Bank, and other international organizations.

2 This post is part of a larger corpus that comprises 33 posts about COVID-19 vaccination published on Facebook by Mixich between March 2020 and March 2022.

source and the target: Wee, 2005b, p. 220) or correspondence (e.g., systematically mapping relations in the source onto the target: Wee, 2005b, p. 221) models. Furthermore, Wee suggests that class inclusion and correspondence models are two different types of "metaphor strategies" (Wee, 2005b, p. 220) used for different discourse purposes. In science texts, the correspondence model seems to be preferred by authors as their presumed intention is to simplify of complex scientific concepts by drawing explanatory analogies with simpler, more familiar ideas. The metaphor discussed in this paper involves a constructed source (*cheating*) that is mapped onto a target (*mRNA vaccine*) in an elaborate school-related metaphorical scenario in which elements of the source domain are recontextualized through correspondences between source and target (Wee, 2005b, p. 371).

Fully acknowledging the limitations of CMT regarding metaphor in discourse, Steen (2008) proposes a three-dimensional model that accounts for undervalued aspects of metaphor use in communication in addition to its conceptual and linguistic dimensions. Steen has expanded this model into a more sophisticated theory known as Deliberate Metaphor Theory – DMT (Steen, 2011, 2015, 2017) that distinguishes between deliberate and non-deliberate metaphors, where only the former are used *as* metaphors to achieve specific communication goals. Despite criticism (Gibbs, 2011, 2015; Gibbs and Chen, 2017) directed particularly at the idea that deliberate metaphors are a special class distinct from other forms of metaphoric language, DMT offers interesting points about the "express use in production and/or reception" (Steen, 2008, p. 223) of a source domain to (creatively) bring a new perspective on the target of a metaphor. Deliberate metaphors, unlike non-deliberate metaphors, are "a matter of communication between language users" (Reijnierse et al., 2020, p. 14) because they help the audience recognize the communicative goal that the speaker might have had when they used a specific metaphor.

Mixich's Facebook post analyzed in this paper is about complex scientific knowledge – the technology underlying a mRNA vaccine – and by using the 'vaccine as a cheat sheet' metaphor the author is seemingly concerned with conceptual clarification. Mixich even signals to his readers that he uses the metaphorical correspondence between the vaccine and an unconventional, but presumably more familiar domain – a student cheating in an exam – to simplify the complicated technical idea by translating it into more familiar terms.

Metaphor, mockery, and conversation

One of the core ideas of discursive approaches to metaphor is that it may be a dynamic phenomenon emerging from interaction (Cameron, 2003, 2007; Gibbs and Cameron, 2008; Cameron et al., 2009) whose interpretation in conversation is a matter of negotiating, calibrating, and maintaining common ground (Ritchie, 2004, 2010). Consistent with Cameron's discourse dynamic approach to metaphor use, Ritchie's (2010) work on metaphors in conversation sheds light on the power of metaphors to build up stories and to stimulate participants to engage in collaborative storytelling. Metaphors are constantly transformed, elaborated, co-created in conversational interaction for the benefits of their relational properties, including bonding through humor, rather than for their informative of persuasive functions (Ritchie and Schell, 2009; Ritchie, 2010). In the analyzed Facebook post, the metaphor 'vaccine as a cheat sheet' seems to serve both as a conceptual clarification tool and as a springboard for mockery. Arguably, the metaphor is a crucial component of a mocking remark targeting ignorant Romanians who might be more familiar with 'cheating' in school exams.

From an interactional pragmatics point of view, mockery is a "form of interactional practice" (Haugh, 2014, p. 78) that requires the speaker to frame some remark as humorous or non-serious and the participants to recognize and treat it as such in their subsequent responses. Jocular (non-serious) mockery is usually signaled in discourse, either by non-verbal cues or by linguistic markers (Drew, 1987; Haugh, 2010, 2014). Mixich straightforwardly indicates that the use of the 'cheating' metaphor is targeted at people "who did not have good grades in biology in high school" and, therefore, might need a "simpler version of the explanation." Another indication of mockery comes at the end of the paragraph where Mixich ostensibly shows his preference for people who did well in biology as opposed to those who did not. Since the conversation is carried out on Facebook, the author of the post also used emoji to signal the jocularity of his remarks.

Corpus and method

The corpus of this study consists of Vlad Mixich's Facebook post published on December 29, 2020, 2 days after the start of the COVID-19 vaccination in Romania, and the comments that it generated, since the latter are an indication of the audience's high engagement with the content. The Facebook post sparked 722 comments in total, however only 121 were analyzed here, in which the paragraph comprising the 'cheating' description is explicitly mentioned. Comments containing only emoji, tags, memes, or links were excluded from the corpus. Cameron et al.'s (2009) discourse-led approach to metaphor analysis was used to identify and group the vaccine metaphors in the corpus. The method consists of identifying linguistic metaphors and indicating their vehicle terms, based on the acknowledgment of the incongruity (inconsistency) between the contextual meaning of the vehicle term and a more basic (i.e., a more concrete, more precise, see Pragglejaz Group, 2007) meaning of the term. Vehicle terms are words or phrases used metaphorically. Each vehicle term is assigned to a vehicle grouping that captures its semantic meaning. Vehicle groupings emerge from data and are used to find patterns of metaphor systematicity (see Appendix Table 1 for a summary of grouping vehicles and systematic metaphors found in the corpus). Systematic metaphors need not necessarily be conceptual metaphors (Cameron, 2008), although they could potentially allude to conceptual domains shared by discourse participants.

The coding of vehicles and linguistic metaphors was carried out manually by the author and another colleague. The Facebook post was examined separately by each coder and then in discussion by both coders in order to reach agreement. All problematic cases were recorded in the Excel file and discussed one by one before a decision about marking/non-marking it as metaphor was made to both coders' satisfaction.

Between March 2020 and March 2022, Vlad Mixich published 33 posts about vaccination and the pandemic on his Facebook page, 4 of which triggered over 500 comments. In this paper, one of the overperforming posts in terms of number of comments is analyzed. The post published on December 29, 2020 and the comments it triggered were selected because of the presence of the 'vaccine as a

cheat sheet' metaphor. The Facebook post and the comments contained various metaphors, the majority of which involved mappings of features from the warfare source domain onto the target (Appendix Table 1).

Findings

Vaccine as a cheat sheet: metaphor and conceptual simplification

Mixich's Facebook post is quite a long text (791 words, 6 paragraphs) to be published on social media, in which the author aims to explain the technology underlying the mRNA vaccine against COVID-19 to debunk the myth then circulating in Romania and according to which the vaccine modifies the human DNA. mRNA vaccines use genetic material (mRNA created in laboratory) as a blueprint to teach our cells how to make Spike proteins that trigger an immune response in our bodies. mRNA contained by the vaccine does not enter the nucleus of the cell (where DNA is located) and does not alter or modify the human genes.[3]

In the middle of the FB post,[4] Mixich suggests that readers view the target (the mRNA vaccine) as a 'cheat sheet' used by a student to cheat in a biology exam and builds a 1-paragraph long metaphorical scenario in which he unveils correspondences between how a mRNA vaccine works and cheating in an exam. My aim here is to explore the communicative and pragmatic implications of the use of the 'vaccine as a cheat sheet' metaphor in the socio-discursive context in which it has emerged.

> There is a simpler version of the explanation, for those who didn't have good grades in biology in high school. A pupil has a biology exam, but he's not in the mood for studying. However, he has an elder sister who is a hardworking student and who had to take the same biology exam in the previous year. The sister went diligently to the library (the cellular nucleus in which our DNA is located) and summarized the biology textbook. The sister lends her handouts (the mRNA of the cell) to her lil' brother who can't bring them to the exam. They are too large to be used to cheat in the exam and the teach [noun informal 'teacher'] could catch him. Therefore, he breaks them down into many little thin cheat sheets (this is the mRNA synthetized by researchers and contained by the vaccine) which he uses in the exam. With these cheat sheets our pupil manages to get a 7 (out of 10) to the exam and to pass the class (that is to increase his immunity against the coronavirus up to a satisfactory level). But this does not mean that he actually went to the library and opened the original textbooks (our DNA).

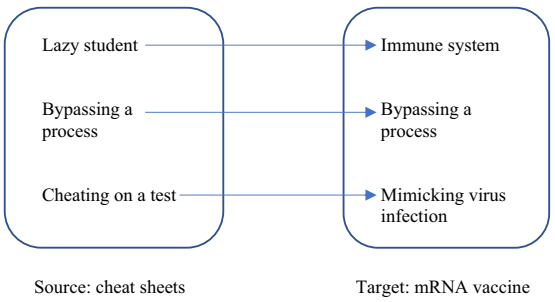

FIGURE 1
Schematic representation of the correspondence strategy.

> For those who did well in biology (without cheat sheets ☺), some recap below and a more detailed explanation.

This is an elaborate school exam scenario involving students, libraries, studying hard but also cheating. This paragraph breaks with the rest of the text in terms of the style used, high frequency of parenthetical expressions, and the use of emoji. The mRNA vaccine is described as a 'cheat sheet' that a lazy student uses to cheat on a biology test. Most likely, the correspondence strategy is used to communicate how the source (cheat sheet) models the target (mRNA vaccine). The correspondences between the target (mRNA vaccine) and the source (cheat sheets) are marked in parentheticals to instruct the reader on how exactly the metaphor should be understood and how the mappings between the source and the target should be established. Figure 1 illustrates the correspondence strategy in the 'vaccine as a cheat sheet' metaphor.

Cheating as bypassing the learning process is mapped onto mRNA vaccine as bypassing the infection process by providing the immune system with instructions (cheat sheets) on how to make a protein that triggers an immune response. The mRNA vaccine supplies the immune system with the cheat sheets (copied instructions) needed to manufacture the protein necessary to recognize the virus. Like a cheating student, the vaccine bypasses the learning process by not entering the library (cellular nucleus) and touching the original textbooks (our DNA). Mixich's communicative goal is to simplify complex scientific knowledge about the vaccine and debunk misinformation that the mRNA enters the cellular nucleus and modifies the DNA of a vaccinated individual.

However, for some elements the metaphorical mappings onto the target are less overt in the absence of Mixich's instructions. Left explicitly unguided, readers might infer correspondences between 'lazy little brother who cheats in the biology exam' and 'the immune system' or between 'biology exam' and 'the COVID-19 disease', though the mapping of 'diligent elder sister' (scientists perhaps?) onto some feature of the target domain seems to elude identification.

Vaccine as a cheat sheet: mocking with metaphor

The choice of the metaphor 'vaccine as a *cheat sheet*' seems to have been motivated by more than merely conceptual clarification.

3 See World Health Organization, Centers for Disease Control and Preventions and Romanian Government-sanctioned information and resources about COVID-19 vaccines available at https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/how-they-work.html, https://www.who.int/news-room/feature-stories/detail/the-race-for-a-covid-19-vaccine-explained, https://vaccinare-covid.gov.ro/scurte-clarificari-cu-privire-la-presupusele-efecte-pe-care-vaccinurile-impotriva-covid-19-le-ar-avea-asupra-adn-ului-uman/.

4 https://www.faceboo-FoMvVMsJHPAk37Nuf4B5eMeEyduovZc9AyBaj4nXs3sRwDnixDGZl

Arguably, Mixich constructed the metaphorical source ('cheating') and the school scenario to mock Romanians who may not have done so well in school at basic biology and, thus, may be more prone to fall for conspiracy theories according to which the mRNA vaccine modifies the human DNA. Pointing fingers at people who do not know basic biology (i.e., the targets of the mockery) does not entail a shift in the topic of the Facebook post; there is, however, a shift in the framing of the topic from an initially metaphorical explanatory frame (i.e., mRNA vaccine works as cheating in an exam) to a provocative frame (i.e., plagiarism, academic dishonesty). This frame-shifting triggers humorous effects (Ritchie, 2005), which take over the communicative effects associated with the explanation, such as acquiring new information, or understanding how a scientific phenomenon works. The humor and playfulness of mockery is recognized and extended in interaction by both Mixich and people who comment to his post.

The source of the metaphor – cheating in an exam – raises the salience of a socially disapproved behavior – plagiarism – and, thus, establishes common ground between the participants to the interaction on Facebook. People who may have resorted to cheating in school to obtain advantages (good grades, school degrees) tend to be less concerned with education, scientific facts, etc., and, therefore, they may be more susceptible to (dis-) misinformation about the vaccine. Mixich's mockery targets ignorant Romanians who might better understand the functioning of the vaccine via the 'cheat sheet' analogy because cheating may be familiar to them.

Vaccine as a cheat sheet: readers' reactions to conceptual clarification and mockery

Has the use of 'vaccine as cheat sheet' metaphor simplified complex knowledge about the mRNA technology and helped dismiss misinformation about the vaccine modifying the human DNA? It is virtually impossible to rely exclusively on discourse to ascertain the relationship between the use of a metaphor and a change in people's behavior. However, from the reactions that Mixich's Facebook post has generated, one could gain access to what people think about the power of the 'cheating' metaphor to facilitate their understanding of the mRNA vaccine.

Many of the comments expressed readers' appreciation of the explanation which was considered "excellent," "very clear" and "accessible for everyone." Very few of the comments echoed the 'cheat sheet' metaphor which could indicate that the choice of a constructed source ('cheating in an exam') may have simplified the target (mRNA technology) and, thus, may have led to conceptual clarification. One commentator expanded the metaphor via reorganization/reinterpretation of source-related information presented in the Facebook post:

> So, the sister who studied in the library (caught the disease) got a better grade (antibodies) than her brother who used the cheat sheets (got the vaccine)! (Comment 57)

Mixich uses 'library' metaphorically to describe *the cellular nucleus in which our DNA is located*, but the participant to the conversation adds to conceptual simplification the use of 'studied in the library' as a metaphor for *catching the disease* (getting COVID-19) to better emphasize the metaphorical association between 'using cheat sheets' and *getting the vaccine*. However, this comment also includes a reference to developing antibodies and acquiring immunity to the disease (absent from the Facebook post), which is explained in a way that is coherent with the cheating metaphorical scenario as "getting a better grade." It is implied that people who get the disease develop more antibodies than those who get vaccinated.

However, one of the earliest commentators rejected Mixich's metaphorical explanation on the grounds of it being "too complicated," which irritated the Romanian health expert who replied: "this is not a battle of explanations!" The follower proposed an alternative metaphor (also involving a constructed source) that they deemed easier to understand and better resonating with the public. 'Vaccine as a foreman' metaphor mapped the mRNA vaccine onto a *construction foreman who goes to a DIY store and asks for specific materials*. The commentator builds a DIY store scenario to draw correspondences between what he considers to be a common experience (i.e., shopping in a DIY store) and the complicated technology of the mRNA vaccine.

> Do you know those DIY stores where foremen dressed in overalls go to the building department and ask for boards that the employees cut to be used for building a fence, or they ask for OSB boards that the employees need to cut in a certain manner to be used for building shelves … Well, similarly, the vaccine disguises itself as a foreman with overalls so that the cell does not realize that this guy with a shopping list for materials and with instruction is from another planet. So, the employees cut the OSB boards for him according to the required shape and, surprise, the result is a spike-shaped board. (Comment 3)

Another comment that questioned the power of the 'cheating' metaphor to simplify complex science underlying mRNA technology reads:

> If the brother cheats using his elder sister's reading notes, why does he become allergic to cheating? (Comment 89)

Here the implication of the metaphor extension is that people are reluctant to vaccinate fearing that they might develop allergic reactions to the vaccine. The metaphor might not help people understand how the vaccine works since it seems to fail to explain why some people become allergic to the vaccine.

By far, the majority of the 121 analyzed comments echoed the mockery implied by Mixich when using the 'cheating' metaphor together with mockery targeting Romanians who cheated in school. Mixich's followers reacted to the mockery either by agreeing to the intended ridicule or by countering the mockery as inappropriate in the context of the interaction (i.e., simplifying complex information about the mRNA vaccine to debunk conspiracy theory narratives). Drawing on Haugh's (2014, p. 95) model of interactional dynamics of jocular mockery, Table 1 comprises examples of how participants to the Facebook conversation responded to mockery entailed by the 'vaccine as a cheat sheet' metaphor used by Mixich as a discourse strategy aimed primarily at simplification and conceptual clarification.

The metaphor 'vaccine is a cheat sheet' links the source and the target in ways that go beyond conceptual clarification by evoking features of the source domain that are morally condemned, i.e.,

TABLE 1 Response strategies to mockery entailed by the 'vaccine as a cheat sheet' metaphor.

Mockery remark (Mixich's Facebook post)	Response strategy (comments)	Examples
Vaccine as a cheat sheet is a simpler explanation for those who did not have good grades in biology	Agreeing with the mockery	Very good explanation! However, those whom you target will never read such a long post…I'm sorry to say it, but it's the least we could learn from Trump. This is explained in vain. Romanians did not learn genetics in high school because it was a tough subject.
	Elaborating	I admire your determination when explaining this, the problem is that the target does not even know what DNA and RNA mean, to distinguish between them is too much. If you think that our functional illiterates manage to read this text and to understand it, then you are a bit naïve.
	Countering	Since it is the first approved vaccine based on this technology those who got an A+ in biology are in the same boat as the rest. This is for the physicians on the net, all highly educated. Nice example with the student who used cheat sheets. You forgot to mention that that student passed the entrance exam to the medical school in the same way and is now a physician in a hospital.
	Rejecting	By segmenting the audience into smart and stupid people you'll get nothing. How do you persuade a skeptic by telling them that they are stupid, that it's not that hard if you think about it a little bit, that you are the smartest and you are going to enlighten them. I like the explanation, but I believe that the comparison to the school and cheat sheets is not quite appropriate to persuade a layperson, they may feel scoffed.

plagiarism. Amplified by public accusations against high-level governmental and political figures, plagiarism has become a polarizing topic in Romanian society, dividing Romanians into those who despise people who disregard the importance of (academic) integrity and build their careers on a questionable educational background, on the one hand, and those who sympathize with some people's ability to succeed in politics and in life, in general, despite not taking education seriously, on the other.

Agreeing with mockery and elaborating it further seem to be commentators' preferred strategies to interact with the mockery, possibly due to the negative entailments of the 'vaccine as a cheat sheet' metaphor. Arguably, the implication is that metaphorical explanation would simplify information for people who do not know basic biology because they have not been too diligent in school but who may be familiar with cheating on a (biology) test. Sometimes, the mockery implied by Mixich's use of the 'cheating' metaphor is extended by the commentators to ad-hominem arguments (see the two threads below) against contestations of the explanatory power of the metaphor itself.

> […] this [paragraph] does not seem too clear for the public, maybe supplemental information could be added in parenthesis. (Comment 13)

> After that paragraph, he explains it in an accessible manner for everyone belonging to the two categories, those with poor grades and those with great grades in biology. If you read the text, you'll find an explanation that fits you. (Thread to comment 13)

> Given your knowledge and expertise, I'd expect that you believe the Earth is flat. He [Mixich] explains it in a very accessible manner and if you had known a little bit of biology, you would have realized how stupid you are. (Thread to comment 54)

Arguably, the efficacy of the 'vaccine as a cheat sheet' metaphor as a discursive strategy aimed at conceptual simplification seemed to have been undermined, to some extent, by using the metaphor in conjunction with mockery. Many of Mixich's followers reacted to the mockery while failing (or simply ignoring) to assess the explanatory power of the metaphor to simplify complex knowledge about the mRNA technology. It is not clear how the metaphor may have contributed to facilitating their understanding of the mRNA vaccine, since their reactions were directed at the mockery associated with the use of this metaphor.

Discussion

This paper discusses a metaphor for the COVID-19 vaccine used in an asynchronous Facebook interaction and seeks to provide a thorough analysis of the role that this metaphor plays in making complex scientific information accessible to lay audiences, and in debunking false narratives about the mRNA vaccine. While metaphors' role in doing science (as 'theory-constitutive'; see Boyd, 1993) may be subject to contestation (Bostanci, 2010; Taylor and Dewsbury, 2018), their role in promoting science and mediating scientific knowledge for public understanding is widely acknowledged (Väliverronen and Hellsten, 2002; Semino, 2008). Metaphors facilitate the interaction between scientists, science communicators and the public, which is paramount in science communication (Burns et al., 2003). Sometimes, the communicative goal is favored over scientific accuracy (Armon, 2017) when choosing a metaphor to simplify complex scientific knowledge and communicating it to a large audience. This seems to be the case of the metaphor 'vaccine as a cheat sheet' used by Vlad Mixich, a Romanian health expert, on Facebook to simplify the complex, abstract mRNA technology and to debunk false information about the vaccine. Mixich's choice of the 'cheating' metaphor to describe how the mRNA vaccine works seems to be motivated by conceptual clarification. His communicative goal is

recognizable both in his post, where his intention to provide a "simpler explanation" is announced at the beginning of the paragraph containing the metaphor, and in his readers' comments which either extend the metaphor or contest it. Mixich constructs the 'cheating' source to explain the virus-mimicking aspect of the mRNA vaccine by an analogy with what he considers to be a (quite) familiar concept to his many Romanians, namely cheating in school.

Science communicators often 'craft' their sources (Wee, 2005a) when explaining abstract science concept for the purpose of conceptual simplification. According to Wee (2005a,b), a constructed metaphorical source allows the author to highlight the structural similarities that the source shares with the target – the scientific concept. Mixich, however, seems to focus on functional similarities between the source (cheating) and the target (mRNA vaccine). The vaccine functions like cheating: it does not enter the cell nucleus (hence, cannot modify the human DNA), just like cheaters do not go to the library to study before an exam. Another similarity between the mRNA synthetized in the vaccine and cheat sheets evoked by the metaphor: both are discarded after they fulfill their function (e.g., help a student pass an exam and help the immune system produce the Spike protein, respectively).

Arguably, this unusual, perspective-changing way of talking about mRNA vaccines may have been deliberately used by Mixich to fulfill a specific communication goal (Steen, 2008, 2017). By signaling the metaphor and drawing attention to the source domain he uses, Mixich seeks to make sure that conceptual clarification is achieved. Comments to the post suggest that the metaphor is both acknowledged (and extended) and contested. Extensions of the metaphorical meaning, albeit not necessarily contributing to further vaccine-related knowledge simplification (see examples containing references to better grades and allergies discussed in the previous section), indicate a validation of 'vaccine as cheat sheets' metaphor's communicative role in interaction. However, while recognizing the author's communicative intention, one of the first commentators contested the metaphor used to fulfill this intention. They challenged Mixich's metaphor's communicative power because it is "too complicated" and proposed an alternative explanation "for everyone to understand": 'vaccine as a foreman' (see Table 1). The metaphor "vaccine as a cheat sheet' seems to be resisted in interaction not necessarily for its lack of explanatory power (Gibbs and Siman, 2021) but for its failure to fulfill a communicative goal, namely, to simplify complex knowledge. Mixich seemed vexed at the rejection of his metaphor's communicative power and defensively reacted to the contester by replying to their comment that it is not a contest of competing explanations.

With the choice of 'vaccine as a cheat sheet' metaphor, Mixich's communicative intentions seems to go beyond merely conceptual clarification. Apparently, not only the author of the Facebook post uses the metaphor to simplify complex information about the vaccine, but he also mocks with this metaphor. Mixich uses the 'cheating' metaphorical scenario to mock Romanians who are ignorant and, thus, less suspicious of false information about the mRNA vaccine spread online. Thus, with the same "cheating' metaphor, Mixich pragmatically intends to achieve conceptual simplification *and* mockery, which, as claimed in this paper, may not be the best strategy to be used in an online interaction that gives people the opportunity to respond (even asynchronically). The metaphor is used to simplify complex knowledge about the mRNA technology while implicitly mocking the target audience presumably in need of vaccine-related conceptual simplification. The combination of mockery and clarification makes Mixich's choice of metaphor a questionable contribution to public understanding of vaccine-related science.

The jocular mockery intended by Mixich is signaled via language and emoji and recognized as such by participants to interaction who respond to the mocking remarks. Reactions to the mocking remarks include agreement with, elaboration, countering, and rejection of the mockery (see Table 1). Mixich's commentators maintain the mockery with some of them adding an aggressive facet to the ridicule at the expense of non-serious playfulness, thus shifting from mockery to putdown humor directed at the target (Dynel, 2008; Haugh, 2010; Taylor, 2015). The playfulness and funniness in cheating metaphor-informed elaborations of Mixich's mockery of some Romanians who need a simpler explanation seems to be surpassed to a certain degree by (ostensible) malice toward the target (see Dynel, 2008 on the aggressive potential of mockery and teasing).

Admittedly, it is impossible to tell from the textual analysis of the comments whether the 'cheating' metaphor has been understood (e.g., comprehended, recognized, interpreted, appreciated, see Gibbs, 1992) by Mixich's followers as a metaphor used to clarify the mRNA technology in the vaccine, despite it being deliberately used (and signaled) by its author. However, the analysis of the comments suggests that some followers recognized Mixich's intention to mock with the 'cheating' metaphor, since they responded either positively (agreement, elaboration) or negatively (countering, rejection) to the mockery. To a certain extent, reacting to the mockery is an indication of metaphor understanding because they seem to have understood at least one of Mixich's pragmatic intentions when using the metaphor (i.e., to clarify *and to mock*, see Gibbs, 2010).

Perhaps the most intriguing feature of the 'cheating' metaphor resides in its potential to polarize, which is visible mainly in agreement and elaboration response strategies. Apparently, recipients display a preference for responding to the cognitive salient and socially biasing frame of plagiarism activated by the metaphor source. Contrary to what the literature suggests (Stivers and Robinson, 2006; Haugh, 2010, 2014), the metaphor-based mockery used by Mixich interrupts the progressivity of interaction by triggering a topic shift: readers focus on plagiarism rather than on ridiculing ignorant people who believe that mRNA vaccine modifies the human DNA. The 'vaccine as a cheat sheet' metaphor used to mock seems to undermine Mixich's discourse agenda – to debunk disinformation about the vaccine by simplifying and clarifying abstract knowledge. Instead, the metaphor activates salient knowledge about plagiarism shared by participants; a new meaning arises that is not necessarily consistent with the agenda: anti-vaxxers who believe in conspiracy theories about vaccines are more likely to be plagiarizers who did not have basic knowledge about biology because they are ignorant, uneducated people.

Thus, as revealed by some of the readers' comments, Mixich's use of the 'vaccine as cheat sheets' metaphor in conjunction with mockery may lead to a polarizing online conversation which, in turn, may undermine science communication and the demystification of public misunderstanding of the mRNA vaccine. Metaphor's power to facilitate science communication and public understanding of how the mRNA vaccine works is subject to contestation. Furthermore, Mixich's use of this metaphor on Facebook to mock may have contributed to widening the gap between supporters and opponents of a highly polarized (and polarizing) topic: vaccination. Thus, while it simplifies complex knowledge related to vaccines and allows the audience

(commentators to Mixich's FB post) to engage with a complex topic, the metaphor may also amplify polarization by fueling anti-vaxxers' use of argumentation fallacies (e.g., ad-hominem) to disarm vaccination supporters. Undoubtedly, empirical research is needed to put these assumptions to test.

Finally, it is worth emphasizing that it is not my intention to make any claims regarding the efficacy of the 'vaccine as a cheat sheet' metaphor in persuading (vaccine-hesitant) Romanians of the safety of the vaccine. This study merely attempts to offer some insights into how this metaphor is used as a discourse strategy to simplify complex scientific information and debunk COVID-19 myths about the mRNA vaccine modifying human DNA.

Conclusion

Metaphors are complex and powerful discourse phenomena indispensable to science communication and understanding. This study aimed to shed some light on the versatility of metaphor use in a COVID-19 vaccine-related interaction on Facebook. The use of the 'vaccine as a cheat sheet' metaphor for conceptual clarification and mockery is analyzed to showcase how the same metaphor is employed to serve two discursive functions concomitantly in an asynchronous online interaction between Vlad Mixich, a Romanian health expert and communicator, and his Facebook readers. Conceptual clarification and mockery seem to overlap during the online interaction, with mockery monopolizing the exchange due to the salience and polarizing potential of the cheating source domain. This study comes with some limitations which could be pursued in future research. A major limitation is the small corpus analyzed, consisting of only one Facebook post and comments that included references to the metaphorical description of the COVID-19 vaccine as a 'cheat sheet.' Nonetheless, the study merely aims at providing some insights into how the metaphor is used as a discursive strategy to achieve conceptual clarification and how this role is identified, negotiated, and contested by participants during interaction on Facebook. This analysis does not aim at making claims about the efficacy of the metaphor in persuading people to change their behavior in relation to vaccination.

This study examined asynchronous interaction which affords that (some) readers' responses to Mixich's message referenced exclusively the mockery entailments while overshadowing the conceptual simplification carried out using the 'cheating' metaphor. Analyzing quasi-synchronous online interaction might help capture a fuller picture of how the communicative functions of metaphor use are negotiated and fulfilled. Furthermore, more research on the role of metaphors in science communication and popularization might reveal how overloading metaphors with overlapping communication functions may result in topic shifts, confuse the audience and (possibly) distract them from an established discourse agenda.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1198172/full#supplementary-material

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An empirical study on the development of metaphorical comprehension of Chinese children

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Metaphor affects how people focus, remember, and process information and significantly influences children's language development. The study explored metaphorical comprehension by Chinese children of different ages (5–8 years). We collected response times and accuracy rates when they processed metaphorical and literal sentences with the graded salience. Linear mixed-effects modeling showed that Chinese children's metaphorical ability improved with age. Subsequent analysis found that the perception period of metaphorical knowledge was at age 5, the development stage of metaphorical knowledge was at age 6 and 7, and the rational decision period of metaphorical ability was at age 8. After 8-year-old, children can invoke the knowledge of the intention schema while activating the source domain, and this knowledge can be automatically and quickly mapped to the target domain. Meanwhile, language development and cognitive processing influenced the metaphorical comprehension of Chinese children, especially children of 8 years of age who had the highest correct rate and the shortest reaction time to process low-saliency metaphorical sentences, while 5-year-old children had the highest accuracy in high-saliency metaphorical sentence and 6-year-old children got the longest reaction time to process sentence in high-saliency metaphor. This study may provide evidence for improving and training metaphor comprehension in children with special needs such as those with an autism spectrum disorder.

KEYWORDS

Chinese children, metaphorical comprehension, salient, behavioral experiments, language development

1 Introduction

Metaphors pervade daily discourse, serving as a pivotal mechanism in both communication and cognitive processes. By furnishing a tangible structure for abstract concepts, metaphors exert a profound influence on the modalities of attention, retention, and information processing (Boers, 2000; Fernandez-Duque and Johnson, 2002; Iskandar and Baird, 2014; Thibodeau et al., 2017; Ahrens and Gong, 2021; Li et al., 2022). This linguistic phenomenon underscores the intrinsic role of metaphorical constructs in shaping conceptual frameworks and facilitating cognitive operations. For instance, the characterization of a lawyer as a 'shark' exemplifies a metaphoric transference that is not readily apparent, bridging disparate ontologies—that of the legal professional and the predatory fish. This metaphorical conflation supports the argument that metaphors are entrenched not solely within the domain of language but extend their influence into the realms of thought and action (Lakoff and Johnson, 1980; Gibbs, 1994; Gibbs and Tendahl, 2006; Kövecses, 2010; Gibbs, 2013; Alessandroni, 2017), serving as a strong evidence for a metaphorical conceptual system highly grounding on a linguistic basis.

The seemingly effortless generation and comprehension of metaphors have garnered escalating scholarly attention, as evidenced by the works of Glucksberg and Keysar (1993), Landau et al. (2015), Al-Azary and Katz (2021), and Carston and Yan (2023). This growing body of research has also gradually substantiated metaphor as a concept of cognitive mechanism (Bai, 2004; Pouscoulous and Tomasello, 2020). Empirical studies, such as those by Sperber and Wilson (1991), further validate the intrinsic and ubiquitous manifestation of metaphorical thought in children's language, suggesting an innate metaphorical competence evidenced through their spontaneous metaphorical expressions. Children's grasp of metaphorical concepts exemplifies the cognitive-linguistic interface where experiential phenomena are mapped from a source to a target domain. Here the target domain refers to the starting point or the described concept of the metaphor, which is the cognitive concrete category or abstract category; While the source domain is the specific category, which is used to compare the target domain. It is due to the existence of cross-domain mappings that we can think and talk about one domain, which is Conceptual Metaphor Theory (Coats, 2019; Conrad and Libarkin, 2022; Maretha and Wahyuningsih, 2023). This mapping evidences the idiosyncratic manner in which children actively engage in the creative depiction of reality, thereby contributing to their epistemic construction. Such metaphorical mappings are indicative of the child's developing capacity to abstractly relate different domains of knowledge and to articulate their understanding of the world (Wiśniewska-Kin, 2023). As a crucial aspect of communicative competence, children's metaphorical competence refers to their ability to understand, interpret, and use metaphors effectively in communication by successfully perceiving of space, identifying and analyzing the conceptual mapping. It involves the skill of recognizing and comprehending the underlying meaning and symbolism conveyed through metaphors (Özcaliskan, 2005; Sabet, 2016).

Thus, metaphorical competence is an important embodiment of children's experience of the world and internalization of knowledge. Current evidence has shown that the metaphorical competence, cognitive flexibility, and information processing speed increase along with children's development (Willinger et al., 2017; Yuan, 2020). It has been reported that the early cognitive and linguistic ability in metaphor comprehension was first charted in children's age between 3 and 5 (Wellman, 1990; Özcaliskan, 2005). They have already demonstrated the ability to interpret the keywords in metaphorical context at 7 years old, and this ability is further strengthened when they are 9 (Nippold et al., 1984), evidencing the positive association between metaphorical competence and age. In this sense, children's metaphorical understanding ability constantly grows over time, and the capability of proactive utilization of metaphor will also be acquired at later stages.

Prevailing research posits that even children as young as 3 years old exhibit the capacity for metaphorical comprehension, and this metaphorical competence appears to augment as they age. Despite these advancements in understanding the developmental trajectory of metaphorical cognition, the intricate cognitive processes underpinning the development of children's metaphorical abilities remain to be fully elucidated by empirical research. Researchers have focused on examining children's understanding of the temporal domain and some conceptual domains (Zhou and Huang, 2001; Liu and Mi, 2008; Du et al., 2020) or on case studies of children's metaphorical output abilities and illustrating them with cross-sectional data (Pan and Zhou, 2018, 2021), as well as on the characteristics and developmental patterns of children's metaphorical thinking (Bai, 2004). Previous literature has demonstrated inconsistent findings regarding children's early metaphorical capability. On the one hand, it has been indicated that the evidence suggests that the literal meaning is better understood than metaphorical ones because of children's generally weaker ability to understand abstract relations (Winner et al., 1980; Silberstein et al., 1982; Gentner, 1988; Zhou and Huang, 2001; Bai, 2004; Liu and Mi, 2008; Pan and Zhou, 2018, 2021; Du et al., 2020). What should be paid specific attention to is the effect the conventionality of metaphor may have in the processing speed of metaphor and literal meaning. Considering the nature of conventional metaphor, which is "the ordinary conceptual system reflected in our everyday language (Lakoff and Johnson, 1980)," the current study would ignore the effect of conventional metaphor as the repeated exposure has made it approximately equal to literal sentences (Prabhakar et al., 2018). While on the other hand, previous research has also reported balanced development of some children's metaphorical and literal language production and comprehension ability, supported by the excellence in reasoning abstract relations (Gentner, 1977; Inhoff et al., 1984; Keil, 1986; McElree and Nordlie, 1996; Walker and Cooperrider, 2016). The temporal dynamics of metaphorical meaning activation remain contentious, particularly regarding whether metaphor comprehension is mediated by direct or indirect cognitive processes (Glucksberg, 2001, 2003, 2008; Wackers et al., 2021; Steen, 2023). The traditional indirect model posits a two-stage processing approach where metaphors are initially interpreted literally, and upon encountering difficulty or incongruity, a specialized metaphorical processing system is engaged to infer pragmatic meaning (Searle, 1979; Genovesi, 2020; Pissani and de Almeida, 2023). This model suggests that metaphor comprehension is a more laborious, secondary process compared to literal interpretation.

Contrastingly, contemporary studies have posited that children's metaphorical cognition, informed by Theory of Mind, may operate

without the additional effort delineated in the classical model. Theory of Mind, which encompasses the prediction and manipulation of mental states based on cultural and social knowledge, appears to facilitate metaphorical understanding from an early age (Wellman, 1990; Frith and Frith, 2003; Norbury, 2005; Lecce et al., 2014). This cognitive ability enables children to navigate the abstract and symbolic nature of metaphorical language, aligning with speakers' intentions and shared cultural contexts, thereby suggesting that metaphorical cognition could be as immediate as literal meaning comprehension.

However, there is a noticeable paucity of studies exploring metaphorical competence in Chinese children, with limited exploration into how they process temporal, conceptual domains, and generate metaphorical expressions (Zhou and Huang, 2001; Liu and Mi, 2008; Pan and Zhou, 2018, 2021; Du et al., 2020). This represents a significant gap in our understanding of cross-cultural cognitive development in metaphor comprehension.

Research methodologies on children's metaphorical competence vary widely, encompassing techniques such as task-based language assessments, pictorial description tasks, lexical gap-filling, and narrative comprehension exercises. These methods also include verbal reporting, naturalistic observation, and structured interviews (Nippold et al., 1984; Özcaliskan, 2005; Rundblad and Dimitriou, 2010; Li, 2011, 2012; Kuang and Zhou, 2018; He et al., 2021; Pan and Zhou, 2021; Sun, 2021). However, the integration of these diverse methods into a cohesive framework that provides behavioral metrics for metaphor comprehension has been limited.

Depending on cognitive development, metaphor provides a way of categorizing reality (Carriedo et al., 2016; Pastor et al., 2020). Utilizing quantitative and descriptive behavioral experiment, the current study aimed to explore the underlying cognitive process of metaphorical comprehension. To be specific, the reaction time (RT) and accuracy rate (ACC) measured by behavioral experiment during the meaning decision task employed among children at different ages have been used to reflect the cognitive process indirectly. This is poised to deliver a more comprehensive understanding of the developmental patterns in children's metaphor comprehension abilities, including potential individual differences across varying age groups.

In conclusion, each work focuses on an aspect to be investigated and on a single paradigm. Nevertheless, they all aim at better understanding when and how metaphor comprehension skills appear in children. However, there exists relatively little research on the evolution of metaphorical comprehension among Chinese children. This study is poised to delineate how Chinese children across different age brackets differentially process metaphorical and literal sentences, employing a sophisticated behavioral experiment framework. Therefore, the goal of this study is to solve this problem by investigating the temporal and accuracy-related aspects of metaphor processing but also elucidating the underlying cognitive neural mechanisms. By doing so, it seeks to contribute to a more granular understanding of the temporal dynamics in metaphor acquisition and to enhance the empirical basis for cognitive theories of language processing.

2 Methodology and materials

First, 40 literal and 40 metaphorical sentences were selected from children's early years picture books, classic story theater series, 100 nursery rhymes, and other related books[1] familiar to children. Both metaphorical and literal sentences have same structure: 'A is B.' In the metaphorical cases, A is understood or explained by B (e.g., "The rainbow is an arch bridge. (The shape of rainbow is like an arch bridge)" "彩虹是拱桥"), involving a mapping of two conceptual domains (Shu, 2004, p. 27). For 'A is B,' A is the starting word, which is the core of the meaning of the whole sentence, and is usually the nominative absolutive noun; while B as a predicate, is the component to explain "what is A" or "How is a." From this perspective, copular constructions in Mandarin are identical to English copular constructions.

Second, in this study, the salience of metaphorical and literal sentences was systematically evaluated, with salience defined as the immediacy of a sentence's meaning as it is perceived by a reader or speaker (Giora, 1997). This construct was operationalized through four indicators: conventionality, familiarity, prototypicality, and frequency, which together facilitate the classification of sentences into categories indicative of high or low cognitive prominence (Giora, 2003; Lai et al., 2009). That is to say, meanings of words, phrases, or sentences (e.g., the conventional interpretations of idioms or provers) have to be coded in the mental lexicon and, in addition, enjoy prominence due to a meaning is more widely and frequently used in a linguistic community, a more prototyping meaning, a more familiar or recently acquired meaning. Meanings not coded in the mental lexicon (e.g., conversational implicatures constructed on the fly) are non-salient. In addition, according to the method recommended by Grioa, metaphorical and literal sentences with high or low-saliency levels were selected in this study.

To empirically measure these dimensions of salience, we adopted a robust experimental design informed by Zhou (2011), which included the enlistment of 6 seasoned educators to appraise our sentences. Utilizing a five-point Likert scale, these educators assessed each sentence for familiarity, conventionality, and prototypicality. The mean scores from these assessments were used to assign a salience level to each sentence, leading to a bipartite categorization: sentences of high salience and those of low salience within both metaphorical and literal classifications. The assessments by these domain experts provided the basis for the nuanced categorization of the study's sentences, facilitating a rigorous examination of salience as it relates to metaphor comprehension.

In addition, we randomly selected 20 non-experimental control participants (5–8 years old age group, 5 in each group to rate the familiarity of 80 sentences.[2] In order to ensure that children understand the meaning of metaphor, we employed a meaning decision task, in which each type of sentence including filler sentences has been tested. Furthermore, children are asked to verbally explain the key words that indicate metaphor in the sentence. In this study, the sentences with mean scores less than 2.5 was removed. Because the total score is 5, less than half of which needs to be deleted. Finally, 48 experimental sentences remained, including 24 metaphorical sentences and 24 literal sentences. The composite scores of metaphorical and literal sentences in the top half are high-saliency sentences, while composite scores belong to the bottom

1 http://www.360doc.com/content/18/0405/10/40814224_743008411.shtml

2 Since children have not yet understood the concepts of conventionality and typicality, only children's familiarity with the sentences is tested.

TABLE 1 The mean of salience according to the sentence type (standard deviation in parentheses).

Condition	Example	Salience
High-saliency metaphorical sentences	星星是眼睛 (Stars are eyes.)	4.647 (0.220)
Low-saliency metaphorical sentences	彩虹是拱桥 (The rainbow is an arched bridge.)	3.941 (0.210)
High-saliency literal sentences	婴儿是孩子 (Babies are children.)	4.653 (0.109)
Low-saliency literal sentences	认真是前提 (Seriousness is the prerequisite.)	4.200 (0.198)

half are low-saliency sentences. In addition, another 24 filler sentences were used to complete meaning decision task, 12 high-saliency metaphorical sentences, 12 low-saliency metaphorical sentences, 12 high-saliency literal sentences, and 12 low-saliency literal sentences are also included. The results of the variance analysis showed that there was a significant difference between high-saliency metaphorical sentences and low-saliency metaphorical sentences in terms of salience ($p < 0.001$), between high-saliency literal sentences and low-saliency literal sentences in terms of salience ($p < 0.001$). There was no significant difference between high-saliency metaphorical sentences and high-saliency literal sentences in salience ($p = 0.903$) and no significant difference between low-saliency metaphorical sentences and low-saliency literal sentences in terms of salience (see Table 1).

Finally, in order to complete the meaning decision task, 24 filler sentences were also added to this study. The filler sentence has the same pattern as the experimental sentence, but the semantics are violated. For example, 'the building is fish'. The study includes the following research questions: (1) The periods children (aged 5–8)'s metaphorical competence can be divided into, and the specific development characteristics of children (aged 5–8)'s metaphorical competence; (2) The influencing factors of metaphorical comprehension of Chinese children. Based on the results of previous studies, the study speculated that the metaphorical competence of children (5–8 years old) shows an increasing trend with the growth of age, and the development of metaphorical competence of children at different ages has certain differences.

2.1 Participants

Forty children aged 5–8 years[3] whose native language was Chinese were selected to participate in this experiment. There were 12 children in each age group, with half of them being boys and half being girls.[4]

All participants were in good health, had normal or corrected vision, were right-handed and had no history of psychiatric or neurological disease, traumatic brain injury, or other related medical conditions. Participants and their parents or legal guardians signed a protocol. Furthermore, the study protocol was approved by the medical ethics committee of the university of researchers.

2.2 Experimental procedure

In this study, an experimental program for sentence comprehension was written using E-prime 2.0. The sequence of the experimental procedure consisted of presenting the gaze point "+" (SONG, 40)[5] in the center of the screen for 250 ms, followed by a random blank screen for 200–300 ms. Then, the subject of a sentence (SONG, 40, two-character word) was presented for 3,000 ms. And the predicate of a sentence (SONG, 40, single character) was presented for 1,500 ms after a random blank screen from 200 to 300 ms. After that, a random blank screen was still 200 to 300 ms, followed by the object of the sentence (SONG, 40, two-character). Subjects were required to respond when the object of the sentence was presented on the screen (see Figure 1 for the experimental procedure).

The experiment was conducted in a quiet environment, and we conducted the experiment for each participant individually. During the experiment, subjects were seated in a chair with both eyes looking at the central point of the screen, 70 cm from the screen, with a horizontal and vertical viewing angle of <4°. All word pairs were presented in a randomized manner. Participants were asked to quickly and accurately determine whether the entire sentence could be understood. Participants were asked to press the "F" key on the keyboard with the left index finger if it was comprehensible and the "J" key with the right index finger if not. For the convenience of the participants, stickers with "✓" "✗" printed on them were placed on the "F" and "J" keys according to the size of the keyboard. The left and right hands, the stickers, and the keyboard were counterbalanced among the participants. To help them become familiar with the experimental process and requirements, participants completed practice trials before the formal experiment, using materials similar to those used in the experiment. The formal experimental phase consisted of 72 trials, with 7 short breaks between, and the whole experiment lasted for 12 min.

3 Data analysis and results

At the end of the experiment, we deleted all data from participants whose correct rates were less than 50%. Among them, two 5-year-old participants were deleted, leaving 10 remaining; a 6-year-old participant was deleted, leaving 11 remaining; a 7-year-old participant was deleted, leaving 11 remaining; all 8-year-old

3 According to Piaget, the age of children's preoperational stage is generally between 2 and 7 years. Given that children do not establish "physical-mental metaphors" until the age of 5 years (Waggoner and Palermo 1989; Pan and Zhou, 2021), and they can basically recognize Chinese characters by the age of 5, so the age range of the subjects was chosen to be 5–8 years.

4 Although studies by Kogan and Chadrow (1986) and Willinger et al. (2017) found no effect of gender on children's metaphor comprehension, the present study controlled for gender as a variable.

5 Song typeface is a kind of Chinese font which is adapted to the printing technique. The stroke thickness changes, and is generally horizontal thin vertical thick, the end has a decorative part (that is, "foot" or "serif"), point, skim, tick, hook and other strokes have a tip, belonging to the serif font (serif), often used in books, magazines, newspapers printing body typesetting.

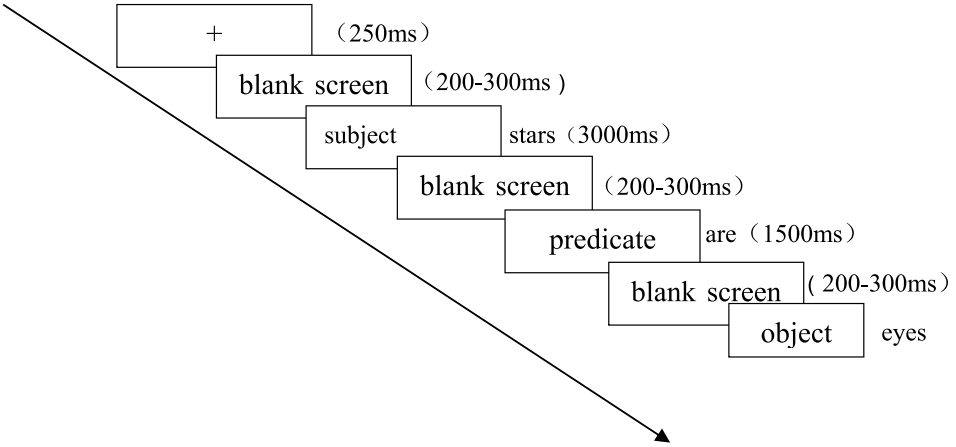

FIGURE 1
Schematic diagram of the experimental process.

participants had an accuracy rate higher than 68%, so all data from twelve 8-year-old participants were retained. The results of the filler sentence test of all participants were excluded from the data analysis and sentences with incorrect responses were not included in the response time analysis. Furthermore, data with a response time outside of ±2.5 standard deviations for each condition were removed based on the age group of the participant. RTs were analyzed using linear mixed-effects modeling, with participant and item entered as random effects (all other variables were entered as fixed effects). The models of the accuracy rate data were analyzed using logistic regression. All analyses were conducted using R statistical software (R Core Team, 2023).

The model fitting procedure for each analysis started with a maximal model that included potential predictor variables as main effects. These included: age (5, 6, 7, and 8 years), sentence type(metaphorical, and literal), and salience(high, and low). For analyses using mixed effects modeling, item and person were entered as random effects. In addition, all models included all possible interactions between group and the other main effects. Categorical variables were dummy coded and all numerical predictor variables were standardized (using natural logs) and centered prior to analyses.

After constructing each maximal model, a backwards stepwise regression analysis was performed to identify the most plausible models for each measure using Akaike information criterion (AIC) values. No distinctions were made between main effects and interactions in this procedure. The predictor variable that had the least impact on the AIC values at each step was eliminated until only variables that significantly improved the fit were included. The analysis aimed to investigate the differences in processing metaphorical sentences and literal sentences with different salience by Chinese children of different ages. When there were interactions, emmeans package in R were used to show the specific performances on processing different sentences among children with different ages.

Descriptive statistics are presented in Table 2. For RTs, analyses showed that the main effect of age was not significant between the groups, Estimates = −0.129, β = −0.133, t = −1.13, p = 0.265. The main effect of sentence type was significant, Estimates = −0.184, β = −0.210, t = −2.81, p = 0.005, Cohen's d = −2.808. The main effect of salience was marginally significant, Estimates = −0.131, β = −0.150, t = −1.94, p = 0.053, Cohen's d = −1.942. The three-way interaction effect was significant, Estimates = −0.186, β = −0.166, t = −0.166, p = 0.010, Cohen's d = −2.575. *Post hoc* comparisons between age groups for the interaction effect were performed. For 5-year-old children, there is a significant difference between metaphorical and literal sentences at low-saliency, Estimate = 0.184, t = 2.807, p = 0.027. For 6-year-old children, there is a significant difference between metaphorical and literal sentences, Estimate = 0.101, t = 2.204, p = 0.028. For 7-year-old children, there is a significant difference between metaphorical and literal sentences, Estimate = 0.102, t = 2.219, p = 0.028. For 8-year-old children, there is a marginally significant difference between metaphorical and literal sentences, Estimate = 0.085, t = 1.947, p = 0.053. For ACCs, analyses showed that the main effect of age was not significant between the groups, Estimate = 0.010, p = 0.179. The main effect of sentence type was not significant, Estimate = 0.050, p = 0.625. The main effect of salience was not significant, Estimate = 0.030, p = 0.641. The interaction effects were not significant, Estimate(s) ≤ 0.015, $p \geq 0.110$.

Planned comparisons between age groups were performed. For 5-year-old children, there is no difference between metaphorical and literal sentences, Estimate = −0.0708, t = −1.294, p = 0.203. For 6-year-old children, there is a significant difference between metaphorical and literal sentences, Estimate = −0.163, t = 2.589, p = 0.013. For 7-year-old children, there is a significant difference between metaphorical and literal sentences, Estimate = −0.205, t = −3.198, p = 0.003. For 8-year-old children, there is a no difference between metaphorical and literal sentences, Estimate = −0.1042, t = −1.589, p = 0.119. The accuracy rate of the children's processing of four types of experimental sentences at different ages and the trends in response time can be seen in Figures 2, 3.

4 Discussion

Utilizing a meaning decision task, the current study centered on drawing a comprehensive picture of the language development and cognitive processing of children's metaphorical and literal sentences and elaborating on the similarities and differences in the processing pathways of metaphor among children at different ages. In addition, we found no significance on gender, so the present study controlled for gender as a variable.

TABLE 2 Average response time and accuracy rates.

Sentence type	Salience	Age	RT (ms)/Sdtime	ACC(%)/SdACC
Metaphorical sentence	Low-saliency	5-year-old	2302.68 (1293.15)	67.50 (47.03)
		6-year-old	2038.25 (853.04)	59.85 (49.21)
		7-year-old	2004.36 (697.84)	59.09 (49.35)
		8-year-old	1785.94 (677.86)	72.22 (44.95)
	High-saliency	5-year-old	2023.75 (828.36)	64.17 (48.15)
		6-year-old	2309.23 (1178.56)	58.33 (49.49)
		7-year-old	1894.05 (591.25)	60.61 (49.05)
		8-year-old	1827.64 (672.69)	62.50 (48.58)
Literal sentence	Low-saliency	5-year-old	1785.44 (818.80)	77.50 (41.93)
		6-year-old	1948.85 (895.99)	77.27 (42.07)
		7-year-old	1777.32 (482.68)	84.09 (36.72)
		8-year-old	1571.99 (544.82)	82.64 (38.01)
	High-saliency	5-year-old	2019.62 (1078.45)	68.33 (46.71)
		6-year-old	1990.75 (841.34)	73.48 (44.31)
		7-year-old	1857.22 (665.26)	76.52 (42.55)
		8-year-old	1708.14 (640.15)	72.92 (44.59)

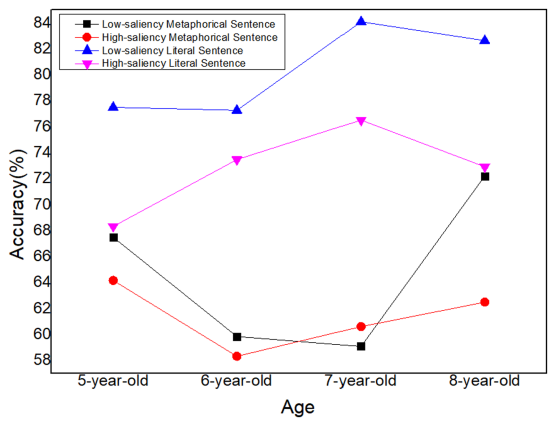

FIGURE 2
Accuracy rates for processing four types of experimental sentences in children of different ages.

4.1 The overall tendency of Chinese children's metaphor comprehension: perception period, development period and rational decision period

The results of the current study demonstrated that children's ability to understand metaphorical sentences developed gradually considering the increased ACC and decreased RT of almost every type of sentence among children at different ages (Figures 2, 3). That is, as children get older, their cognitive abilities and language proficiency continue to advance, which has become the important foundation for their comprehension of metaphorical sentences (Zou, 2012; Yuan, 2020). Based on our findings, 5 years old could be seen as a period of "metaphor perception" during which children have the intuition of difference between literal sentences and metaphor; 6 and 7-year-old children experience a period of "metaphor development" as a significant difference of accuracy in metaphor could be observed ($p < 0.05$); 8-year-old children are in a period of "rational decision" period during which they have relative low reaction and high accuracy.

First, we found that the effect of salience seems not so obvious than predicated overall for Chinese children aged 5–8, except for low-saliency sentences of 5-year-old children. 5-year-old in our study displayed a significant difference of reaction time in low-saliency sentences, and their processing time for metaphorical sentence (2302.68 ms) showed longer than literal sentence (1785.44 ms). Meanwhile at the same condition, there was no significant difference for accuracy. Children of 5-year-old could understand low-saliency metaphorical sentences as well as low-saliency literal ones while the latter with longer reaction time. Zhou et al. (2021) also found in their metaphor comprehension task, preschoolers, 4–5 year-old, understood literal and non-literal language equally well and they attributed the result to children's relational reasoning mindset. Children at this stage are primed with language processing and world knowledge and are experiencing a gathering of each and every piece of knowledge to perceive the difference between low-saliency literal and metaphorical sentences. Because the connotations of the source domain bring children at that stage closer to their interactions with the world and closer to their bodily experiences, children at the age of 5 are more likely to learn earlier. Children can use this as a basis for forming initial hypotheses about the meaning of the target concept consisting of this source domain, which can help them understand the metaphors mapped to those target domains. Nevertheless, it is obvious to see that 5-year-old children employed longer time to process low-saliency metaphorical sentences than literal ones, which closely connected to semantic network. Semantic network is a type of data representation incorporating linguistic information that describes concepts or objects and the relationship or dependency between them (Nettleton, 2014). Literal sentences take less time to process due to their close semantic

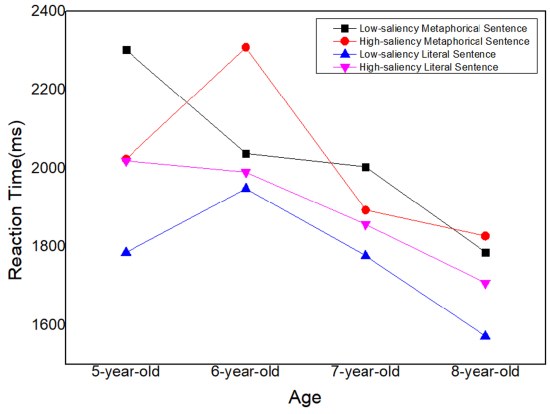

FIGURE 3
Response time to processing four types of experimental sentences in children of different ages.

distance in the semantic network. So they could be easily understood by 5-year-old children whose vocabulary are limited. By contrast, metaphorical sentences' source and target domains are in two different categories, and the semantic network is farther apart, thus requiring longer processing time and cognitive effort. In short, 5-year-old children have perceived the difference between low-saliency metaphorical sentence and literal ones, and they attempt to process metaphorical sentences from a perspective different from that of literal statements. That is, children at this stage have a certain level of embodied experience and vocabulary to perceive the differences between metaphorical and literal sentences. However, due to limited cognitive processing abilities, they require more time to identify metaphorical sentences. Therefore, we believe that metaphorical understanding in children at this stage falls within the metaphor perception period.

The second result is that we have noticed marked difference in 6 and 7 years old children upon their metaphorical comprehension and literal meaning processing according to accuracy. Children of 6 and 7 years old experienced better literal sentence processing than metaphorical ones. The reaction time for both low- and high saliency metaphorical sentences were longer than literal ones. At the age of 6–7, children have developed their theory of mind, which assists them to understand others' different thoughts and feelings (Miller and Rose, 2009; Osterhaus and Koerber, 2021). However, their understanding is still more concrete and less abstract compared to older age groups. On one hand, literal sentences directly convey the speaker's intended meaning without relying on abstract or metaphorical language. Children at this age are more adept at concrete thinking, which means they understand things more directly and literally. Literal sentences align well with their developing cognitive abilities and straightforward interpretation of the world. On the other hand, metaphorical language often involves understanding and interpreting abstract concepts or comparisons, which can be more challenging for children, but they still develop their cognitive flexibility. 6 and 7 years old children can understand simple metaphors, construct parsing categories based on perceptual foundations (Siltanen, 1986, 1990), and seem to begin processing metaphors word by word. And functional magnetic resonance imaging studies have also shown that the analogical reasoning and metaphor processing abilities of children at this age overlap in brain activation, show common underlying neural processes (Prat et al., 2012), and are similar to the brain activation areas of adults. The increased metaphorical ability can be explained, at least in part, by the increase in neural efficiency, that is, the increased functional connectivity within and between brain regions (Yin et al., 2016). Given that we infer that metaphorical comprehension of 6 and 7 years old children belong to development period.

Additionally, individuals in 8-year-old group exhibited the highest accuracy rate (72.22%) and the shortest response times (1785.94 ms) in low-saliency sentence comprehension. At this developmental stage, 8-year-old children demonstrate an enhanced ability to comprehend metaphors, attributing it to their capacity to activate source domains along with associated intentional schemas. This activation facilitates automatic and rapid mappings from the source domain to the target domain. Notably, the observed increase in processing speed suggests a corresponding increase in metaphorical understanding competence, as heightened processing speed contributes to the acquisition of new information.

Intriguingly, Figures 2, 3 revealed a negative growth in the accuracy rate and reaction time of high-saliency metaphorical sentences among 8-year-olds. We posit that this may indicate a reduced reliance on literal meaning in metaphorical comprehension, reflecting a deeper exploration of metaphorical meaning. Indeed, 8-year-old children engage their executive functions when processing complex linguistic phenomena, such as metaphor, as supported by studies (Best et al., 2009; Brydges et al., 2014). Their involvement in abstract reasoning, integrating information from both source and target domains, contributes to the understanding of metaphorical sentences. While the complexity of these cognitive processing procedures may lead to an increased likelihood of misjudgment and longer reaction times. In conclusion, we contend that 8-year-old children, during this deep-processing stage, attain a qualitatively new level of metaphor processing and belong to the rational decision period of metaphor mastery.

To fully explore the underlying processing mechanism of metaphor comprehension, we will illustrate our results from the perspectives of language development and cognitive processing in the following sections.

4.2 Language development and cognitive processing affect the metaphorical comprehension of Chinese children

To elaborate on the characteristics of Chinese children's metaphors from the perspective of language development, we would analyze the potential reasons from two dimensions: vocabulary level and processing speed.

As an indispensable and essential component of language acquisition, vocabulary accounts for a vital component in verbal fluency and social interaction (Kelley and Poholik, 2023; Preethika and Gupta, 2023), serving as the primary source of constructing the external physical world and internal mental processes. From the perspective of vocabulary level, children's performance on the metaphorical and literal sentences is progressive and proportional to age (Ferreira et al., 2023), presenting the way their flexible mapping between target domain and source domain and relatively high efficiency of identification of metaphorical and literal sentences. In a general view, children who were in higher vocabulary

levels (e.g., 6- and 7-year-old children) tended to identify the words of the source domain and could map them to the relative target domain by combining the similarities of the two concepts as they demonstrated significant differences of accuracy and reaction time ($p < 0.05$). What should be noted is that 7-year-old children, who possess relatively high vocabulary levels, could identify the semantic meaning of literal sentences as they present higher accuracy compared with children at other different ages. For those who are aged 8, excessive vocabulary might mislead their judgments toward literal sentences that led to lower accuracy. The difference between the metaphor comprehension of 5- and 8-year-old children will be analyzed from the perspective of cognitive processing in 4.2.

Besides vocabulary level, processing speed is also a critical element in evaluating children's comprehension of metaphorical and literal sentences. Based on the tendency in Figure 3, an interesting discovery was that children aged 6 took the longest time in processing high-saliency metaphorical sentences, which indicated that children at this age have difficulty in processing such sentences. A plausible reason might be that they are fully aware that high-saliency metaphorical sentences are not similar to other kinds of sentences. The time they cost might imply the internal mapping processing from the source domain to the target domain, which leads to low processing speed. Similarly, 5-year-old children began to realize the difference between low-saliency metaphorical and literal sentences ($p < 0.05$), which could be seen as proof of their awakenings to metaphors.

The underlying cognitive processing mechanism that might contribute to current results should be paid more attention, and we would explain it also from two perspectives: executive functions and abstract reasoning.

Consisting of response inhibition, working memory, and cognitive flexibility, executive functions (EF) develop rapidly during the preschool period and are considered as crucial contributors to general academic achievement (St Clair-Thompson and Gathercole, 2006; Diamond, 2013; Allan et al., 2014), including metaphor comprehension (Carriedo et al., 2016). The process of metaphor comprehension calls for the requirements of great abstraction and attention effort, which demands a high level of cognitive regulation—EF (Carriedo et al., 2016). To be specific, it involves (1) the activation or mapping of relative concepts from the source domain to the target domain and inhibition of irrelevant concepts (i.e., response inhibition); (2) bearing the information of the source domain which should be working with those in the target domain (i.e., working memory); and (3) changing the perspective flexibly between those two domains (i.e., cognitive flexibility). Based on our findings, 5-year-old children could recognize and distinguish metaphorical and literal sentences at low-saliency as there was a significant difference in reaction time between these two types of sentences ($p < 0.05$). We inferred that children at that age have begun to realize the concept of metaphor and might have combined or mixed the entities of source and target domains. As for 6-year-old children, which has been considered as a critical turn in the current study, they fully understood the differences between metaphorical and literal sentences and they tend to spend more energy or effort exploring the potential connection between source domain and target domain, which contributes to long RT and low processing speed in metaphor comprehension. Meanwhile, excessive cognitive cost might decrease their EF and result in low accuracy. An unexpected result of the accuracy of high-saliency metaphor sentences between 5- and 8-year-old children should not be ignored as it may reveal the unique cognitive processing mechanism of children in understanding metaphors. With higher EF, 8-year-old children may hold more irrelevant information in mind which may impact their response inhibition and further affect their working memory and cognitive flexibility, compared with 5-year-old children. However, we cannot simply conclude that 5-year-old children exhibit better comprehension of high-saliency metaphorical sentences than 8-year-old ones considering that there is no difference between metaphorical and literal sentences of ACC ($p > 0.05$). Therefore, there is a large chance that children who aged 5 would not distinguish these two types of sentences and process metaphorical sentences in the way they are employed in literal sentences. Nevertheless, this result should be treated with caution. Further research should employ a larger sample size to verify the findings of the current study.

In addition to EF, abstract reasoning has been widely known as the manipulation of self-generated thoughts, or thoughts that are not directly connected to the context, constrained by abstract elements that can be coordinated at one time (Hatcher et al., 1990; Marini and Case, 1994; Dumontheil, 2014). As grow older, children's competencies to identify and distinguish metaphorical and literal sentences are strengthened. Till 8 years old, the cognitive efforts the children put in recognizing the sentence type we mentioned above were much lower, leading to the marginally significant difference between metaphorical and literal sentences in reaction time. Also, in accuracy, there was no significant difference was detected between these two types of sentences ($p > 0.05$), indicating that abstract reasoning no longer impacts children at this age, or it has been ignored unconsciously by 8-year-old children. For those aged 7, however, abstract reasoning may still play a vital role in decoding the semantic meaning of literal sentences as they used relatively low reaction time and obtained high accuracy.

5 Conclusion

Through a meaning decision task, this article investigates the difference, patterns, and salience of metaphorical and literal sentences processed by Chinese children of different ages. The study found that the metaphorical capacity of Chinese children increased with age, with a perception stage at age 5, a metaphorical development stage at age 6 and 7, and a rational decision stage of metaphorical ability at age 8. From then on, children can recall the knowledge of intention schema while activating the source domain and then automatically and rapidly map this knowledge to the target domain. At the same time, language development and cognitive processing influenced the metaphorical comprehension of Chinese children, typically, children of 8 years of age who had the highest correct rate and the shortest reaction time to process low-saliency metaphorical sentences. While 5-year-old children had the highest accuracy in high-salient metaphorical sentence and 6-year-old children got the longest reaction time to process sentence in high-saliency metaphor.

This study still has the following limitations. First of all, the sample size of this study is small, and more results of the study can be included in future studies. Secondly, due to the limited attention of children, in order to ensure the experimental validity, the study took 7 breaks during the experiment to ensure that children's judgment of sentences was not affected by additional factors such as fatigue. Further studies should more directly explore the impact of vocabulary, executive functions, and so on given that they do not have external measures that could be used

to sustain the claims about the putative mechanisms that explain the development of metaphor understanding for children. In addition, future studies can also use neuroscience or imaging methods to examine metaphor processing and its predictors in children of different ages to improve existing metaphor processing theories. The results of the study can also be compared with general data on brain development.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in the article/Supplementary material.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics committee of School of Foreign Languages, China University of Petroleum (East China). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

LC: Conceptualization, Writing – original draft, Data curation, Formal analysis, Funding acquisition. TZ: Conceptualization, Data curation, Supervision, Writing – review & editing. LZ: Formal analysis, Writing – review & editing. YL: Conceptualization, Data curation, Writing – review & editing. SY: Formal analysis, Writing – review & editing. YP: Formal analysis, Validation, Writing – review & editing. YG: Supervision, Validation, Visualization, Writing – review & editing. PW: Validation, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1254129/full#supplementary-material

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Writing direction and language activation affect how Arabic-English bilingual speakers map time onto space

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We investigated whether writing direction and language activation influence how bilingual speakers map time onto space. More specifically, we investigated how Arabic-English bilingual speakers conceived where (e.g., on the left or on the right) different time periods (e.g., past, present, future) were located, depending on whether they were tested in Arabic (a language that is written from right to left) or in English (a language that is written from left to right). To analyze this, participants were given a task that involved arranging cards depicting different scenes of a story in chronological order. Results show that, when tested in Arabic, participants were significantly more likely to use right-to-left arrangements (following the Arabic writing direction), compared to when tested in English.

KEYWORDS

metaphor, time, space, Arabic, bilingual, writing direction

Introduction

In this study, we explore whether writing direction and language activation influence how people map time onto space. To address this theoretical issue, we examined how Arabic-English bilingual speakers conceive where (e.g., on the left or the right) different time periods (e.g., past, present, future) are located, depending on whether they are tested in Arabic (a language that is written from right to left) or in English (a language that is written from left to right).

According to the conceptual metaphor theory (Lakoff and Johnson, 1980; Lakoff, 1993), people resort to expressions that refer to concrete concepts when they talk about abstract concepts such as TIME or LOVE and, in doing so, transfer the vocabulary pertaining to a *source domain* to a *target domain*. For instance, people apply the phrasal lexicon related to the concrete concept of journey (source domain) to the intangible concept of love (target domain) (e.g., *We have **come a long way** since first met*, *We **hit a dead-end***, *This relationship is **not going anywhere***, *We decided to **go our separate ways***). Our language abounds in conceptual metaphors, such as TIME IS MONEY (e.g., *You are **wasting** my time*, *This will **save** you hours*, *I have **invested** a lot of time in our relationship*, *This is not **worth** my time*), ANGER IS HEAT (e.g., *She is **boiling** with anger*, *He was **fuming***) or ARGUMENT IS WAR (e.g., *Your claims are **indefensible***, *He **attacked** every **weak point** in my argument*). The

fact that conceptual metaphors like these are so ubiquitous is not haphazard: Lakoff and Johnson propose that conceptual metaphors help us structure our thoughts by offering a framework to our conceptualization processes that allows us to map across conceptual domains. One of the most widely used conceptual metaphors is TIME IS SPACE (Clark, 1973; Traugott, 1978; Alverson, 1994; Haspelmath, 1997) (e.g., *The end is **getting closer***, *The time for action has **arrived***, *The best part is **coming up***, *I leave my past **behind***, *The deadline is **approaching***). Given that time is an intangible and ephemeral concept that cannot be perceived directly by any sensory organ, people from different cultures capture it conceptually using the more concrete source domain of space (Bender and Beller, 2014).

One of the sources for this time-space mapping is our bodily actions. In fact, the abundant literature on *embodied cognition* (Varela et al., 1991; Lakoff and Johnson, 1999; Gibbs, 2003, Gibbs et al., 2004; Gibbs, 2006; Lachaud, 2013) offers substantial support to the idea that many conceptual metaphors arise from (and are grounded in) embodiment. According to the embodied cognition hypothesis, the way our bodies interact with the world and other people affect the way we form and communicate ideas. In other words, our sensorimotor experiences influence the way we think and talk. For instance, the conceptual metaphor MORE IS UP (e.g., *His wage came **down***, *The fees went **up***) may originate in the many occasions in which our perceptions showed us that greater quantities are usually associated with increased height (e.g., the more papers we pile up, the higher the stack will be). Similarly, the origin of the conceptual metaphor AFFECTION IS WARMTH (e.g., *She gave me a **warm** greeting*, *She is a **cold** lady*) may reside in the fact that everybody has experienced physical feelings of warmth during pleasant situations that involved intimacy and comfort (Zhong and Leonardelli, 2008). Indeed, in an experimental study, Williams and Bargh (2008) have demonstrated that physical experiences of warmth unconsciously increase interpersonal feelings of warmth (e.g., a person is more likely to judge the experimenter who gave her a drink as generous and caring if the drink was hot instead of cold; people are more likely to engage in an act of generosity if they were given a hot therapeutic pad instead of a cold one). Likewise, Gibbs (2013) has shown that the conceptual metaphor RELATIONSHIPS ARE JOURNEYS is based on embodied simulations. In his study, participants who read stories about successful romantic relationships that contained metaphors such as *Your relationship was moving along in a good direction* walked longer distances than participants who read stories about unsuccessful relationships (e.g., *You and your wife are stuck in this marriage*); more importantly, this difference in walking distance disappeared when the critical metaphorical statement (e.g., *Your relationship was moving along in a good direction*) was replaced by a non-metaphorical expression (e.g., *Your relationship was very important to you*). Finally, another example of a conceptual metaphor that arises from our sensorimotor experiences is MORALITY IS CLEANLINESS (e.g., *He is involved in some dirty business*). For instance, previous studies have shown that exposure to moral "impurity" increases the desire to get cleansing products and the likelihood of taking antiseptic wipes (Zhong and Liljenquist, 2006). Deceiving acts also increase the likelihood of using hand sanitizer (Lee and Schwarz, 2010). Cleanliness is also associated with more severe judgments on controversial topics such as abortion and pornography (Zhong et al., 2010), and dirty workplaces trigger harsher judgments on other people's immoral acts (Schnall et al., 2008).

In the case of the conceptual metaphor TIME IS SPACE, which is the focus of the current investigation, the embodied source of this mapping seems to reside in our own kinetic experiences (that is, our bodies or body parts moving) or our perceptions (that is, seeing other entities move). In fact, the concept of time and the concept of space are naturally linked via our movements and vision: When we move our bodies to cover longer distances (or when we observe other people's bodies do it), we also take more time; moreover, we leave the places we visited first behind, whereas we look ahead while approaching places we will reach soon. This explains why many cultures consider that the past resides in the back and the future in front (e.g., *I always leave my past **behind***; *We are **moving toward** a new digital era*) (although this ego-moving conception of time seems to be impaired in blind people; see Rinaldi et al., 2018), or that upcoming events move toward us until they reach us and move past us, becoming, at that point, past events (e.g., *A new experiment is **coming up***) (Wierzbicka, 1973; Bender et al., 2005, 2010, 2012; Bender and Beller, 2014; Rothe-Wulf et al., 2015; Sinha and Bernárdez, 2015; Moore, 2017; Bylund et al., 2020; Callizo-Romero et al., 2020; Feist and Duffy, 2020; Almirabi, 2021). An exception to this "FUTURE IS IN FRONT OF EGO" and "PAST IS IN BACK OF EGO" rule is Aymara language (an Amerindian language spoken in the Andean highlands of western Bolivia, southeastern Peru and northern Chile), whose speakers show linguistic and gestural signs of considering that FUTURE IS BEHIND EGO and PAST IS IN FRONT OF EGO, following the rationale that people can "see" the past, but not yet the future (Núñez and Sweetser, 2006).

Among the many kinetic and perceptual experiences that act as embodied sources of the time-space mapping, our experiences with reading and writing deserve special attention. For instance, Bergen and Lau (2012) demonstrated that English speakers (who write from left to right), mainland China Mandarin speakers (who write from left to right and then top to bottom), and Taiwanese Mandarin speakers (who write from top to bottom and then from right to left) responded differently when they were asked to order sets of cards depicting different stages of development of plants and animals (e.g., tadpole, froglet, frog) in chronological order. English speakers always represented time as moving from left to right. Mainland China Mandarin speakers also had a tendency to use the left to right direction, but there was also a small portion of participants who decided to lay the cards out from top to bottom. In the case of Taiwanese Mandarin speakers, they were just as likely to represent time as moving from left to right as from top to bottom, with a proportion of participants depicting it as moving from right to left. This pattern of results may also be related to the fact that the Chinese temporal words for *last* (e.g., in *last month*) and next (e.g., in *next week*) are, respectively, the words *shàng* (literally meaning *up*) and *xià* (literally meaning *down*) (Scott, 1989; Chen, 2014, 2021; Su, 2019). Other studies have also shown that Mandarin speakers display a vertical top-to-bottom pattern for time, congruent with Chinese vertical spatiotemporal metaphors (Boroditsky, 2001, 2018; Boroditsky et al., 2010). Accordingly, Mandarin-English bilingual speakers are more likely to arrange time vertically the more proficient in Mandarin they are; they are also more likely to do so when tested in Mandarin than when tested

in English (Fuhrman et al., 2011). Similarly, Tversky et al. (1991) revealed that the directionality of people's graphic productions depends on the language they speak: Arabic speakers (who write from right to left) tend to represent temporal concepts from right to left, whereas English speakers tend to do it from left to right. Relatedly, Fuhrman and Boroditsky (2010) revealed that English speakers arranged temporal sequences to progress from left to right, whereas Hebrew speakers (who write from right to left) arranged them from right to left. A similar study (Zhang et al., 2022) revealed that English speakers prefer arrangements that place past-themed photos to the left, whereas that was not the case for Farsi speakers (who write from right to left). Moreover, Fuhrman and Boroditsky (2010) also showed that English speakers had faster reaction times when the key they had to press to indicate that an event happened earlier than another event was located on the left, compared to when the key was located on the right; on the contrary, Hebrew speakers displayed the reverse patterns. Spanish speakers (who write from left to right) also respond more quickly when the past-related words are presented on the left, compared to when they are presented on the right (Santiago et al., 2007). Recall of temporal information is also more accurate when it is presented from left to right than from right to left for English speakers (Fischer-Baum and Benjamin, 2014). Even a study using auditory tasks (Ouellet et al., 2010) has revealed that Hebrew speakers show signs of having temporal representations that differ from Spanish speakers' even when the stimuli presented does not use the visual modality; in fact, Spanish speakers respond faster to auditorily presented past words with the left hand and to auditorily-presented future words with the right hand, whereas Hebrew speakers show the opposite pattern. Even more interestingly, it has been shown that products' design and arrangement seem to follow these language-specific patterns of time-space mappings (Pitt and Casasanto, 2022): For instance, in the United States, shampoos tend to be found on the left and conditioners on the right on supermarket shelves, whereas in Israel the opposite arrangement is found.

Despite the abundance of studies addressing different aspects of this time-space mapping, it is striking to note how scarce the literature studying this relationship among Arabic speakers is, despite Arabic being one of the five most spoken languages in the world. In fact, besides the articles mentioned above, very few other studies (mostly theses, dissertations or preprints of qualitative nature) have addressed this matter (Eweida, 2007; Hamdi, 2008; Berrada, 2009; Filipović and Jaszczolt, 2012; Maalej, 2020). What is even more surprising is that there has not yet been a study that investigates how bilingual Arabic speakers (e.g., Arabic-English bilingual speakers) conceptualize this mapping. One of the few previous studies testing bilingual participants is by Miles et al. (2011). These authors revealed that Mandarin-English speakers seem to have both a vertical and a horizontal time-space mapping, consistent with the writing direction in Mandarin and English, respectively. However, in this study, the researchers did not manipulate the language in which participants were tested (i.e., Mandarin or English): All participants were tested in English.

Our study intends to fill this gap by investigating whether bilingual speakers map time onto space differently depending on the language that is activated the most during the experiment. More specifically, we want to compare how Arabic-English bilingual speakers (who use two writing systems with opposing directions) react when asked to map time to space using instructions presented purely in Arabic or purely in English. For this purpose, we asked Arabic-English bilinguals to read a story that was presented either in Arabic or in English, and subsequently arrange a series of cards depicting different scenes of the story in chronological order. This study addresses the larger theoretical goal of whether language activation plays a role on how bilingual speakers map time onto space based on the two writing directions they use.

Methods

Participants

A total of 94 Arabic-English bilingual participants were recruited from introductory psychology classes at the American University of Sharjah in exchange for partial course credit. All students in the psychology participant pool had been sent a pre-screening survey that gathered demographic information, and in order to take part of this study, participants had to have rated themselves as "very good" or "excellent" on a 5-point Likert scale that included "1-poor," "2-fair," "3-good," "4-very good," and "5-excellent" in all eight of the following areas: speaking, oral comprehension, reading and writing in both English and Arabic. 19 participants were removed from all analyses for not following the instructions, leaving 75 participants who were included in the analyses. A total of 39 of these 75 participants were tested in Arabic, and 36 were tested in English.

Materials

The participants were presented a story either in English (included in **Supplementary Appendix A**) or in Arabic (included in **Supplementary Appendix B**). After reading the story out loud, they were asked to arrange nine laminated cards that depicted the different scenes of the story (Quino, 2022; images adapted from https://www.usuariosdelosmedios.es/quino-ser-como-todos/).

Procedure

Depending on the condition that participants were assigned to, they were fully tested either in English or Arabic. This means that, from the moment participants arrived at the laboratory, they were addressed by fully proficient and balanced English-Arabic bilingual research assistants who greeted them, gave them instructions and debriefed them using exclusively either English or Arabic.

Participants were tested individually. They were instructed to sit at a table and read out loud the story that they were presented. After being given the opportunity to clarify any questions they had regarding the story, they were given a shuffled stack containing nine laminated cards depicting the different scenes of the story that they had just read. Participants were then asked to arrange those nine cards in chronological order. Participants were given the freedom to use all the space on the table they were seated at (which had a width of 95 cm and a length of 55 cm) as they pleased.

Each participant's final card configuration was coded by two independent research assistants who were trained to use the codes

presented in Figure 1. In case of inconsistencies between the two coders, either the principal investigator or a senior research assistant intervened to determine the final and most appropriate codes for those cases.

Results

Figure 1 displays the coding system used for the initial coding. Out of the 39 participants who were tested in Arabic, seven (17.95%) used a purely left to right arrangement (code 1 in Figure 1). Four (10.26%) used a purely right to left arrangement (code 2). Seven (17.95%) used a purely top to bottom arrangement (code 3). A total of 13 (33.33%) used a combination of left to right and top to bottom (code 5). Four (10.26%) used a combination of right to left and top to bottom (code 6). Two (5.13%) used a combination of top to bottom and left to right (code 9). One (2.56%) used a combination of top to bottom and right to left (code 10). One (2.56%) used an L-shaped arrangement that started as purely top to bottom and then switched to purely left to right (code 21).

Out of the 36 participants who were tested in English, eight (22.22%) used a purely left to right arrangement (code 1). Eight (22.22%) used a purely top to bottom arrangement (code 3). A total of 13 (33.33%) used a combination of left to right and top to bottom (code 5). Six (16.67%) used a combination of top to bottom and left to right (code 9). One (2.56%) used an L-shaped arrangement that started as purely top to bottom and then switched to purely left to right (code 21).

The arrangements that were purely vertical were not taken into account in our analysis because they were unrelated to the writing directions in English and Arabic. Thus, the seven participants tested in Arabic and the eight participants tested in English who used the purely top to bottom arrangement (code 3) were not included in our analysis because this arrangement is not relevant for our specific research question (in other words, top-to-bottom arrangements are not reflective of either Arabic or English writing directions). That left us with 32 participants tested in Arabic and 28 participants tested in English who used arrangements that included a horizontal (left to right or right to left) component. These remaining 60 participants' final arrangements that had a horizontal component were re-coded into two categories: including a left to right component or including a right to left component. That is, participants' arrangements that were assigned codes 1, 5, 9, and 21 were re-coded into the category "includes left to right component," and participants' arrangements that were assigned codes 2, 6, and 10 were re-coded into the category "includes right to left component."

Out of these 32 participants tested in Arabic that were included in our analysis, 23 (71.88%) used arrangements that included a left to right component, whereas nine (28.13%) used arrangements that included a right to left component. On the other hand, all of the 28 participants tested in English that were included in our analysis used arrangements that included a left to right component.

The Fisher's exact test, conducted using the function *tabi* in Stata 18, indicated that participants tested in Arabic were significantly more likely to use arrangements that included a right to left component, compared to participants tested in English ($p = 0.001$).

Discussion

The results show that when Arabic-English bilingual speakers are in "Arabic mode," they are more likely to use chronological arrangements that include the right-to-left directionality (in agreement with the Arabic writing direction), compared to when they are in "English mode." Arrangements that included the right-to-left directionality were only used by participants tested in Arabic, and never by participants tested in English. This suggests that when Arabic-English bilingual speakers have the Arabic language more activated than the English language (due to, for instance, having an interlocutor who talks to them solely in Arabic, or having recently been exposed to text in Arabic), they are more likely to conceptualize time as moving from right to left (following the Arabic writing direction), compared to when they have the English language more activated.

Three main conclusions can be drawn from these results. First, this study contributes to the scarce body of literature that suggests that the embodiment of time does not depend only on innate basic sensorimotor abilities, such as vision and walking (as in the case of the time-space mapping that equates the past to the back and the future to the front, derived from our visual and motor experiences of moving in space and leaving locations visited in the past behind), but also on more complex and uniquely human sensorimotor abilities, such as writing, which, in human evolution, is a relatively recent skill that has been around for only around 5,000 years.

Second, this study is the first that has demonstrated that the embodiment of the time-space mapping among bilingual speakers is not fixed but is rather context-dependent: Language activation influences how bilingual speakers map time onto space, and how they reflect this mapping through hand movements, such as the ones used to arrange images depicting different scenes of a story in chronological order. In fact, to our knowledge, this is the first study that has tested how time is mapped onto space in bilingual speakers by manipulating language activation. These results expand on Hendricks and Boroditsky's (2017), who revealed that it is possible to teach new time-space metaphors (e.g., vertical linguistic metaphors, such as *Breakfast is above dinner* or *Breakfast is below dinner*) to English speakers, who subsequently displayed new non-linguistic space-time mappings through implicit association tasks.

Third, the finding that even though the participants tested in Arabic were significantly more likely to equate the past to the right and the future to the left compared to the participants tested in English, the majority of the participants tested in Arabic still used arrangements that included the left-to-right directionality (in agreement with the English writing direction) suggests that the linguistic characteristics of the environment (such as daily exposure to a certain language) also influences the application of time-space metaphors. In particular, the tendency to use left-to-right directionality might be related to the characteristics of our sample, which was composed of fully bilingual Arabic-English speakers who had been highly exposed to the American culture (e.g., American series, music) and the American style of education since childhood. In fact, given that this study was conducted at the American University of Sharjah, whose language of instruction is English, it is logical to expect weaker effects of Arabic language activation during the experiment. This aspect of the results suggests that it

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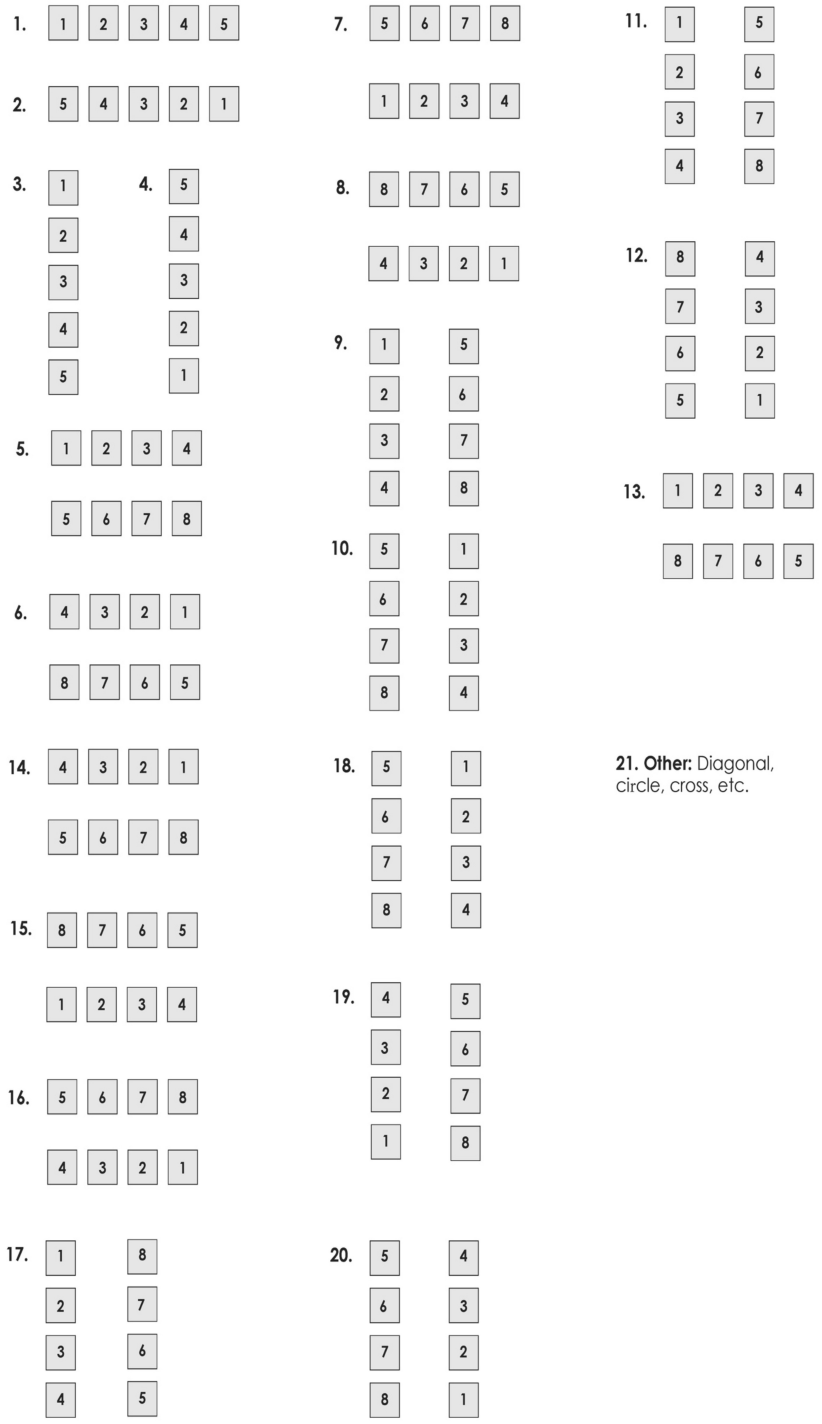

FIGURE 1
Codes used to classify the way participants arranged the cards.

would be fruitful for future studies to replicate this experiment using a sample of equally fluent Arabic-English bilingual speakers who live in a more Arabic-dominant place to examine the role of linguistic environment more in detail. Finally, we must also take into account that not all written Arabic follows the right-to-left direction: In fact, Arabic numbers are written from left to right. Therefore, the way Arabic-English bilinguals represent the progression of mathematical operations in space in both Arabic and English may have also influenced the way in which they think time moves (for more information about the representation of mathematical concepts in bilingual speakers see Farsani, 2016).

In conclusion, we found that writing direction and language activation influence the use of conceptual metaphors. In particular, we demonstrated that the language in which bilingual Arabic-English speakers were tested influenced how they mapped time onto space when recalling the order of events in a story. Our results

are consistent with theories that suggest that the embodied source of the TIME IS SPACE metaphor resides in kinetic experiences. Importantly, all our participants lived and worked in the same environment and, thus, the observed differences can be attributed to the language that was activated specifically during testing. However, even so, we also observed an overall bias toward using a spatial arrangement that was consistent with the language that was most often used in the university environment (English). In conclusion, the application of conceptual metaphors appears to be a product of both immediate linguistic context (i.e., the language used during the testing session) and general linguistic context (i.e., the language that is the most dominant in the environment participants live in).

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the IRB, American University of Sharjah. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

JP: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Supervision, Visualization, Writing – original draft, Writing – review & editing. CG: Data curation, Formal Analysis, Supervision, Writing – original draft, Writing – review & editing. TS: Data curation, Formal Analysis, Supervision, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1356039/full#supplementary-material

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Is metaphor a natural kind?

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In Metaphor Studies, metaphor is considered as a "form of understanding one thing in terms of something else." It is assumed that, despite their differences, metaphors share many properties and that a theory of metaphor should capture these essential properties. In short, it is assumed that metaphor is a natural kind. We call this view the Natural Kind Assumption. In this paper, we will challenge it and show that metaphor is not a natural kind. Finally, we will discuss the main philosophical consequences of this view.

KEYWORDS

metaphor, metaphor studies, natural kind, cognitive linguistics, pragmatics, figurative language

1 Introduction

Over the last five decades, the number of theories, hypotheses, evidence and data on metaphor has grown considerably. The extensive work on metaphor makes Booth's prediction true (1979, 49), for which "by the year 2039, there will be more students on metaphor on Earth than people".

The interest in metaphors has led to the development of a fruitful field of research at the interface of philosophy, linguistics and cognitive science, known as Metaphor Studies. Research in this field differ considerably in their approaches and definitions. Despite these differences, however, there is a general tendency to accept that the use of metaphor is a "form of understanding one thing in terms of something else" (1). From this perspective, metaphors are assumed to represent a homogeneous class of phenomena and therefore share a large number of properties. The aim of a theory of metaphor is to grasp these common properties.

This view of metaphor, which runs like a common thread through all metaphor theories of the last fifty years, essentially assumes that metaphors constitute a natural kind. In other words, metaphors represent a category of entities for which numerous inductive generalizations can be developed. Despite the differences between metaphors, it is essential to find generalizations about the members of this category. Using Boyd's terminology (1990), we will define this perspective on metaphor as the Natural Kind Assumption (henceforth NKA). In contrast to the prevailing acceptance of the NKA, this paper attempts to challenge it. Contrary to the assumptions of Metaphor Studies, we argue that metaphors do not constitute a homogeneous category for which numerous inductive generalizations can be made. In essence, we assume that metaphor is not a natural kind. We will explore the main implications of this hypothesis for a theory of language, especially in reference to metaphor research.

Specifically, first we will examine what a natural kind is. By showing the variety of theories and data concerning metaphor, we will argue that metaphor cannot be a natural kind. Consequently, the term "metaphor" is not a natural kind term. It denotes different phenomena that are too heterogeneous to be considered as a single natural kind. Instead, "metaphor" is a complex, theory-dependent philosophical notion. Finally, we will discuss the main consequences of this hypothesis for Metaphor Studies.

2 What is a natural kind?

A Natural Kind identifies classes that reflect the structure of the natural world, exist independently of our conceptualization and around which relevant inductive generalizations can be developed (Machery, 2005). In particular, the literature on natural kinds assumes that there are two kinds of classes (see Bird, 2022): those for which inductive generalizations can be formulated (e.g., the class of gold, which seems to exist without our conscious categorization), and those for which few or no generalizations can be made (e.g., objects weighing more than 50 kg). There seems to be little scientific interest in anything that weighs more than 50 kg, other than the fact that we perceive it as heavier than 50 kg. While the elements that belong to the class of gold share a common and non-accidental physical property, the elements that belong to things that weigh more than 50 kg share a property in a completely accidental way, and therefore there is nothing that allows us to identify properties within the class of "things that weigh more than 50 kg" that distinguish them from other classes. In Boyd's (1990, 1991) words: "A class of C entities is a Natural Kind if and only if there is a large set of scientifically relevant properties such that C is the maximal class whose members tend to share these properties because of some causal mechanisms."

A natural kind is thus a category for which numerous generalizations can be developed. Its members are expected to systematically possess a considerable number of relevant properties that are not accidental. It is important to emphasize that these properties are not accidental, as there is at least one causal mechanism that explains why the members of this category tend to exhibit these properties. It is also important to note that this category should not be a subset of a larger class for which the same generalizations could be formulated.

Therefore, the following conditions must be met for a class to be considered a Natural Kind:

- There is an essential and not accidental set of properties common to these phenomena.
- The presence of these properties is an essential prerequisite for defining an element as belonging to this class.
- There must be specific properties that distinguish the elements of this class from other phenomena.

However, in reality, there is another kind of class, namely one that deals with abstract entities that exist on a different ontological level than the physical world. Think, for example, of scientific constructs and theoretical objects, entities whose empirical verification in the world is quite problematic. Often, however, this third class of objects is studied like the first class, i.e., as empirically verifiable entities in the world that share essential physical properties in a non-accidental way. In short, this third class is treated as if the elements of which it is composed were natural kinds. But can this third class of objects be said to constitute a natural kind? Some confusion seems to arise between the ontological levels of reality, where theoretical constructs are equated with chemical and empirical elements. However, in the history of philosophy, especially since the second half of the Twentieth Century, various authors have raised the question of whether it is possible to treat our theoretical constructs as natural kinds. This was the case with Davidson (1985), who argued that language is not a natural kind. More recently, Machery (2005) has raised the problem of concepts: can we say that concepts, which cognitive science holds to be the primary elements of our minds, are natural kinds? Machery's answer is no, concepts are not natural kinds, and the term *concept* "is inappropriate to carve human beings' mental representations at their joints, if one aims at formulating empirically relevant inductive generalizations about human minds" (Machery, 2005, 2). Similarly, Lohr (2023) and Taylor (2020) also pose this question for the notions of "concreteness" and "emotions". While Lohr argues that concreteness and concrete concepts are not natural kinds, Taylor argues that "it is indeterminate whether concepts and emotions are natural kinds. They are neither determinately natural kinds, nor determinately non-natural kinds" (Taylor, 2020, 2073). Leezenberg (2007) and shortly thereafter Sperber and Wilson (2008) note that metaphors have also been treated as natural kinds for centuries, especially since Lakoff and Johnson's Conceptual Metaphor Theory (1980), and argue that this treatment is inappropriate. In this regard, the authors write:

> There is no mechanism specific to metaphors, no interesting generalization that applies only to them. In other terms, linguistic metaphors are not a natural kind, and 'metaphor' is not a theoretically important notion in the study of verbal communication" (Sperber and Wilson, 2008, 97).

In the case of Sperber and Wilson (2008), there is even a form of deflationism and eliminativism of the term "metaphor". According to the authors, an utterance can be considered literal or metaphorical depending on the context: if the utterance "the water is boiling" is uttered in relation to a pot of boiling water, it is interpreted literally; if it is uttered in front of very hot but not boiling water, we have a hyperbolic interpretation; if, on the other hand, the utterance is made in the midst of a tense political situation, it receives a metaphorical interpretation. In all these cases, the same processes of contextual modulation of meaning are at work. For this reason, Sperber and Wilson argue in a radical way that metaphor is not a natural kind and that the term "metaphor" is not an interesting theoretical notion for the study of human language.

In the next section we will discuss whether metaphor fulfills the requirements to be considered a natural kind, and therefore whether the question "what is a metaphor?" should be treated as a question about entities that constitute a natural kind (e.g., "what is the amygdala?"), or whether such a question should otherwise be considered a philosophical question and the notion of metaphor should be treated as a multifaceted theoretical construct.

3 Is metaphor a natural kind?

We can call the perspective that claims that metaphors constitute a natural kind the Natural Kind Assumption (NKA). This assumption holds that metaphor is a unified and homogeneous empirical phenomenon and that, despite superficial differences, there are several not accidental and shared properties between the member of this category. A theory of metaphor should aim to capture these properties. This assumption, which is widely accepted in metaphor research, is based on three premises:

(1) Metaphor, despite their differences, share not accidental common features. "Metaphor" represents a class of homogeneous phenomena with common properties.
(2) The presence of these properties is the essential precondition for defining an element as metaphorical.
(3) Metaphors have specific properties that distinguish them from other types of phenomena.

Despite the widespread support for the NKA, we will now challenge this perspective. We will emphasize that metaphors are not a unitary kind for which generalizations can be made.

3.1 The NKA leads to the antinomies of metaphor

There is some confusion to be observed in the context of Metaphor Studies, and it seems to be related to the NKA. In particular, it is possible to identify three key issues around which Metaphor Studies revolve and to discuss contrasting theories and empirical evidence on this interesting and complex phenomenon:

(1) Is metaphor a matter of style or of thought?
(2) What is and how is the meaning of a metaphor constructed?
(3) What is the relationship between literal and metaphorical meaning?

It is important to clarify that it is not possible to expect precise and unambiguous answers to these questions. No theory and no field of research seems to be able to grasp the metaphorical phenomenon comprehensively and accurately. Each theory and each answer to these questions emphasizes certain aspects of the metaphorical phenomenon while neglecting other equally important aspects. Similarly, each theory and question seem to have valid reasons supporting both the claim and its opposite, leading to what can be termed "antinomies" in metaphor research – contradictory hypotheses, all supported by data, to which a precise answer is difficult, if not impossible. Given the compelling arguments in favor of both the thesis and antithesis of each antinomy, it is a great challenge to take a definitive stand on each antinomy.

Regarding the first antinomy – is metaphor a matter of style or of thought? – against a tradition that views metaphor as a figure of style (see Johnson, 1981) authors such as Tesauro (1670), Vico (1744/1977), Nietzsche (1873), Richards (1936/95), Blumenberg (1960/2010), Black (1962), Ricoeur (1975), Kittay (1987) and, finally, Lakoff and Johnson (1980) argue that metaphor plays an essential and peculiar role in our cognition. It is a mechanism, rather than an utterance, which enables us to "see the similar in the dissimilar" and thereby create new knowledge. According to Lakoff and Johnson, metaphor represents the way in which our conceptual system is constructed through mappings between concrete and abstract concepts.

The second antinomy reveals a contradiction with regard to what is meant by the term "metaphorical meaning" and how it is constructed. According to some hypotheses, metaphorical meaning is an independent, secondary meaning that is constructed by inferential processes in relation to propositions (Grice, 1975; Searle, 1979; Sperber and Wilson, 2008). We will refer to this group of hypotheses as Proposition Theories of metaphor (hereafter PTM). According to other authors, however, metaphor has no meaning of its own, but it means what words mean in their literal sense (Davidson, 1978; Lepore and Stone, 2015) since the peculiarities of metaphors lie on its perlocutionary effects, that are non-propositional effects. As Rorty (1987) likes to say, metaphor is an "unfamiliar noise" like the song of an unfamiliar bird. We refer to this hypothesis as the Image Theories of metaphor (hereafter ITM).

Finally, the third antinomy can be seen as an internal debate within PTM about the importance of literal meaning in shaping metaphorical meaning. One perspective holds that literal meaning actually contributes to the formation of metaphorical meaning (Grice, 1975; Searle, 1979; Weiland et al., 2013; Carapezza, 2019), while another viewpoint rejects the activation or involvement of literal meaning in this process. These proponents argue that metaphorical meaning is constructed either directly or in real time (Bezuidenhot, 2001; Recanati, 2004) or as an *ad hoc* concept (Carston, 2002; Sperber and Wilson, 2008).

As long as metaphor is treated and investigated as a natural kind, these three overarching questions around which Metaphor Studies revolve will remain unresolved antinomies, both theoretically and empirically. However, if we acknowledge the heterogeneity of the metaphorical phenomenon and abandon the Natural Kind Assumption (along with the claim to develop a comprehensive theory of metaphor that explains all its manifestations), we can ask whether they are in fact conflicting theories and conflicting data. Instead, we can consider whether the different answers to the three questions refer to different types of metaphor, and whether the different theories of metaphor are in fact incommensurable because they deal with phenomena of different nature.

Recently, some theoretical approaches, which we can call "hybrid", have recognized the versatility of the metaphorical phenomenon noting precisely that the different theories of metaphor are not only opposed and contradictory, but also refer to different types of metaphor, to different phenomena that fall under the umbrella of metaphor.

Giora (2003), for example, through the concept of "salience" distinguishes three types of metaphor, each corresponding to different modes of processing. Giora defines salient meaning as "the meaning that first comes to mind" and distinguishes between: (1) Idioms and catachresis in which the salient meaning coincides with the figurative meaning and is processed before the literal meaning. For example, in the idiom "legs of the table" the figurative meaning is the one that comes to mind first, and an inferential effort is needed to derive the literal meaning from it, which refers

to human legs. (2) In conventional metaphors, such as "Ludwig is a lion", both the literal meaning (Ludwig is literally a lion) and the metaphorical meaning (Ludwig is very brave) are equally salient and are activated in parallel. (3) In novel metaphors, the most salient meaning corresponds to the literal meaning, which is activated first and, according to Grice (1975) and Searle (1979), is rejected and implicitly reinterpreted. Thus, according to Giora metaphor comprehension is based on the degree of salience of a lexical item. This degree determines whether sequential or parallel processes occur, so that different linguistic expressions arranged on a salience scale entail different processes.

This is also true for Steen (2008, 2023), who distinguishes between deliberate metaphors and non-deliberate metaphors – that is, linguistic expressions that are produced with the intention of creating a metaphor and require special attention (Cuccio, 2018), and linguistic expressions that only have a metaphorical past but are no longer processed as such (Lakoff and Johnson, 1980). Similarly, Green (2017) and Carston (2018), following Davies (1982), note that the contrast between Proposition Theories of metaphor and Image Theories of metaphor is not simply a matter of opinion, but each theory addresses different types of metaphor. In this context, Green distinguishes between Image Demanding Metaphors and Image Permitting Metaphors – metaphors where the activation of imagery is possible but not necessary (such as conventional metaphors, e.g., "Ludwig is a lion") and metaphors where the activation of imagery is necessary (such as novel metaphors, e.g., "The snow is a winter closet"). According to Green, the former can be well described by Proposition Theories of metaphor, while the latter can be better described by Image Theories of metaphor. In parallel, Carston (2010, 2018) distinguishes between local metaphors, such as "Ludwig is a lion", which require a simple contextual modulation of meaning (and thus require neither the activation of literal meaning nor mental imagery) and whose processing is well described by Proposition Theories of metaphor, and extended and poetic metaphors, better described by Image Theories of metaphor, such as the verses of *The Lovesong of Alfred Prufrock* by T.S. Elliot, which we present here:

> The yellow fog that rubs its back upon the window-panes,
> The yellow smoke that rubs its muzzle on the window-panes,
> Licked its tongue into the corners of the evening,
> Lingered upon the pools that stand in drains,
> Let fall upon its back the soot that falls from chimneys,
> Slipped by the terrace, made a sudden leap,
> And seeing that it was a soft October night,
> Curled once about the house and fell asleep.

With this type of metaphor, it is necessary to retain the literal meaning, subject it to slow and reflective inferences, and then derive the metaphorical meaning. In this process, a mental image can emerge that emphasizes the content of metaphors and makes it easier to remember, even if it remains an epiphenomenon of the deeper pragmatic and propositional processes.

In addition, another dual theory of metaphor is proposed by Canal et al. (2022), which distinguishes between physical and mental metaphors: while physical metaphors require inferences about physical attributes of the metaphor topic (e.g., "ballerinas are butterflies"), mental metaphors require inferences about psychological attributes of the metaphor topic. These two types of metaphors appear to require different processing modes based on a different role played by the Theory of Mind.

Although these approaches emphasize the heterogeneity of the metaphorical phenomenon and propose broader hypotheses about metaphor, they nevertheless do not escape our antinomies. For although they recognize the versatility of the metaphorical phenomenon, they are based on a conception of metaphor that rests on the syntactic-semantic structures of the utterance. Moreover, also in these approaches, metaphor is seen as something that is "naturally" present in language, a linguistic expression considered metaphorical regardless of its function, occurrence, context and user. These scholars are looking for an internal feature of language, whereas the focus should be on how the language is used. They are looking for internal, structural features that make a linguistic expression a metaphor, whereas it is probably the contexts of use that make a linguistic expression a metaphor and determine what we do with that metaphor – whether a linguistic expression is a metaphor with a metaphorical meaning or whether it is an unfamiliar noise, whether it requires the lingering of the literal meaning or it is processed directly as an *ad hoc* concept, whether it is a figure of speech or plays a more significant role in our cognition.

So, these hybrid approaches still do not resolve the antinomies. They do not resolve them because, while recognizing the multifaceted nature of the metaphorical phenomenon, they continue to regard metaphor as a natural kind – a notion corresponding to a bunch of phenomena that can be defined as "metaphorical" and share a common essence. Moreover, these approaches remain bound to certain theoretical assumptions and thus offer a limited and highly theory-bound view of metaphor, losing sight of fundamental aspects of the phenomenon.

3.2 The heterogenic view of metaphor

In the following discussion we will present evidence that metaphor is not a homogeneous phenomenon and consequently cannot be considered a natural kind.

As can be seen from the first antinomy – is metaphor a matter of style or thought? – the term "metaphor" means in different theories:

- A cognitive mechanism that enables us to "see the similarities in the dissimilar" and thus create new knowledge (Vico, 1744/1977; Nietzsche, 1873; Blumenberg, 1960/2010; Aristotle, 2004).
- A conceptual structure that organizes our cognitive system by structuring abstract concepts through concrete concepts (Lakoff and Johnson, 1980; Gallese and Lakoff, 2005; Lakoff, 2009).
- A linguistic mechanism that merges terms belonging to different semantic domains (Richards, 1936/95; Black, 1962; Ricoeur, 1975; Kittay, 1987; Camp, 2003) or the realization of such a mechanism in the form of an utterance (Sperber and Wilson, 2008; Carston, 2010, 2018).

It is evident that these three meanings of "metaphor" have no common characteristics and do not refer to a unified category of phenomena. Instead, they denote three different levels of description that refer to three different types of phenomena that are to some extent related but not comparable. If we leave aside

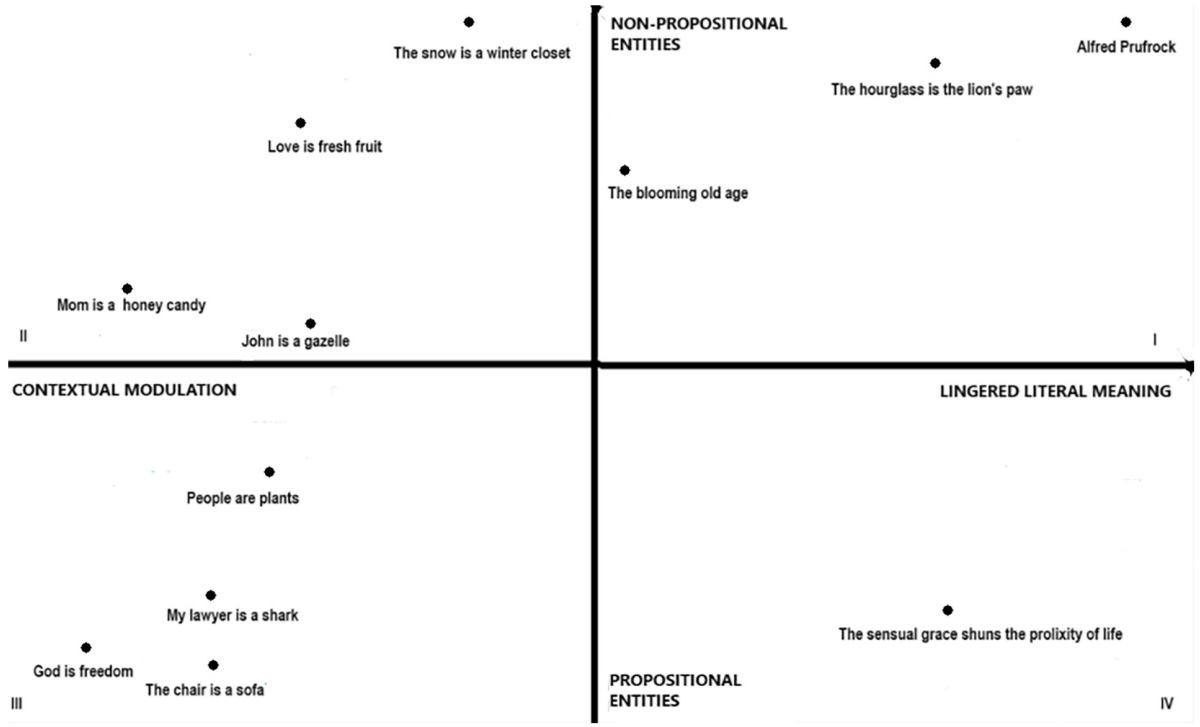

FIGURE 1
Orthogonal chart with different kind of "metaphors".

the first two meanings of the term "metaphor" and focus only on the third meaning, which refers to metaphor as a type of utterance, we also find that generalizations applicable to all forms and uses of metaphor are not possible.

If we examine the two parameters mentioned in the previous paragraph devoted to the second and third antinomies — namely, the reliance on literal meaning and the use of non-propositional entities in the interpretation of a metaphor — it becomes possible to recognize different metaphorical expressions that can be arranged in an orthogonal diagram. On the horizontal axis we position the spectrum of contextual modulation and persistence of literal meaning, while on the vertical axis we denote the involvement of a non-propositional dimension (**Figure 1**).

The x-axis varies according to the use of the literal meaning: on the left side we find metaphors that require contextual modulation of the meaning – that is, the derivation of an *ad hoc* concept – while on the right side we find metaphors that activate the literal meaning. The y-axis, on the other hand, varies depending on the activation of mental imagery or other related non-propositional entities (such as perceptual, emotional and sensorimotor mechanisms): at the top we find metaphors that activate mental imagery (or, in general non-propositional entities), while at the bottom we find metaphors that do not activate mental imagery (Garello and Carapezza, 2023). The position of the metaphor on these coordinates could vary as a function of the vividness of mental imagery and the strength of the non-propositional entities associated, which could depend on a number of factors: (1) the concreteness of the target and vehicle of a metaphor (Gleason, 2009): metaphors consisting of concrete targets and vehicles ("the snow is a winter closet") or of abstract targets and concrete vehicles ("love is fresh fruit") will presumably be located higher than metaphors consisting of abstract targets and vehicles ("God is freedom"). (2) The specificity of the target and vehicle of a metaphor (Bolognesi and Caselli, 2022): metaphors consisting of general targets and vehicles (people are plants) will presumably be located lower than metaphors consisting of specific targets and vehicles (mom is a honey candy). (3) The animacy of the target and vehicle of a metaphor (Cuccio et al., 2013): metaphors that consist of animate targets and vehicles (John is a gazelle) or inanimate targets and animate vehicles (the blooming old age) will presumably be located higher than metaphors that consist of inanimate targets and vehicles (the chair is a sofa). (4) The conventionality of the metaphor (Green, 2017): conventional metaphors (my lawyer is a shark) will be located lower than novel metaphors (love is fresh fruit). (5) The type of meaning we want to convey: if a concrete, animate, or specific meaning is intended, our metaphor will presumably be located higher than a metaphorical utterance with an abstract, inanimate, or general meaning. Thus, if "John is a lion" is uttered with the intention of conveying that "John is brave," conveying an abstract meaning [as defined by Canal et al. (2022)] will be located lower than the analogous use to convey that "John has a thick mane," which conveys a physical and concrete meaning (see Garello, 2024). If we stick to the conventional numbering of quadrants in a Cartesian diagram, we can find: (1) In the first quadrant extended metaphors (e.g., the fog described in "The Love Song of J. Alfred Prufrock") or highly poetic metaphors where literal meaning and a non-propositional dimension must be considered. (2) In the second quadrant are metaphors that require pragmatic modulation in the explicature of the utterance and for which the formation of mental imagery may be necessary (if the metaphor is novel and/or characterized by

a concrete, animate, or specific vehicle and/or conveys a concrete or animate or specific meaning) or otherwise unnecessary. (3) In the third quadrant are strongly conventional metaphors and catachresis which, being understood as phenomena of polysemy, require the derivation of an *ad hoc* concept and do not activate a non-propositional dimension. Or again, metaphors that have both an abstract or general or inanimate target and vehicle (e.g., "God is truth", "Justice is freedom"). (4) Finally, in the fourth quadrant are metaphors that require the lingering of the literal meaning but do not activate mental imagery, such as "the sensual grace shuns the prolixity of life".

3.3 Metaphor is not a natural kind

Based on the observation that the contradictory answers to our antinomies refer to different phenomena and thus highlighting the heterogeneity of the term "metaphor", we can now question the three premises on which the Natural Kind Assumption (NKA) is based and that we recall here:

(1) Metaphor, despite their differences, share non-accidental common features. "Metaphor" represents a class of homogeneous phenomena with common properties.
(2) The presence of these properties is the essential precondition for defining an element as metaphorical.
(3) Metaphors have specific properties that distinguish them from other types of phenomena.

Against these premises, we claim that:

(1a) Metaphors do not represent a class of homogeneous phenomena with common properties.
(2a) If present, the shared properties between different types of metaphors are not essential to define an element as metaphorical.
(3a) Metaphors do not have specific properties that distinguish them from other types of phenomena.

We begin by challenging the first two premises of the Natural Kind Assumption, against which we argue that: (1) metaphor, in light of the Heterogenic view, does not represent a class of homogeneous phenomena with common properties, as it is shown by the schematic representation made in the previous section. (2) If present, the shared properties between different types of metaphors are not essential to define an element as metaphorical. In other words, it seems that there are many different kinds of metaphorical utterances that have little in common in terms of their syntactic, semantic and pragmatic features, as well as the way they are processed and the functions they serve in a given context. Any similarities that exist between these types of metaphors are better explained by the Wittgensteinian notion of "family resemblance" than by a common mechanism.

> Instead of producing something common to all that we call language, I am saying that these phenomena have no one thing in common which makes us use the same word for all but that they are related to one another in many different ways. And it is because of this relationship, or these relationships, that we call them all language (Wittgenstein, 1953, § 65).

Let us consider the processes we define as "games": we have board games, chess, card games, ball games, sports competitions and so on. If we try to find a common element between these "games", we will not find it. We will see similarities and relationships but no element that is constantly present in all types of games.

> Consider for example the proceedings that we call "games". I mean board-games, card-games, ball-games, Olympic games and so on. What is common to them all? Don't say: "There must be something common, or they would not be called "games" but look and see whether there is anything common to all. For if you look at them you will not see something that is common to all but similarities, relationships and a whole series of them at that. To repeat: *don't think but look!* [. . .] Can see how similarities crop up and disappear. And the result of this examination is: *we see a complicated network of similarities overlapping and criss-crossing*: sometimes overall similarities, sometimes similarities of detail (Wittgenstein, 1953, § 66 – *italics ours*).

With the words "don't think, but look," Wittgenstein challenges us to adopt an approach to understanding language and reality that emphasizes the direct observation of phenomena over abstract conceptual analysis. We observe phenomena without becoming too entangled in conceptual considerations and, in our case, in metalinguistic categories. What is observed in games, as in the various kinds of "metaphors", are not unique elements, or "essences" but a "complicated network of overlapping and intersecting similarities" (Wittgenstein, 1953, § 66). We call something a "game" or, in our case a "metaphor", because it has a kinship with something that has been called that way before and thus acquires an indirect kinship with other things so named. This does not mean, however, that the game, or metaphor, is a homogeneous class of phenomena with similar and specific properties. Rather, what we call "metaphor" is neither *a priori* limited, nor *a priori* limitable. The similarities between different kinds of metaphors emerge and disappear as a function of contexts and are not the result of an underlying and common mechanism.

Finally, we come to the criticism of the third premise of the NK assumption. Against it we claim that metaphors don't have specific properties that distinguish them from other types of phenomena. The different types of metaphors that we have grouped and systematized in the model in the previous section do not seem to have common properties that are due to a causal mechanism (according to the definition provided by Boyd (1990, 1991). Therefore, we can now try to understand whether the different types of metaphors have features specific to each quadrant or whether such features can be found in other utterances and uses of language. It seems to us that even in this case, it is not possible to identify unique and specific features for each type of metaphor.

Specifically, in the first quadrant, where we found extended and imagistic metaphors (such as *The Love Song* by Alfred Prufrock), we could also find haikus or imagistic descriptions that also require the

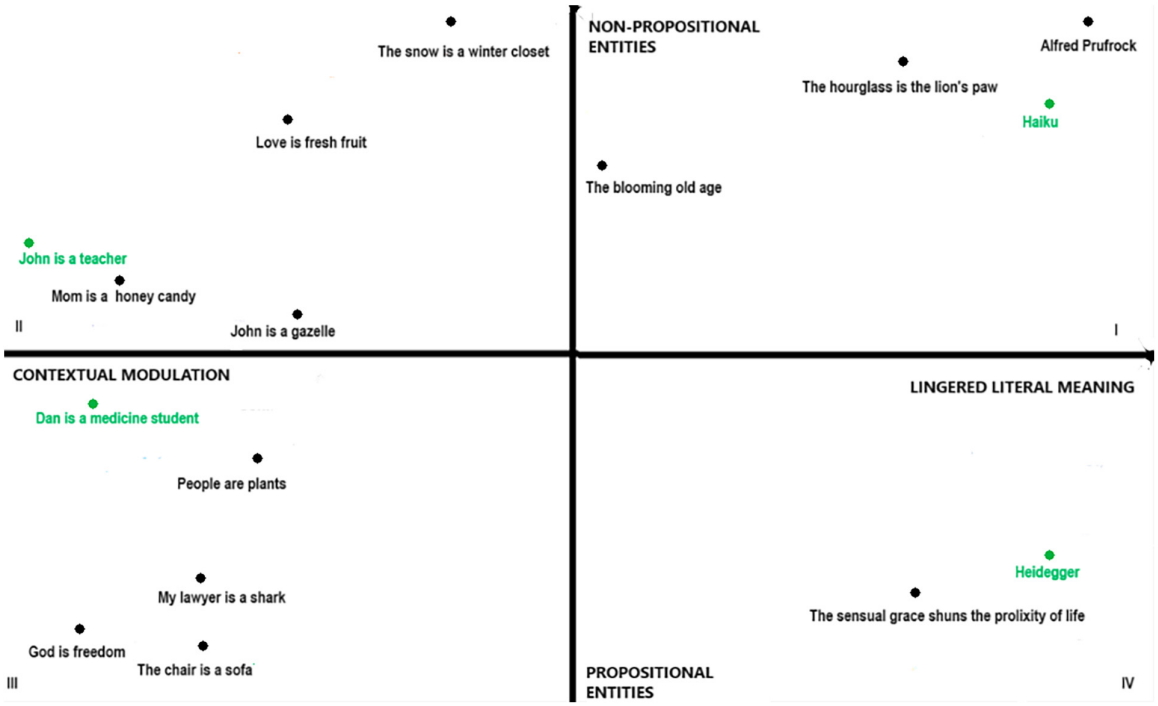

FIGURE 2
Orthogonal chart: different kinds of "metaphor" and other kinds of utterance in relation.

use of literal meaning and in which the imagistic dimension seems to be particularly vivid and conscious. We think, for example, of the short Japanese composition by Mizuta Masahide (1657- 1723): "Barn's burnt down/now I can see the moon." Or the composition by Yosa Buson (1716-1784): "Such a moon/the thief pauses to sing." In these haikus, the use of literal meaning is essential to the construction of haiku's meaning and indeed it is precisely on the basis of literal meaning that mental imagery is evoked and could plausibly play a central role in constructing the meaning of the composition. The conceptual density of haiku might be given precisely by a process of mutual adjustment between the explicit and literal level and the implicit level mediated by the imagery – as seems to happen in the extended metaphors we have placed in the first quadrant. Therefore, metaphors found in the first quadrant, i.e., extended metaphors characterized by an imagistic dimension in which metaphorical meaning is constructed through the use of literal meaning and the relationship between literal and metaphorical meaning is mediated through mental imagery, seem to share the same processes of meaning construction common to other linguistic uses, such as haiku and, in general, literal imagistic descriptions.

Similarly, the metaphors found in the second and third quadrants, i.e., "local" metaphors, where the metaphorical meaning is constructed directly in the explicature of the utterance by deriving an *ad hoc* concept and may or may not activate mental imagery depending on the characteristics of the vehicle and topic, seem to undergo the same processes of meaning construction found in other more or less novel linguistic uses: the processes of narrowing and broadening by which we construct *ad hoc* concepts are at work in much of our conversation every day and non-propositional entities play a more or less prominent role depending on the contextual and linguistic features of the conversational exchange.

The fourth quadrant, in which we find complex or extended metaphors with abstract targets and vehicles, can therefore be shared with other highly abstract but not strictly metaphorical uses of language, such as certain forms of philosophical abstraction, as in the works of Hegel, Fichte, or Heidegger. In Heidegger (2019, 90), for example, we find the utterance, "The metaphysical representation owes its view to the light of being. The light, or rather what such thought experiences as light, does not itself fall within the view of this thought because it represents being only ever by looking at beings" (*our translation*) (Figure 2).

At the procedural level, then, metaphors do not seem to have any special features reserved for them: the identification of the four types of metaphors and the four ways of constructing metaphorical meaning does not imply the recognition of a special status for metaphors and indeed each "way" is shared by a type of metaphor with other linguistic uses.

The three premises on which the Natural Kind Assumption rested thus seem to be crumbling: metaphors are not a unified and clearly definable phenomenon but rather a flexible, complex and multilayered theoretical construct. Thus, there is no a fixed, theory-independent class of objects in the world called "metaphor" and there is nothing consistent with the intuition that there is a common and specific set of properties that uniquely identify a class of objects in terms of metaphor. In this way our antinomies dissolve: it is not possible to give an unambiguous answer to the questions from which the antinomies of metaphor arise, because there is no clearly and unambiguously definable class of objects in the world called "metaphor". Rather, what a metaphor is and how it works depends on our beliefs and theories about how

"language" works in general. Metaphor, therefore, turns out to be an unstable theoretical construct to which only provisional answers can be given. When we move from the level of the functioning of metaphor to the level of formalization in search of a definition of "metaphor", we find that it is only provisional and definable within the framework of a theory. Thus, a definition of metaphor seems to depend on the theory of language on which it is based. Namely, the definition of metaphor is inherently tied to the theoretical underpinnings of the language framework within which it is situated. Different theories offer different lenses through which metaphor can be understood. For this reason, there are not "false theories" of metaphor but only "partial theories of metaphor" and each one grasps an aspect of it. In a nutshell, metaphor is not a natural kind.

4 Eliminativism or preservation? The future of metaphor studies

Therefore, metaphor seems not to be a natural kind but a complex and multifaceted theory-dependent philosophical notion. Consequently, the term "metaphor" seems not to be a natural kind term. Scholars who talk about "metaphor" often refer to very different phenomena that might even turn out to be incommensurable. The sense of metaphor referred to by Black, Nietzche, Lakoff and Johnson seems to be very different to the sense of metaphor found in Davidson and Rorty or in Grice and Sperber and Wilson.

The term "metaphor" and the phenomena to which it refers differ so much within the various theories of metaphor that it is not possible simply to compare or evaluate these various uses by appealing to supposedly theory-neutral observations. On this basis, we can ask what theoretical implications arise for studies of metaphor. We believe that this recognition can lead to two opposing attitudes. On the one hand, an attitude in which, since metaphor is not a natural kind and the meanings of the term are often incomparable, the study of metaphor should be abandoned. Metaphor is thus seen as a superfluous theoretical category and, to follow Occam's principle, we may choose not to include it in the Olympus of topics that can be studied. The opposite stance, to which we fully subscribe, recognizes that metaphor is not a natural kind and it acknowledges the challenges of Metaphor Studies, but this does not lead us to deny the relevance of metaphor in language studies.

This way seems to lead neither to antinomies nor to the abandonment of millennia-old studies on metaphor. It is a matter of recognizing minimal, general operations, not just those peculiar to metaphor, which serve as a hinge for all meanings of the term, without resorting to an assumed "essence" of metaphor: the different meanings of the term "metaphor" would be linked by "family resemblances" that are not unique to metaphor but are also common to other linguistic-cognitive processes. Therefore, while it is not possible to identify unifying features and processes between different types of metaphor, it is possible to recognize that they are the result of generic mechanisms of linguistic-cognitive creativity that create new knowledge and represent things differently by connecting distant elements – such as the processes of "bisociation of ideas" (Koestler, 1964) or "condensation" (Freud, 1899) or the more general processes of semantic shift, in which two objects or ideas that were not previously associated are connected and concentrated in a single representation with a variable degree of intensity during the history of a word (Bowdle and Gentner, 2005). These minimal and generic mechanisms do not constitute the essence of metaphor for two reasons:

(I) They are not particular to metaphor, but are common to other human creative processes, such as scientific discovery, theorizing, art production, and dreaming.
(II) Because of their universality, these mechanisms do not identify a homogeneous group of linguistic and non-linguistic entities but manifest themselves differently in different products of human activity (utterances, scientific theories, works of art, etc.).

It is therefore not possible to find unifying elements among metaphors that identify stable structural features, apart from the very general operations related to human creativity that are also common to other linguistic-cognitive processes. However, it is possible to recognize "family resemblances", where an expression is defined as a "metaphor" because it has a direct kinship with something that was previously called a "metaphor", thus extending our concept of "metaphor" and continuously overlapping with other meanings of the term.

This view seems to be close to the Aristotelian view of metaphor in the *Rhetoric*: Aristotle, in fact, used the term *metaphorà* to refer not only to metaphors in the narrow sense in which they are understood today, but to a process that produces "brilliant expressions" of various kind and, more generally, to figurative language as a whole, which is the result of the speaker's ability to "bring things before the eyes" of the listener through the use of such linguistic expressions.

With this solution, although we deny that metaphor is a natural kind and that there is therefore a unique and homogeneous phenomenon defined as "metaphor", we recognize the existence of different types of metaphor that are not reducible to each other and are the result of general processes of human creativity that allow us to productively connect different domains. However, these mechanisms are not specific to metaphors. Among the different types of metaphor, it is therefore not possible to identify unique and universal characteristics, but "family resemblances" or "symptoms" that make an utterance metaphorical or not on the basis of several factors. Just as with all other uses of language.

Moreover, rather than abandoning this complex field of research, we believe that the recognition that metaphor is not a natural kind but a complex philosophical notion theory-dependent can actually enrich and clarify this field of research. In fact, from this observation comes two needs: first of all, it poses the problem of finding empirical approaches to the study of a notion that is not a natural kind but may have interesting empirical applications and implications. Secondly, it highlights the need to make the different theories of metaphor comparable to each other. Embracing the complexity of metaphor enriches our understanding of language and paves the way for a more nuanced and comprehensive exploration of this intricate facet of human form of life.

5 Conclusion

The productive vitality of metaphor research of the last 50 years has led to considerable confusion in this area of research. The term "metaphor" has become so layered over the centuries that it has come to denote an indefinite variety of notions and objects, many of which differ greatly from one another. The question "what is a metaphor?" therefore has become "what are we talking about when we talk about metaphors?". In trying to provide an album to help navigate the diverse and numerous theories on this topic of importance to philosophy of language, linguistics and cognitive science, we have identified three questions around which the discussion of metaphor revolves: 1) is metaphor a matter of style or of thought? 2) What is and how is the meaning of a metaphor constructed? 3) What is the relationship between literal and metaphorical meaning?

We have found that it is not possible to provide a clear and definitive answer to this questions that represent what we have called "the antinomies of metaphor." These antinomies are linked to a common assumption that run through Metaphor Studies, namely the assumption for which metaphor is a natural kind.

In contrast, this paper challenges this Natural Kind Assumption and argues that metaphors do not constitute a natural kind but rather a complex, theory-dependent philosophical notion. This departure from the traditional view prompts a reconsideration of the implications for a theory of language, particularly in the context of Metaphor Studies. In particular, the recognition that metaphor is not a natural kind does not lead to the rejection of Metaphor Studies, but rather underlines the need to reconsider theoretical and empirical approaches that address the poliedric and multi-layered nature of a philosophical notion that is as interesting as it is complex.

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SG: Conceptualization, Investigation, Writing – original draft. MC: Conceptualization, Investigation, Writing – review and editing, Funding acquisition, Project administration, Resources, Supervision.

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The concrete processing of Chinese action metaphors: an ERP study

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The present research adopts ERP (Event-Related Potentials) technology to investigate whether there exists a concreteness effect in the processing of Chinese action verbs within metaphorical context. The mean amplitudes of N400 activated by action metaphors were compared with those activated by literal verbs and abstract verbs. The findings indicated that the Met verbs evoked a significantly larger N400 response at frontal brain region compared to the Abs verbs at a time window 200–500 ms, while the Met verbs elicited a notably greater N400 amplitude specifically at the posterior brain region in comparison to the Lit verbs at 300–500 ms time window. These results may be interpreted as indicating that the comprehension of the Met verbs is based on the concrete action semantics.

KEYWORDS

Chinese action metaphor, concreteness effect, semantics, embodied cognition, N4005

Introduction

How semantic information is represented is one of the focuses of psycholinguistic research. Classical cognitive theories claim that concepts are represented amodally as abstract symbols, and there is no relationship between semantic system and sensory-motor system (Pylyshin, 1984; Shallice, 1988). Embodied cognition theory, contrasting with the traditional view, holds that semantic information is rooted in the sensorimotor experience of the body (Glenberg and Kaschak, 2002; Barsalou, 2008), language comprehension relies on the reactivation of relevant sensorimotor experiences (Zwaan and Madden, 2005). However, it is still unclear exactly how the semantic system and sensory-motor system interact. Weak embodiment theories propose that sensorimotor systems are only activated when ideas are directly connected to physical activity. Strong embodiment, on the other hand, gives sensorimotor cortex a sweeping role in language comprehension, even of more abstract concepts (Desai et al., 2011). Action-related language is currently a burgeoning area of research within the embodied semantic approach, aiming to investigate the intricate relationship between sensorimotor and semantic systems (Vukovic et al., 2015; Tian et al., 2020, 2023; Monaco et al., 2023). A series of electrophysiological studies have proved the embodiment of the processing of literal action language by showing the activation of the sensorimotor cortex during language comprehension (Tettamanti et al., 2005; Aziz-Zadeh et al., 2006; D'Ausilio et al., 2009; Raposo et al., 2009; Kolb et al., 2010; Moody and Gennari, 2010; Fargier et al., 2012; Moseley and Pulvermüller, 2014; Gianelli and Dalla Volta, 2015; Vukovic et al., 2015; Johari et al., 2022). For example, the processing of literal action sentence "I grasp a knife" elicits activation in a left fronto-parieto-temporal circuit within the premotor cortex, exhibiting somatotopic organization (Desai et al., 2011). Action verbs, however, have a variety of uses. It is not enough to explain the relationship between sensorimotor system and semantic system only by examining the embodiment of action verb

embedded in concrete context. In everyday discourse, concrete action verbs are also often metaphorically used to construct abstract concepts that are far from physical experience (Zheng et al., 2018). It is possible to represent abstract concepts through metaphorical mappings to concrete domains (Desai, 2022). For example, comprehending the linguistic expression "He grasped this idea" needs the retrieval of the conceptual mapping "understanding is grasping." An intriguing opportunity to examine the interaction between semantic system and sensory-motor system is provided by action metaphor since it permits the comparison between the action verbs used in literal context (e.g., grasp a flower) and the same action verbs used in metaphorical context (e.g., grasp an idea) (Desai et al., 2011, 2013).

Recently, a growing body of studies have investigated the question of the embodiment of action metaphor processing by comparing metaphoric action sentences with non-metaphoric ones, and yielded mixed findings (for an overview, see Khatin-Zadeh et al., 2023). Some of the studies have demonstrated the activation of the sensorimotor systems during action metaphor comprehensions (Desai et al., 2011, 2013; Boulenger et al., 2012; Lauro et al., 2013; Schuil et al., 2013; Fernandino et al., 2016; Martin, 2016; Johari et al., 2021). For instance, Desai et al. (2011) used fMRI to examine the processing mechanism of action metaphors. The experimental materials included literal action (e.g., The daughter grasped the flowers, Lit) sentences, metaphorical action (e.g., The public grasped the idea, Met) sentences, and abstract action (e.g., The public understood the idea, Abs) sentences. They found that the left anterior inferior partial lobule (associated with action planning) was activated by both Lit and Met sentences, and the left superior temporal areas (associated with abstract language comprehension) were activated by both Met and Abs sentences. These results were consistent with the view that the sensorimotor systems are involved in the representation of the metaphorical action sentences. Similar findings were also noticed in the study of Lauro and his colleagues. Using fMRI, Lauro et al. (2013) found motor involvement in the processing of literal and metaphorical sentences, while the idiomatic sentences only showed a trend toward significance. The results proved that the understanding of language may activate the motor areas, but to a different degree based on the concreteness of the contexts in which the action-related verbs appear. In another more recent study, the involvement of the motor system in the understanding of metaphorical action sentences was examined by Johari et al. (2021) using high-definition transcranial direct current stimulation (HD-tDCS). The findings demonstrated that the comprehension of metaphorical action sentences involved the left motor brain. However, inconsistent results were also found in the previous related studies. For instance, Aziz-Zadeh et al. (2006) discovered effector-specific activations in response to visually presented literal action sentences, while no such activations were observed for figurative phrases (e.g., "biting off more than you can chew"). Raposo et al. (2009) found that motor areas were significantly activated when action verbs were presented alone, and to a lesser degree, within literal sentence contexts, but the utilization of these same verbs in metaphorical sentences primarily resulted in activation in language processing regions rather than sensorimotor areas.

The above studies only investigated the static activation of the sensorimotor cortex in the processing of action metaphors from the perspective of neuroanatomy. Then when does the sensory-motor recruitment take place during action metaphor understanding? Understanding the time-course of processing can further clarify the embodied nature of action metaphors. If sensory-motor activation occurs early, it would be interpreted as that concrete bodily experiences play a significant role in understanding abstract meaning (Gallese and Lakoff, 2005), and thus supporting the strong embodiment account. If it is engaged later, then it can be viewed as epiphenomenal (Mahon and Caramazza, 2008), and thus supporting the weak embodiment account. ERPs are an excellent approach for researching sentence processing (Kazmerski et al., 2003). Moreover, ERPs are particularly well-suited for investigating the temporal evolution of processing conflicts between arguments within linguistic phenomena (Ji et al., 2020). The classic N400, a negative ERP component peaking around 400 ms after word onset, is often used to explain the concreteness N400 effect of concrete words (Kutas and Federmeier, 2011). To be more specific, the classic N400 is believed to be associated with the semantic processing of linguistics expression, and the N400 effect found in the processing of concrete words is ascribed to a greater activation of semantic information by concrete words compared to abstract words (West and Holcomb, 2000). However, Barber et al. (2013) observed concreteness N400 effect while maintaining a constant context availability between concrete and abstract words, and they argued that the processing of concrete words involves the engagement of multimodal (sensory-motor) aspects from a widely distributed cortical network, while the processing of abstract words elicits distinct and shallower features. Therefore, according to Barber et al. (2013), the underlying knowledge that is recruited rather than the quantity of semantic information activated accounts for the concreteness effect. Furthermore, in contrast to the classic N400 effect, which disperses over the posterior regions, the concreteness N400 effect demonstrates a frontal distribution (Adorni and Proverbio, 2012; Barber et al., 2013; Lai et al., 2019).

Instead of concrete nouns, there have been also studies examining the concreteness effect of verbs. Using ERPs, Dalla Volta et al. (2014) examined the processing time-course of abstract verbs and concrete action verbs. The experiment materials included verbs associated with actions performed by hands, feet, and mouth (e.g., to knit, to kick, to bite) as opposed to abstract controls (e.g., to infer). The study revealed that concrete action verbs exhibited higher mean amplitudes compared to abstract verbs in the frontal motor region of the brain right hemisphere during the 200–300 ms interval. Furthermore, a concreteness effect was observed in the parietal region of the left hemisphere within the 300–400 ms timeframe. The authors suggested that the concreteness N400 may be attributed to two underlying factors: a sensory-motor recruitment associated with frontal activity and a language-sensitive response linked to parietal activation. In another study, Bardolph and Coulson (2014) conducted a study to investigate the impact of the activated motor system (by asking the participants to move the marbles up and down) on the processing of verbs with varying degrees of spatial attributes both in their literal (e.g., ascend, descend) and metaphorical (e.g., inspire, defeat) senses. The study revealed that for literal verbs, in the time range of 200–300 ms, incongruent condition elicited a larger negativity effect compared to congruent condition. In contrast, for metaphorical verbs, the incongruency effect was observed only after 500 ms from word onset. These findings indicated that a neural response related to direct physical representation was observed between 200 and 300 ms after the presentation of words, whereas a neural response associated with figurative embodiment appeared more than 500 ms after word initiation. However, these investigations solely focused on verbs presented in isolation. In an ERP experiment, Lai et al. (2019) investigated the activation timing of the sensorimotor systems during

the processing of action verbs in literal (e.g., The man bent the rod) and metaphorical sentence contexts (e.g., The church bent the rules) based on the concreteness N400 effect. Frontally distributed N400 effects were obtained in the literal-abstract contrast (200–300 ms after verb onset) and the metaphor-abstract contrast (200–500 ms after verb onset), and posterior N400 effect was acquired in the metaphor-concrete contrast (200–400 ms after verb onset). They authors concluded that the literal sense of the verb in the metaphorical context is activated early and maintained throughout the 200–500 ms window.

The present study conducted an ERPs experiment to explore whether there exists a concreteness effect for Chinese action verbs in metaphorical context. Specifically, we employed three types of sentences: literal action sentences (e.g., The doctor broke the cup), abstract sentences (e.g., The company violated the rules) and metaphoric action sentences (e.g., The company broke the rules). One possibility is that the action metaphors are primarily comprehended as their concrete semantics, then the concreteness effect would be found in the processing of action metaphors. An alternative is that the action metaphors are comprehended partly through concrete semantics and partly through further cognitive processes, then the metaphor-abstract contrast and literal-abstract contrast should have different activation timings and topographies. A further alternative is that the action metaphors are comprehended abstractly, then the metaphor-abstract contrast should not exhibit any resemblance to the concreteness effect.

Methods

Participants

Participants in the ERPs experiment were 25 healthy Chinese native speakers (9 males and 16 females ranging in age from 19 to 23, mean age 20.98), with no history of linguistic or neurological impairment. Two additional participants were removed due to excessive ERP artifacts. They were all undergraduate students enrolled at Ocean University of China. All the participants were right-handed and had normal or corrected-to-normal vision. Prior to participating in the experiment, informed consent was obtained from each individual. Following the completion of the experiment, participants received financial compensation.

Materials

The experimental material consisted of 23 triples, including 69 sentences in three conditions of literal action (Lit), metaphorical action (Met), and abstract action (Abs). Twenty-seven Filler sentences were also used. All the experimental sentences took the same syntactic structures (Subject-Predicate-Object) and were constructed in triples consisting of one sentence from each condition (see examples in Table 1). As in the previous studies (Desai et al., 2011, 2013; Lai et al., 2019), each triple consisted of a Lit sentence using a hand–/arm-related action verb to describe a physical action, a Met sentence utilizing the same verb figuratively to convey abstract meaning, and an Abs sentence employing an abstract verb to express the same meaning as the Met sentence. Each sentence's agent was selected to suggest a literal or figurative/abstract reading of the verb. For Met and Abs sentences, the agent referred to an entity which could not make physical actions, and the agents of these two types of sentences in one triple were always the same. In contrast, for literal action sentences, the agent was a person. The Filler sentences featured different syntax from the experimental sentences. Table 1 shows the examples of experimental materials.

TABLE 1 Examples of experimental materials.

Lit	小偷推翻了桌子 (The thief *overturned* the table)	医生打破了杯子 (The doctor *broke* the cup)
Met	团队推翻了提案 (The team *overturned* the proposal)	公司打破了规则 (The company *broke* the rules)
Abs	团队反对了提案 (The team *rejected* the proposal)	公司违反了规则 (The company *violated* the rules)

To get these experimental sentences, we first selected 100 sentences from CCL corpus,[1] The Modern Chinese Dictionary (the Commercial Press, 5th edition) and other related studies (Desai et al., 2011, 2013; Ji et al., 2020). These 100 sentences were adapted by five PhD students majoring in linguistics to fit the experimental demands and then underwent a series of pretests to exclude the influence of other variables. All participants (3 groups, 25 participants in each) in the pretests were native speakers of Chinese and did not participate in the formal ERP experiment.

The first group of subjects were invited to rate the meaningfulness, familiarity and action association of the 100 sentences by using 7-point-likert-scales (1 = strongest, 7 = weakest). Sentences whose average scores of meaningfulness and familiarity were less than 3.5 were excluded, and there was no significant difference in meaningfulness and familiarity (ps > 0.05) among the three types of experimental materials. The third pretest was an action association rating. Although we have purposefully chose the materials, it was plausible that some of these abstract verbs still had some link with physical actions. This pretest was conducted to ensure that all abstract verbs in this experiment were less associated with body actions. The mean score (sd.) of Lit sentences was 6.26 (0.41), and the mean score of Abs sentences was 2.98 (0.80), $p < 0.001$.

The second and the third group of subjects were asked to do the "subject-predicate" and "predicate-object" cloze probability tests separately. In the "subject-predicate" cloze probability test, all sentences had their subjects replaced with blanks, and participants were asked to fill in the blank with the first word that came to mind to complete the sentence. Similarly, the "predicate-object" cloze probability was tested by the third group of participants. To avoid predictive inertia for experimental materials (Schaller et al., 2017), we selected only those sentences with an average cloze probability of "subject-predicate" and "predicate-object" less than 10% as experimental materials. Finally, 23 triples were created, producing 23 sentences in each of the Lit, Met and Abs conditions. In order to avoid the strategy effect, 27 Filler sentences (used to obscure the triple construction of the stimuli) with the different sentence structure and different verbs (including both action and abstract verbs) were created.

1 http://ccl.pku.edu.cn:8080/ccl_corpus/index.jsp

Twenty of them were nonsense sentences, and the others did make sense. All the sentences were divided into 3 blocks, and sentences in each block were arranged in pseudo-random order to avoid sequential effect. Each type of sentence was distributed as evenly as possible in every testing block.

Research design and procedure

The experimental materials were programmed with E-prime 2.0 software. The experimental materials were divided into three blocks using a Latin square design so that sentences from one triplet were presented in different blocks, each block consisted of 23 experimental sentences and 9 Filler sentences, and the sentences in the blocks were presented randomly. Before the experimental set, a practice set with 12 trials (including 4 Filler sentences) was ran first. Stimuli were presented on a 19-inch monitor with a white background and were displayed in black letters in Song typeface with 36 font size. In the practicing part, a fixation cross "+" was firstly displayed in the center of the screen for 250 ms to remind the subjects of the beginning of the experiment. The trials were then presented word-by-word, with each word being displayed for a duration of 600 ms, followed by a blank screen lasting 600 ms. After the presentation of several sentences, a randomly selected yes-no comprehension question was presented to each participant. Participants were instructed to respond with accuracy and speed by pressing the "F" and "J" keys on the keyboard. The sequence of the yes/no answer was balanced. After responding within 3,000 ms, the participants were presented with a blank screen for 2,000 ms before proceeding to the next trial. If the subject failed to respond within 3,000 ms, the question disappeared and they were also presented with a blank screen for 2,000 ms before moving on to the next trial. Please refer to Figure 1 for more detailed information about the experimental procedures.

In this study, participants were not obliged to provide explicit responses to the target verbs in order to avoid recording brain activity associated with motor response preparation and execution. At the end of the practice block, a prompt appeared to ask the participants if they have understood the whole process. Participants chose to go on or go back by pressing the key buttons. The procedure of the experimental set was the same as that of the practicing set. During the experiment, they could choose to take a rest during in-between blocks.

Electrophysiological recording and statistic analysis

Participants were seated in a comfortable and height-adjustable chair in the Language and Brain Science Lab of Ocean University of China. They were seated at a distance of 140 cm from the computer monitor, and the resolution of the computer screen was 1,024 × 768. The behavioral data were recorded by the psychological software E-Prime 3.0.

The scalp EEGs were recorded using a 32-channel Ag-AgCl electrode cap, with a sampling rate of 1,000 Hz and a band-pass filter ranging from 0.01 to 100 Hz. Offline referencing was performed for all electrodes to the mean of two mastoids. Vertical eye movements were monitored through a supra-to sub-orbital bipolar montage. An EEG amplifier was used to amplify the EEG data. The impedance of the electrodes was consistently maintained below 5kΩ throughout the whole experiment.

Curry 8 software was used to process the acquired ERP data in the off-line processing. The main steps included baseline correction, filtering, artificial reduction (threshold and bad block), epoch and averaging. When segments contained signals exceeding ±100 μV, they were rejected. After artificial reduction, only 23 out of 25 participants' data entered into SPSS 20.0 for further statistical analysis. The epochs ranged from 200 to 1,000 ms and were time-locked to the onset of words, and a baseline correction was applied from-200 to 0 ms prior to the target word onset. Offline calculations were then performed on the average waveforms. Figure 2 demonstrates the averaged ERP responses at electrodes for Lit verbs, Met verbs, and Abs verbs. The horizontal axis shows the time-course, and each tick represents 100 ms. The vertical axis shows the amplitude, and each tick represents 2.5 μV.

After the exaction of the EEG data, 23 participants' data entered into SPSS 20.0 for further statistical analysis. Statistical analyses were carried out in the time window of 200–500 ms, 200–300 ms, and 300–500 ms separately. For the N400 component, the averaged

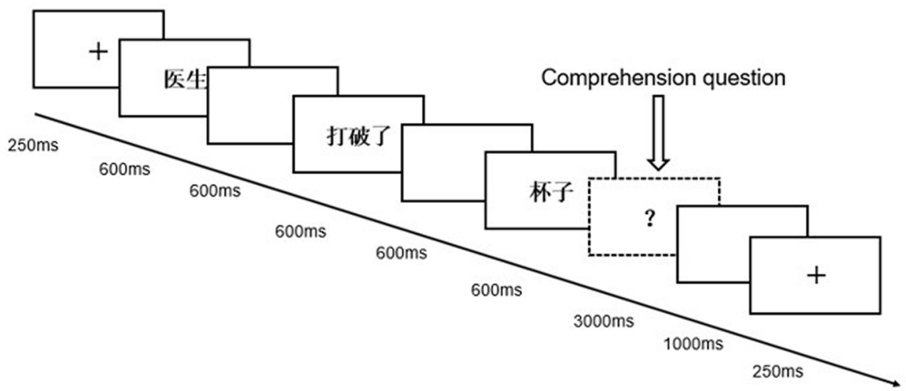

FIGURE 1
Experimental procedure.

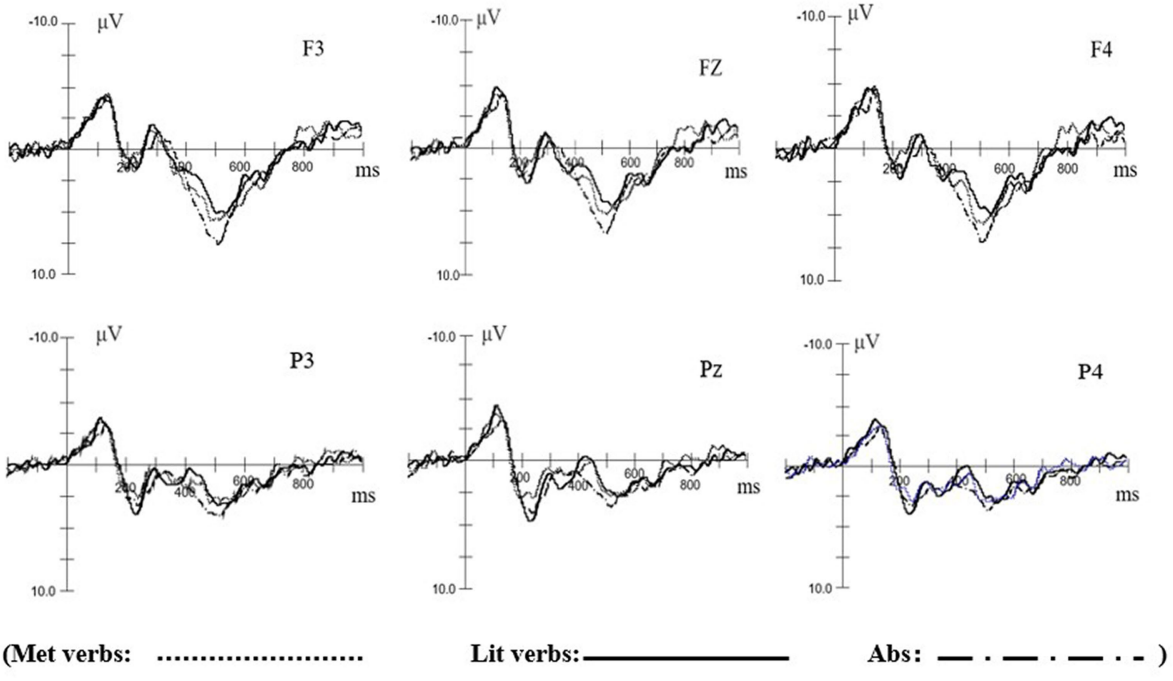

FIGURE 2
Averaged ERP responses for Lit, Met, and Abs verbs.

amplitudes of 200–500 ms were analyzed using repeated-Measures ANOVAs with the factors of condition (Lit, Met, Abs) and region of interest (frontal: F3/F4/Fz, posterior: P3/P4/Pz). Then, we separated the time window into two sections (200–300 ms and 300–500 ms) based on the visual inspection of the grand averaged data in order to better capture the temporal dynamics of the brain activity and determine whether the Chinese configuration and stroke would influence the concreteness N400 effect, as the time differences may reflect differential underlying neural mechanisms (Lai et al., 2019). The premise of this approach is the assumption of sphericity, which means that all variances and all correlations of the pairs of repeated measurements must be equal. If this assumption fails, Greenhouse–Geisser sphericity correction would be conducted. The present study only reported the corrected *p* values, and the degrees of freedom are original ones.

Results

Behavioral results

Behavioral data in this experiment only included accuracy to assess whether the subjects concentrate on the experimental materials or not during the whole process. SPSS 20.0 was used to calculate the accuracy of the subjects, and the results showed that the mean accuracy rate of all participants was 87.5%, the lowest was 75%, and the highest was 98.78%. The results of behavioral data indicated that the participants demonstrated attentiveness toward the experimental sentences throughout the whole experiment.

ERP results

According to the previous research on metaphor processing (Lai et al., 2009; Bambini et al., 2016; Lai et al., 2019) and visual inspection of the averaged ERP responses, we selected the 200–500 ms time window for the analysis of the N400 effect elicited by predicate verb. We then analyzed the time window of 200–300 ms and 300–500 ms separately to further clarify the underlying neural mechanisms.

N400 (200–500 ms)

Mean amplitudes for the three conditions from 200 to 500 ms were extracted and analyzed using Repeated-Measures ANOVA of 3 condition (Lit, Met, Abs) × 2 region of interest (frontal, posterior). The results revealed significant main effect of condition for both frontal (F (1, 22) = 3.847, p = 0.029) and posterior (F (1, 22) = 4.882, p = 0.023) regions. Further analysis indicated that at the frontal region, Lit verbs elicited a significantly more negative mean amplitude over Abs verbs (F (1, 22) = 3.432, p = 0.033), Met verb evoked a significantly more negative mean amplitude over Abs verb (F (1, 22) = 2.849, p = 0.043), and at the posterior region, Met verbs elicited a significantly more negative mean amplitude over Lit verbs at the posterior location (F (1, 22) = 3.378, p = 0.037).

200–300 ms

Mean amplitudes for the three conditions from 200 to 300 ms were extracted and analyzed using Repeated-Measures ANOVA of 3 condition (Lit, Met, Abs) × 2 region of interest (frontal, posterior). The results showed a significant main effect of condition at the frontal region (F (1, 22) = 3.052, p = 0.041), and further analyses showed that

Lit verbs elicited a significantly more negative mean amplitude over Abs verbs (F (1, 22) = 3.130, p = 0.041), and Met verb evoked a significantly more negative mean amplitude over Abs verb (F (1, 22) = 2.929, p = 0.045).

300–500 ms

Mean amplitudes for the three conditions from 300 to 500 ms were extracted and analyzed using Repeated-Measures ANOVA of 3 condition (Lit, Met, Abs) × 2 region of interest (frontal, posterior). The results showed a significant main effect of condition at the frontal brain region (F (1, 22) = 3.634, p = 0.032), and further analyses showed that the mean amplitude elicited by Lit verbs was more negative than Abs verbs (F (1, 22) = 3.584, p = 0.030), and the mean amplitude elicited by Met verbs was more negative than Abs verbs (F (1, 22) = 3.846, p = 0.029). A significant main effect of condition at the posterior region was also found in this time window, and further analysis indicated that Met verbs elicited more negative mean amplitude than Lit verbs (F (1, 22) = 4.021, p = 0.013).

Discussion

To explore the processing mechanism of the metaphorical use of action verbs for Chinese native speakers, the present study examined the event-related brain response to visually presented Met verbs. To be more specific, this study compares the mean amplitudes activated by the Met verbs with those activated by the Lit verbs and the Abs verbs. Given the lack of clear establishment regarding ERP correlates of sensory-motor recruitment, we employed the concreteness N400 effect to approximate the data. The concreteness N400 effect has been widely investigated and proved to be the indicator for the comprehension of concrete semantic (Zhang et al., 2006; Adorni and Proverbio, 2012; Barber et al., 2013; Lai et al., 2019; Chen et al., 2022; Xia and Peng, 2022). Therefore, it is feasible to estimate the processing mechanism of Met verbs through the utilization of concreteness N400 (Lai et al., 2009). The findings revealed that the Met verbs evoked a significantly larger N400 response at frontal brain region compared to the Abs verbs at 200–500 ms time window, while the Met verbs elicited a notably greater N400 amplitude specifically at the posterior brain region in comparison to the Lit verbs at 300–500 ms time window.

According to ERP data, the ERP components of N400 is the main indexes to explore the mental representation of the metaphorical meaning of Chinese action verbs. The present study found a concreteness N400 effect when comparing Lit verb with Abs verb, which is largely consistent with the previous studies (Hauk et al., 2006; Zhang et al., 2006; Kim and Lai, 2012; Barber et al., 2013; Vukovic et al., 2015; Lai et al., 2019). However, its activation time is slightly different from some of the previous studies. In terms of timing, the concreteness N400 effect begins at 200 ms after the onset of the Lit verb in the present study, which is earlier than the findings of Zhang et al. (2006), Kanske and Kotz (2007), Adorni and Proverbio (2012), and Barber et al. (2013). The reason may be that the focuses of the present study and other studies are different. The materials in the present study were embedded in sentence contexts whereas others focused on single words. This reason has also been mentioned in Lai et al. (2019) which also found a concreteness N400 effect at the 200–500 ms time window, and its materials were also sentences. According to Lai et al. (2019), even if it was only a few words preceding the target verbs, sentential context may have induced the pre-activation of the verbs meaning to some extent, thereby leading to an earlier time-window. By examining the influence of processing action verbs in the corresponding body movements, Boulenger et al. (2006) found that the interference effects could be observed within 200 ms after verb onset. The results were interpreted by the authors as reflecting the early involvement of the cortical motor regions in the processing of action verbs.

In terms of scalp distribution, the present study found that Lit verbs elicited a significantly more negative mean amplitude at the frontal location, which is consistent with the results of Bardolph and Coulson (2014), Dalla Volta et al. (2014), and Lai et al. (2019). There studies linked the negative ERP component in the time window of 200–300 ms at the frontal region to embodiment. For instance, Bardolph and Coulson (2014) examined the embodiment of processing words associated with spatial attributes (e.g., ascend, descend) and found a frontally distributed negative ERP component from 200 to 300 ms after word onset. Dalla Volta et al. (2014) found a concreteness N400 effect at the frontal brain region when comparing concrete action verbs with abstract verbs, and they performed source estimation for this concreteness effect and detected a cortical cluster in the sensorimotor region near the rolandic fissure. Furthermore, it was observed that the activation of hand-related verbs originates from the precentral gyrus. Lai et al. (2019) explored the processing mechanism of action verbs in literal and metaphorical situation. They found a significant concreteness N400 effect (comparing Lit verb and Abs verb) in the frontal brain region and ascribed it to the activation of the sensorimotor system. The findings of the present study are substantially consistent with the results of these research.

We also found a N400 effect (200–500 ms after word onset) at the frontal brain region when comparing Met verb with Abs verb, which is the main focus of the present study. The primary inquiry of this study pertained to the existence of a concreteness effect during the cognitive processing of action verbs within metaphorical contexts. This N400 effect seems to indicate that the literal meaning was accessed early (starting at 200 ms post verb onset) during the comprehension of Met verb and that the sensorimotor system was activated in this process according to the above discussion. However, the results do not mean that we support the "literal-first" view of metaphor processing, as the frontal N400 effect elicited by Met verbs was similar to that caused by Lit verbs (from 200 to 500 ms post verb onset). If this early N400 effect is attributable to the access of the literal meaning of Met verbs which is suppressed as soon as the metaphor is identified (Reilly et al., 2019), it should dissipate within 300 ms after verb onset (Lai et al., 2019). Therefore, the present study thus provides empirical evidence supporting the assertion that the metaphorical usage of a verb preserves its fundamental semantic component (Torreano et al., 2005; Cacciari et al., 2011). Another reason that is worth noticing is the special physical features of Chinese characters. In the present study, most of the action verbs are with the radical "扌" (e.g., 拍/pat, 摸/touch, 抓/grasp) which is a variant of a Chinese character "手" ("hand" in English). Therefore, the radical "扌" is closely related with hand actions, which might provide semantic clues to subjects and then cause the activation of the sensorimotor systems before the semantic access of the action verbs (starting 200 ms after verb onset). In other words, there may be an automatic activation of the sensory-motor systems when participants see characters with "扌" as their radicals, thus causing similar motor activation during the

processing of action verbs both in metaphorical and literal sentences. Future studies could explore whether action verbs with the radical "扌" and those without the radical cause different N400 effects. In brief, these results are mostly in line with previous findings about the representation of the metaphorical meaning of action verbs. The activation of frontal area in the early processing stage of the metaphorical meaning of action verbs indicates that there may be engagement of sensory-motor system during Met verbs comprehension.

For Met and Lit verbs, there are no significant difference between them at the frontal brain area in the time window of 200–500 ms, but Met verb elicited a significantly more negative mean amplitude over Lit at the posterior location in the 300–500 ms time window, which is mostly compatible with the N400 effect (i.e., the classic N400 effect) documented in previous ERP studies. These results seem to indicate that the processing of Met verbs and Lit verbs elicited similar activation of the frontal area. But at posterior electrode sites, the Met verbs elicited a larger N400 than Lit verbs, which is more likely consistent with the classic N400. The classic N400 effects are typically interpreted as reflecting the relative difficulty of lexical/semantic integration processes, whereby a word's fit with the context is inversely related to the magnitude of the N400 amplitude (Kutas and Federmeier, 2011). In the present study, the predicates of Met sentences and Lit sentences are all concrete action verbs literally, but for Met sentences, abstract meanings are expressed by the analogy to concrete concepts. The process of aligning the metaphorical interpretation of the verb with sentence context takes place in this processing stage (Bowdle and Gentner, 2005; Tzuyin Lai and Curran, 2013). Therefore, processing Met verbs may take more brain energy than the processing of Lit verbs in homing in the sentence contexts.

Conclusion

In the present study, we examined the concreteness N400 effect in response to Chinese Met verb comprehension within the framework of embodied language theory. We found that Lit verb and Met verb elicited similar concreteness N400 effect at the frontal brain region when compared with Abs verb. However, these findings do not directly demonstrate the activation of the sensorimotor cortex during the processing of Met verb. We merely indicate that Met verbs are comprehended similarly to Lit verbs in terms of the frontally distributed concreteness, which may be interpreted as that the comprehension of the Met verbs is based on the concrete action semantics. One limitation of the present experiment is that the scope of this study is limited to Chinese action metaphor sentences with a subject-predicate-object structure, and does not encompass the analysis of Chinese action metaphors at other linguistic levels, such as phrases and texts. Therefore, the findings presented in this study are exploratory in nature and require further validation. Future studies could explore the impact of various contextual factors like sentence structure, surrounding words, or even discourse coherence on Met verb comprehension.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Ethics statement

The studies involving humans were approved by Ethics Review Committee of the School of Foreign Languages, OUC. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

YZ: Formal analysis, Methodology, Software, Supervision, Writing – original draft, Writing – review & editing. SC: Supervision, Writing – original draft, Writing – review & editing. YP: Formal analysis, Validation, Writing – original draft, Writing – review & editing. XY: Resources, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Conventionality matters in Chinese metaphor but not simile comprehension: evidence from event-related potentials

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Metaphor and simile, two prevalent forms of figurative language widely employed in daily communication, serve as significant research subjects in linguistics. The Career of Metaphor Theory in cognitive linguistics posits that as conventionality increases, the cognitive mechanisms of metaphor comprehension shift from "comparison" to "categorization." In line with this notion, prior electrophysiological investigations have revealed that novel metaphors elicit a stronger N400 brain response compared to conventional metaphors. However, the observed N400 difference between conventional and novel metaphors may merely stem from the familiarity contrast between them, as conventional metaphors are typically more familiar than novel ones. To address this dichotomy, the present study not only compared the N400 responses between conventional and novel metaphors but also between conventional and novel similes. While conventional and novel similes differ in familiarity, similar to conventional and novel metaphors, both are processed via "comparison" mechanisms. The results revealed that novel metaphors elicited larger N400 amplitudes compared to conventional metaphors, aligning with previous findings. In contrast, no significant N400 differences were observed between conventional and novel similes, suggesting that familiarity disparity is unlikely to account for N400 distinctions. Our findings imply that conventional and novel metaphors undergo distinct cognitive processing mechanisms ("comparison" versus "categorization"), thereby providing further empirical validation for the Career of Metaphor Theory.

KEYWORDS

metaphor, simile, figurative language, cognitive processing, ERP, N400

1 Introduction

Metaphor and simile are two of the most common types of figurative utterances. In the field of philology, metaphor and simile are considered as rhetorical devices. In cognitive linguistics, metaphor serves as a crucial cognitive tool in human thinking, which are understood via a cross-domain conceptual mapping between objects according to Lakoff and Johnson (1980). Gentner (1983) then proposed the structural-mapping theory which suggested that the mapping from source to target domain involves the relations between objects rather than the characteristics of objects. According to this theory, metaphors are understood by establishing correspondences between partially isomorphic conceptual

structures of the source and target domain. The Career of Metaphor Theory (Bowdle and Gentner, 2005) further suggested that comprehending conventional and novel metaphors involve distinct cognitive processing. The understanding of novel metaphors involves comparisons, in which the source concept aligns with the target concept structurally. With using a novel metaphor repeatedly (e.g., "My job is a jail"), the conventionality will increase, then abstract metaphoric category (i.e., "the unpleasant and compulsory thing" represented by "jail") can be created as a secondary sense of the source term (i.e., "jail"). In this case, during metaphor comprehension, the target concept (i.e., "my job") can be aligned with the abstract metaphoric category (i.e., "the unpleasant and compulsory thing") represented by the source term vertically. Notably, conventionality refers to the degree to which a particular metaphorical expression has become established or widely recognized within a language or culture. Conventionality is distinct from familiarity, as conventionalization encompasses not only the increasing familiarity of the expression but also the process by which a source concept acquires a metaphorical category associated with it (e.g., "jail" mentioned above referring to "the unpleasant and compulsory thing"). In short, the Career of Metaphor Theory suggested that, as conventionality increases, the understanding of metaphor will undergo a shift from comparison to categorization.

The advancement of human neuroimaging techniques, such as electroencephalogram (EEG) and functional magnetic resonance imaging (fMRI), has enabled noninvasive exploration of how the human brain processes language. This has led to the rapid growth of a new field called neurolinguistics. Similar to metaphor being a critical research focus in cognitive linguistics (Keysar et al., 2000; Gibbs et al., 2004; Garello et al., 2024), the investigation of how the human brain processes metaphor is also a significant question in neurolinguistics (Tartter et al., 2002; Iakimova et al., 2005; Desai et al., 2013; Lauro et al., 2013). Notably, Arzouan et al. (2007a) conducted an event-related potential (ERP) study to investigate brain responses to conventional metaphoric expressions (e.g., "transparent intention") and novel metaphoric expressions (e.g., "conscience storm"). They observed that the N400 elicited by novel metaphoric expressions was enhanced compared to that elicited by conventional metaphoric expressions. The N400 amplitude difference between novel metaphor and conventional metaphor is consistently observed (Arzouan et al., 2007b; Lai et al., 2009; Goldstein et al., 2012; Tang et al., 2017a,b; Huang et al., 2022), with few exceptions (Pynte et al., 1996; Lai and Curran, 2013). Consistent observations were reported in fMRI studies, which suggested that conventionality can modulate metaphor comprehension (Cardillo et al., 2012; Horvat et al., 2022).

Arzouan et al. (2007a) suggested that the larger N400 amplitude elicited by novel metaphor expressions can be attributed to the increased difficulty of processing, as conventional metaphors are familiar while novel metaphors are unfamiliar. Tang et al. (2017a) found enhanced N400 elicited by scientific metaphors compared to conventional ones. They also proposed that the greater N400 amplitudes for scientific metaphors indicate enhanced difficulty in meaning comprehension due to their unfamiliarity. However, Lai et al. (2009) interpreted the difficulty difference between understanding novel and conventional metaphors as a result of different processing mechanisms (i.e., "comparison" in novel metaphors versus "categorization" in conventional metaphors) rather than a difference in familiarity (i.e., new utterances versus repeated utterances). Specifically, they suggested that enhanced N400 is elicited by novel metaphors because novel ways of thinking require the comparison of concepts and the creation of conceptual mappings on the spot. This view aligns with the Career of Metaphor Theory, which suggests that conventional metaphor and novel metaphor are processed by different cognitive mechanisms, i.e., "comparison" and "categorization."

Based on the aforementioned assertions, the Career of Metaphor Theory would find support if the difference in N400 responses between novel and conventional metaphors indeed reflects distinct processing mechanisms rather than mere differences in familiarity. One strategy to explore this matter is by investigating the N400 difference between novel and conventional similes. Metaphors and similes are often discussed in conjunction, as the two types of figurative utterances share a similar typical structure: "a topic word + the linking word + a vehicle." In typical terms, a metaphor is expressed using the copula and adheres to the structure "An X is a Y" (e.g., "The mind is a computer"). In contrast, a simile employs a comparative word such as "like" and follows the structure "An X is like a Y" (e.g., "The mind is like a computer"). It is widely accepted that understanding a simile involves a comparison mechanism because similes, like literal comparative sentences (e.g., "The daughter is like her mom"), contain explicit remarks, regardless of their level of conventionality (Bredin, 1998; Chiappe and Kennedy, 1999; Glucksberg and Haught, 2006; Lai and Curran, 2013; Gargani, 2016). Therefore, if there is no N400 difference between conventional and novel similes, it might suggest that the N400 difference between conventional and novel metaphors stems from differences in processing mechanisms rather than familiarity. Conversely, if there is an enhanced N400 response elicited by novel similes compared to conventional similes, it may indicate that the N400 difference between conventional and novel metaphors reflects differences in familiarity. The present study aims to bridge this research gap by recording ERPs in response to Chinese metaphors and similes.

In this study, the metaphor and simile expressions in Chinese were carefully selected to maintain an exact match in syntactic structure and sentence length between them. All sentences adhere to either the "X 是Y" ("是" means "is") or "X 像Y" ("像" means "is like") format, effectively eliminating potential confounding variables such as complex syntactic processing. Consequently, the only differing factor between metaphors and similes used in this study lies in the predicate verbs: "是" (means "is") for metaphors and "像" (means "is like") for similes. Therefore, Chinese metaphors and similes serve as ideal materials to investigate whether the N400 difference between novel metaphors and conventional metaphors is due to differences in their familiarity or differences in processing mechanisms, thereby contributing to the evaluation of the Career of Metaphor Theory from a neurophysiological perspective, offering insights into the underlying neurocognitive mechanisms involved in processing metaphor and simile.

2 Materials and methods

2.1 Participants

Twenty-three students from Sichuan University, who were native Mandarin Chinese speakers, participated in the study. The participant group comprised 11 men and 12 women, with an average age of

22.3 years (SD = 2.16, range: 19–27) and an average year of education of 15.9 years (SD = 1.70, range: 13–18). All participants had either normal or corrected-to-normal vision. They were free from any neurological disorders or significant head injuries and right-handed according to the Edinburgh Inventory (Oldfield, 1971). Before the experiment, participants willingly gave their consent by signing consent forms, and after the experiment, compensation was provided. The study received approval from the Biomedical Research Ethics Committee of Sichuan University. The data of five additional subjects were not included due to excessive amounts of artifacts observed during EEG recording.

2.2 Stimuli

The sentence stimuli used in this study were categorized into four conditions (refer to Table 1): a conventional metaphor condition (e.g., 历史是长河 - History is a long river), a novel metaphor condition (e.g., 工作是合唱 – Work is a chorus), a conventional simile condition (e.g., 历史像长河 – History is like a long river), and a novel simile condition (e.g., 工作像合唱 – Work is like a chorus). Conventional figurative sentences (conventional metaphors or conventional similes) were characterized by a higher level of familiarity, interpretability, and cloze probability of the vehicle word due to the repeated use. Novel figurative sentences (novel metaphors or novel similes) were newly constructed and characterized by a lower level of familiarity, interpretability, and cloze probability of the vehicle word. Each sentence stimulus comprised three words: a topic word, a linking word ("是" or "像," means "is" or "is like"), and a vehicle. The topic words consisted of 2–3 Chinese characters, and all vehicles consisted of 2 Chinese characters. There were 50 sentences in each condition. The 50 conventional metaphors and 50 conventional similes shared the same topic and vehicle words, with "是" ("is") used for metaphor sentences and "像" ("is like") for simile sentences. This correspondence also held true for the 50 novel metaphors and 50 novel similes. Additionally, there were 250 literal sentences (e.g., 长江是长河 - The Yangtze River is a long river) and 250 anomalous sentences (e.g., 律师是长河 - The lawyer is a long river) used as filler sentences.

The 50 sentences for each condition were chosen from four larger pools, each containing 150 sentences. The authors constructed these four pools of sentences with reference to a dataset by Wang (2022). Prior to the experiment, the cloze probability of the vehicle words in the 150 sentences of each pool was assessed. Forty native Chinese speakers (mean age = 21.8 years, SD = 1.29; mean year of education = 15.8 years, SD = 1.22), college students at Sichuan University, participated in this pre-test. Sentences lacking sentence-final vehicle words were presented, and participants were instructed to write down the word that first came to mind, completing the sentence plausibly. Another group of 40 college students (mean age = 20.8 years, SD = 1.73; mean year of education = 14.8 years, SD = 1.45) was enlisted to evaluate the familiarity and interpretability of the 150 sentences in each pool, using a five-point scale (1 = highly non-familiar/non-interpretable, 5 = highly familiar/interpretable). Fifty sentences were chosen for both conventional metaphors and conventional similes because they received ratings exceeding 3 points in both familiarity and interpretability tests. Conversely, 50 sentences for both novel metaphors and novel similes were chosen because they received ratings below 3 points in the familiarity test. Table 1 presents the mean values of familiarity and interpretability for the selected 50 sentences in each condition, along with the cloze probability of the vehicle words. The familiarity values, interpretability values, and cloze probability values were analyzed by ANOVA using conventionality (conventional and novel) and figurative type (metaphor and simile) as within-subject factors. Results were summarized in Table 2, indicating significant main effect of conventionality in all the three ANOVAs. Importantly, for the familiarity values, planned paired samples *t*-tests revealed significant difference between conventional and novel metaphors [$t(49) = 25.901$, $p < 0.001$, two-tailed] and between conventional and novel similes [$t(49) = 28.462$, $p < 0.001$, two-tailed].

2.3 Procedure

The 700 sentence stimuli, comprising 50 for each condition and 500 filler sentences (including 250 anomalous sentences and 250 literal sentences), were segmented into four blocks, each containing 175 sentences, avoiding the repetition of vehicles in each block. Within each block, there were 25 metaphors, 25 similes, and 125 fillers. The substantial number of filler sentences served two purposes: firstly, to prevent participants from recognizing that all figurative sentences were semantically congruent, thus deterring them from relying solely on sentence structure recognition as a strategy to assess interpretability. Secondly, the substantial number of filler sentences helped reduce potential repetitive effects on the processing of figurative sentences. These fillers comprised 75 non-figurative sentences using the same linking word ("是" or "像") as figurative ones (e.g., 长江是长河 – The Yangtze River is a long river), along with 50 sentences using a different linking word (i.e., "有") compared to figurative ones (e.g., 妹妹有玩偶 – The young sister has a toy). Each block contained a total of 112 (or 113) semantically congruent sentences and 63 (or 62) semantically incongruent sentences. The sequence of the four blocks was balanced among participants through Latin Square design. Each block had a duration of 13–15 min, and intervals of rest were provided between blocks to maintain participant comfort.

TABLE 1 Example materials and mean cloze probability, familiarity, and interpretability for each condition.

Type	Conventionality	Sentences	English meaning	Cloze Probability		Familiarity		Interpretability	
				Mean	SD	Mean	SD	Mean	SD
Metaphor	Conventional	历史是长河。	History is a long river.	0.01	0.04	3.96	0.50	4.39	0.36
	Novel	工作是合唱。	Work is a chorus.	0.00	0.00	1.74	0.37	2.99	0.66
Simile	Conventional	历史像长河。	History is like a long river.	0.03	0.09	4.01	0.54	4.46	0.37
	Novel	工作像合唱。	Work is like a chorus.	0.00	0.00	1.82	0.41	3.34	0.62

TABLE 2 ANOVA results of the pretest evaluations of the materials.

Measures	Factors	F	p	η2
Familiarity values	Conventionality	825.418	<0.001	0.944
	Figurative type	4.389	0.041	0.082
	Conventionality × Figurative type	0.449	0.506	0.009
Interpretability values	Conventionality	163.474	<0.001	0.769
	Figurative type	37.931	<0.001	0.436
	Conventionality × Figurative type	21.499	<0.001	0.305
Cloze probability values	Conventionality	8.237	0.006	0.144
	Figurative type	2.685	0.108	0.052
	Conventionality × Figurative type	2.685	0.108	0.052

In each block, a sentence stimulus was presented using the paradigm adapted from Tang et al. (2017a) (Figure 1). The sequence unfolded as follows: a fixation cross (500 ms), a blank screen (250 ms), the topic word (1,000 ms), another blank screen (250 ms), the linking word ("是" or "像") (1,000 ms), followed by another blank screen (250 ms), the vehicle word (1,000 ms), and ended with the response instruction (5,000 ms). The vehicle word was accompanied by a concluding period, signifying the completion of the sentence. Participants were directed to rapidly assess the interpretability of each sentence by pressing one of four keys (i.e., "perfect sense," "some sense" "little sense," and "no sense") upon the appearance of the response instruction. Following each response, the program seamlessly transitioned to the subsequent sentence. The stimuli were displayed in black against a white background, and the experiment was conducted in a quiet room with subdued lighting. Prior to the formal experiment, participants underwent a brief practice session.

2.4 Electroencephalograms recording

Electroencephalograms (EEG) data were acquired through a 64 Ag/AgCl electrode cap connected to a SynAmps 2 amplifier (NeuroScan, Charlotte, NC, USA). Electrode placement adhered to the international 10/20 system, with supplementary electrodes positioned at the left and right mastoids. Vertical electrooculograms (EOGs) were captured using a pair of bipolar channels situated above and below the left eye. AFz served as the grounding point, and the impedance between the reference electrode and any other electrode was maintained below 10 kΩ. Continuous EEG data were recorded and digitized at a 24-bit resolution, with a sampling rate of 500 Hz.

2.5 Data analysis

The offline processing of continuous EEG data recorded utilized Neuroscan (ver 4.3). Initially, the EEG data underwent filtering via a finite pulse response filter, with a bandpass range of 0.1–25 Hz. Correction for eye-blink artifacts followed a regression-based procedure outlined by Semlitsch et al. (1986). Subsequently, the EEG data were segmented into epochs, time-locked to the critical word (the vehicle word in each condition). Each epoch lasted 900 ms and included the 100 ms period preceding the vehicle word. All epochs underwent baseline correction utilizing the pre-stimulus 100-ms baseline. Channels displaying amplitudes exceeding ±75 μV were flagged for artifacts. EEG epochs with artifacts in any channel, excluding the VEOG channel, were excluded. Following artifact removal, the remaining EEG epochs were categorized based on four experimental conditions and averaged independently, resulting in the generation of ERPs for each condition. Finally, the ERPs were referenced to an average reference. SPSS (version 22) was employed to analyze both the ERP amplitude data and behavioral data.

3 Results

3.1 Behavioral results

The response times for the four experimental conditions are presented in Table 3 and were subjected to ANOVA with conventionality (conventional and novel) and figurative type (metaphor and simile) as within-subject factors. The results unveiled significant main effects of conventionality [$F(1, 22) = 221.671$, $p < 0.0001$, $\eta^2 = 0.496$] and figurative type [$F(1, 22) = 10.509$, $p = 0.004$, $\eta^2 = 0.323$]. Additionally, a significant interaction between the two factors was observed [$F(1, 22) = 6.454$, $p = 0.019$, $\eta^2 = 0.227$]. *Post hoc* paired samples *t*-tests were conducted to delve into the interaction effect. These analyses disclosed a significant difference between conventional metaphor and conventional simile conditions [$t(22) = 3.247$, $p = 0.004$, two-tailed]. However, no significant difference emerged between novel metaphor and novel simile conditions [$t(22) = 0.708$, $p = 0.487$, two-tailed], contributing to the observed interaction between conventionality and figurative type.

The sensicality values (perfect sense = 4, some sense = 3, little sense = 2, and no sense = 1) for the four experimental conditions, as presented in Table 2, underwent the same ANOVA for response time analysis. The results revealed significant main effects of conventionality [$F(1, 22) = 106.210$, $p < 0.0001$, $\eta^2 = 0.828$] and figurative type [$F(1, 22) = 21.510$, $p = 0.0001$, $\eta^2 = 0.494$]. There was no significant interaction between the two factors [$F(1, 22) = 1.641$, $p = 0.213$, $\eta^2 = 0.069$].

3.2 ERP results

Figure 2 presents the grand-averaged ERPs elicited by the vehicle words in the four experimental conditions at four

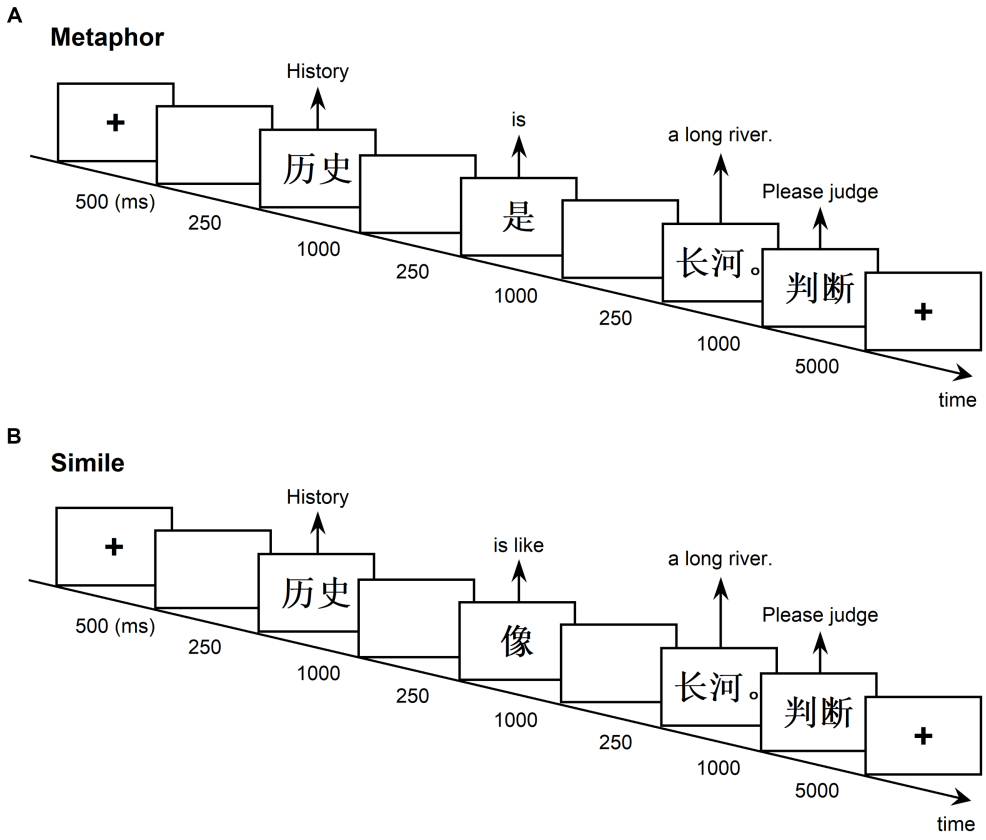

FIGURE 1
Experimental paradigm. Metaphor **(A)** and simile **(B)** sentences were presented word by word. The specified durations for each word and intervals between words were given. The end of the sentence was marked by a concluding period. Upon the emergence of the response instruction, participants were prompted to swiftly assess the interpretability of each sentence by pressing a designated key (perfect sense, some sense, little sense, and no sense). Following each participant response, the program transitioned to the next sentence.

TABLE 3 Mean response times and sensicality values for each condition.

Figurative type	Conventionality	Response time (ms)		Sensicality value	
		Mean	SD	Mean	SD
Metaphor	Conventional	654.12	288.33	3.34	0.47
	Novel	835.34	385.41	2.50	0.74
Simile	Conventional	531.09	203.63	3.64	0.41
	Novel	821.56	366.62	2.70	0.65

representative electrodes (FCz, Cz, CPz, and Pz). Notably, for the metaphor sentences, pronounced differences were observed between the conventional and novel conditions around 400 ms. In contrast, for the simile sentences, no prominent difference was noted between the two conditions. To better elucidate the ERP differences between the conventional and novel conditions, we computed the difference ERPs by subtracting the ERPs elicited in the conventional condition from those in the novel condition for both metaphor and simile sentences. The upper panels of Figure 3 depict the resulting grand-averaged difference ERPs from all 64 recording electrodes (excluding the VEOG channel). Additionally, the global field power (GFP) of each difference ERP was calculated, as illustrated in the lower panels of Figure 3. The topographic maps at the peaks of the GFP elucidate the spatial distribution of the ERP differences around 400 ms (i.e., the N400) between the conventional and novel conditions.

The current study observed a prominent N400 response in the novel metaphor condition when compared to the conventional metaphor condition (Figures 2, 3). However, the N400 response was not evident in the novel simile condition in contrast to the conventional simile condition (Figures 2, 3). For the statistical analysis of the mean N400 amplitudes, mean ERP amplitudes were computed for each condition and participant within the 300 – 500 ms time window across four electrodes (FCz, Cz, CPz, Pz). The selection of this time window and these electrodes was guided by prior knowledge indicating that N400 is prominent around

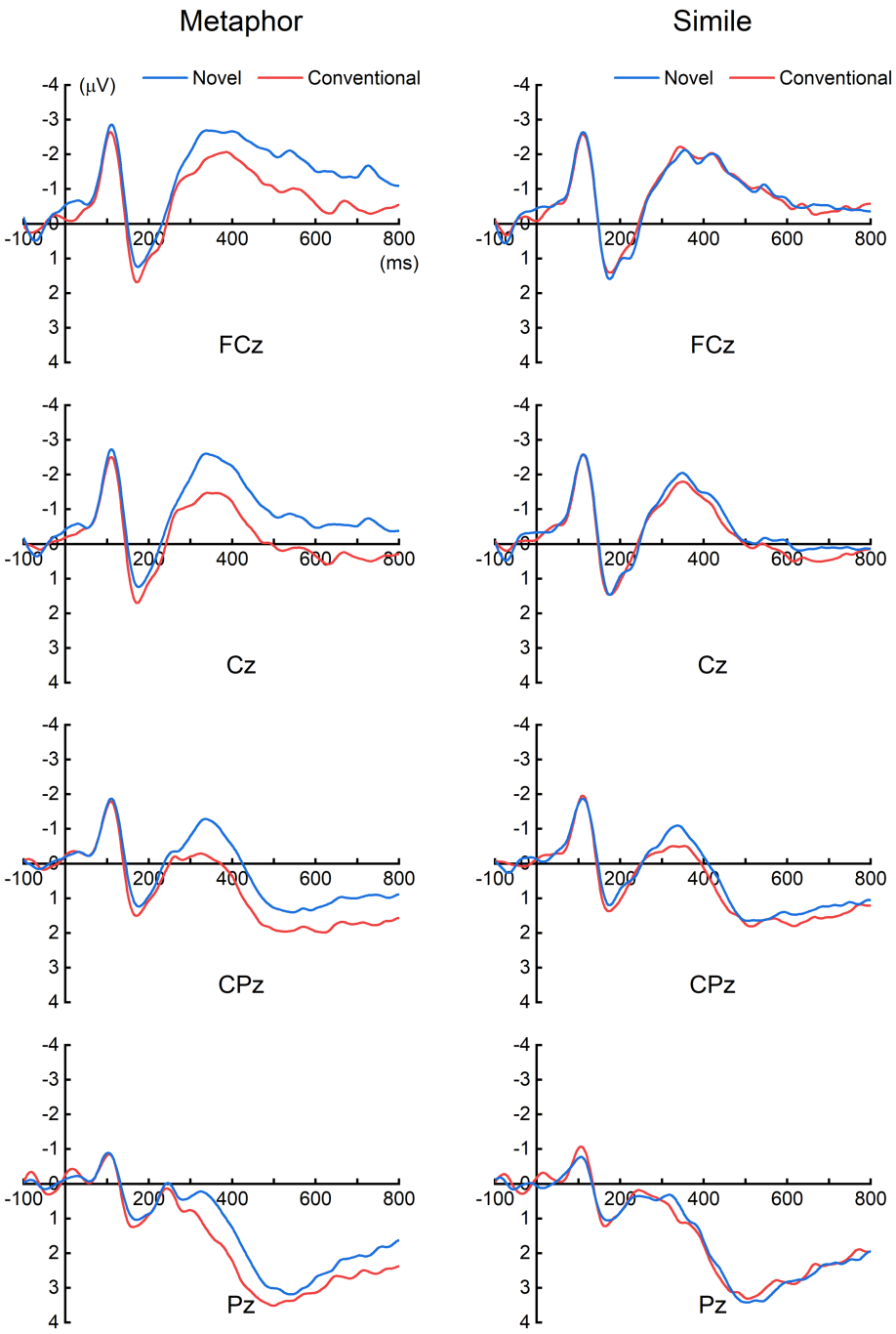

FIGURE 2
Grand-averaged ERPs elicited by the vehicle words of each condition. For the metaphor sentences, prominent ERP differences around 400 ms (i.e., N400) were observed between the conventional and novel conditions. In contrast, for the simile sentences, no prominent ERP difference was noted between the two conditions.

400 ms in the central area of the scalp (e.g., De Grauwe et al., 2010; Goldstein et al., 2012).

For each participant, the mean N400 amplitude was derived by subtracting the mean ERPs (within 300–500 ms across electrodes FCz, Cz, CPz, and Pz) for the conventional condition from those for the novel condition, for both metaphor and simile. Paired samples *t*-test revealed a significant N400 response elicited by the novel condition when compared to the conventional condition for the metaphor sentences [$t(22) = 3.864$, $p = 0.001$, two-tailed] (Figure 4). In contrast, there was no significant N400 response elicited by the novel condition in comparison to the conventional condition for the simile sentences [$t(22) = 0.860$, $p = 0.399$, two-tailed]. Moreover, paired samples *t*-test revealed that the mean N400 amplitudes were significantly larger for the metaphor compared to the simile [$t(22) = 2.167$, $p = 0.041$, two-tailed].

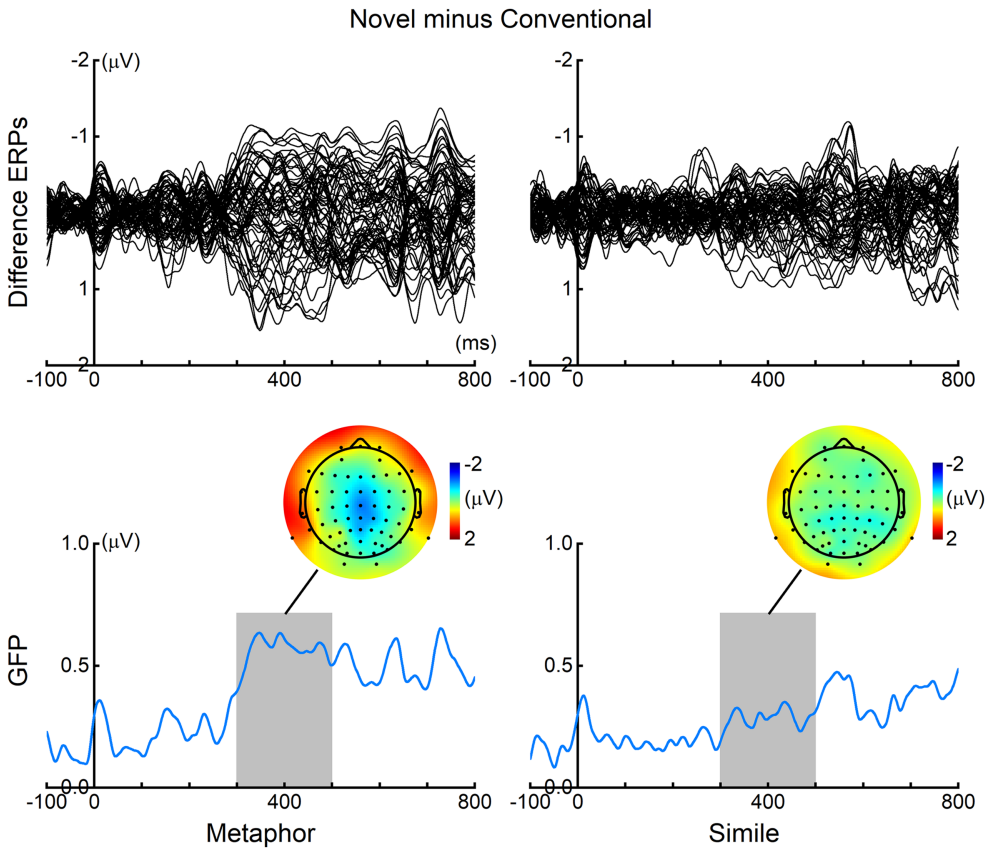

FIGURE 3
ERP differences between novel and conventional conditions. In analyzing both metaphor and simile sentences, the ERPs for the conventional condition were subtracted from those for the novel condition. The resulting difference ERPs from the 64 recording electrodes are visualized in the upper panels as butterfly plots. Concurrently, the global field power (GFP) of the difference ERPs for each condition is calculated and presented in the lower panels. For metaphor sentences, a prominent N400 response was evoked by the novel condition in comparison to the conventional condition. In contrast, there was no noticeable N400 elicited by the novel condition when compared to the conventional condition for simile sentences. The time interval selected for statistical analysis of the N400 (300–500 ms) is highlighted in gray bars. Additionally, topographic maps of the N400, calculated based on the mean ERP amplitudes within the 300–500 ms window, are visually depicted.

4 Discussion

The principal finding of this study was that conventional and novel metaphors elicited distinct ERP patterns around 400 ms, whereas no significant ERP difference was observed between conventional and novel similes. These results were discussed as evidence supporting the Career of Metaphor Theory and shed light on the neurocognitive mechanisms involved in comprehending figurative utterances.

4.1 The N400 difference between conventional and novel metaphors

The current study found that novel metaphors elicited more negative N400 responses compared to conventional metaphors (Figures 2–4). These results were consistent with previous findings (Arzouan et al., 2007a; Lai et al., 2009; Tang et al., 2017a; Huang et al., 2022). As mentioned, the N400 difference between conventional and novel metaphors was attributed to either different familiarity or different cognitive mechanisms between the two types. In this study, similes were introduced as an additional control condition to investigate whether familiarity could modulate N400 amplitude. The results showed no significant N400 difference between conventional and novel similes. Therefore, familiarity may not be the critical factor modulating the N400 amplitude of figurative sentences. Hence, the N400 difference between conventional and novel metaphors observed in the present study and previous studies is best explained as the result of different neurocognitive mechanisms involved in conventional and novel metaphors, rather than differences in familiarity.

The N400 is widely recognized as an index linked to meaning processing (for a review see Kutas and Federmeier, 2011). Some studies suggest that the N400 reflects aspects of semantic integration processes (Kutas and Hillyard, 1980; Hagoort et al., 2004; Lau et al., 2008; Bermudez-Margaretto et al., 2015). According to this perspective, the N400 effect reflects the process of integrating critical words with the previous context. Recent new perspectives consider the N400 as a component that reflects the retrieval of lexical semantic information from long-term memory (Brouwer et al., 2012; Delogu et al., 2019; Aurnhammer et al., 2023). From this viewpoint, the N400 effect results from the enhanced activation of characteristics from long-term memory representations linked to a lexical item. Based on these perspectives, the current results suggest that semantic integration or lexical retrieval of the vehicles in the metaphors might be more

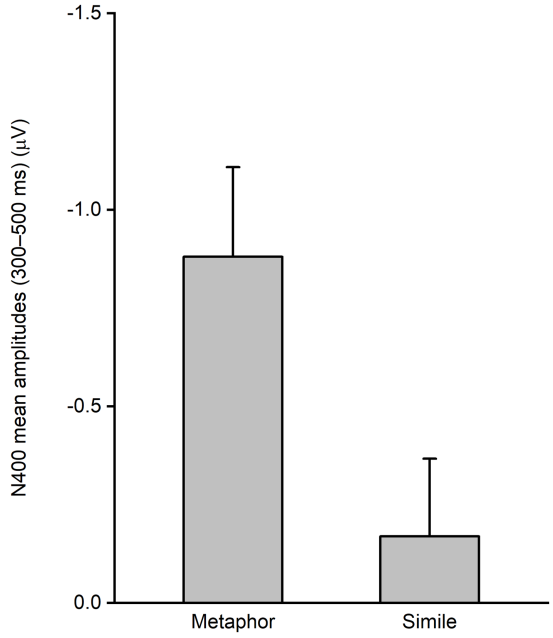

FIGURE 4
Mean N400 amplitudes. Significant N400 response was elicited by the novel condition when compared to the conventional condition for the metaphor, but no significant N400 response was elicited by the novel condition when compared to the conventional condition for the simile. Moreover, the mean N400 amplitudes were significantly larger for the metaphor compared to the simile.

challenging in the comprehension of novel metaphors (which involve comparison mechanisms) compared to conventional metaphors (which involve categorization mechanisms).

Notably, the N400 responses in the present study exhibited a longer duration (lasting from 300 ms to 800 ms, see Figure 3), compared to the typical N400 responses, which generally manifest within the 300–500 ms range. Similar prolonged durations of N400 were reported in studies of Arzouan et al. (2007a), Goldstein et al. (2012), and Tang et al. (2017a). This late negativity has been interpreted as a secondary integration of meaning, which supported the serial processing model of novel metaphor (Bowdle and Gentner, 2005; Tang et al., 2017a). As proposed by the Career of Metaphor theory, the comprehension of figurative language may involve either direct or indirect processing. The serial processing is influenced not only by conventionality but also by grammatical form. Typically, comprehension of conventional figurative sentences is direct: Conventional metaphors are processed as direct categorizations, while conventional similes are comprehended as direct comparisons. Conversely, the comprehension of novel figurative sentences can be either direct or indirect depending on grammatical structure: Novel similes are understood as direct comparisons, while novel metaphors are processed as indirect comparisons (Bowdle and Gentner, 2005). Therefore, the late negativity elicited by novel metaphors might represent a continuation of the N400, indicating the persistent difficulty in processing novel metaphors through the indirect comparison mechanism.

In summary, our findings provide additional neurophysiological evidence supporting the Career of Metaphor Theory, which suggested different cognitive mechanisms between novel and conventional metaphors (i.e., "comparison" versus "categorization"). The Career of Metaphor Theory provides a convincing theoretical framework for examining metaphors and has thus emerged as an influential theory in cognitive linguistics (Bowdle and Gentner, 2005; Jones and Estes, 2006; Thibodeau and Durgin, 2008; Jamrozik et al., 2016). It reconciles apparent contradictions between traditional comparison views and subsequently-emerged categorization views of metaphor comprehension, elucidating processing differences for metaphors of varying conventionality. Furthermore, it addresses the dichotomy between the direct access model and the serial processing claim of metaphor, proposing that processing metaphors in direct or indirect approach depends on both their levels of conventionality and their grammatical form (Bowdle and Gentner, 2005). Given its significance in cognitive linguistics, it is essential to subject the Career of Metaphor Theory to empirical scrutiny from a neurophysiological perspective using electrophysiological technology. Our findings offer such empirical support for the Career of Metaphor Theory, contributing to its evaluation from a neurophysiological standpoint.

4.2 No N400 difference between conventional and novel similes

The conventional and novel similes utilized in the current study exhibited significant differences in familiarity, as evidenced by Table 1, which notably influenced participants' response times and sensicality values (Table 3). Similarly, conventional and novel metaphors also displayed such differences. However, the current study observed no significant N400 difference between conventional and novel similes, as illustrated in Figures 2–4. These results indicate that the N400 response is not significantly influenced by the familiarity disparity between conventional and novel similes. Moreover, the absence of a significant N400 difference between conventional and novel similes aligns with the perspective that both conventional and novel similes are processed by the same "comparison" mechanisms. In summary, the absence of an N400 difference between conventional and novel similes contributes to elucidate the N400 difference between conventional and novel metaphors.

Previous N400 studies have indicated that N400 amplitude is notably modulated by cloze probability (Groppe et al., 2010; Arbel et al., 2011; Zhu et al., 2019). In the current study, the difference in cloze probability between conventional and novel similes was relatively minor (0.03 versus 0.00, see Table 1) compared to previous studies. Therefore, such a slight difference in cloze probability may not be sufficient to induce an N400 difference between conventional and novel similes.

4.3 Different neurocognitive mechanisms between metaphor and simile

Metaphor and simile, both being figurative utterances, share a similar typical structure: "a topic word + the linking word + a vehicle." Particularly in Chinese, these two figurative utterances exhibit close resemblance, with the only distinction lying in the linking word of metaphor and simile ("是" versus "像"). However, previous studies in cognitive linguistics have suggested that metaphor and simile are processed differently (Bredin, 1998; Bowdle and Gentner, 2005; Glucksberg and Haught, 2006; Lai and Curran, 2013). For instance,

according to the Career of Metaphor Theory, novel metaphors are processed as comparisons, because novel metaphors involve source terms that only refer to a domain-specific concept but not to a domain-general concept. Thus, comprehension of novel metaphors entails comparing the source and target domains, aligning the target concept structurally with the source concept to access the metaphorical meaning. In contrast, conventional metaphors are processed through categorization, with source terms having both literal and metaphorical meanings. Consequently, comprehension of conventional metaphors involves vertically aligning the target concept with the source concept without domain comparison. On the other hand, it is generally agreed that understanding similes only requires comparison mechanisms, and there are no cognitive process differences between novel and conventional similes (Bredin, 1998; Chiappe and Kennedy, 1999; Glucksberg and Haught, 2006; Lai and Curran, 2013; Gargani, 2016).

The results of the present study align well with the perspectives proposed in cognitive linguistics as discussed above, which suggested that metaphor and simile are processed by distinct cognitive mechanisms. Specifically, the N400 difference observed between conventional and novel metaphors reflects the involvement of comparison mechanisms in the comprehension of novel metaphors, whereas categorization mechanisms are engaged in comprehending conventional metaphors. In contrast, the absence of an N400 difference between conventional and novel similes reflects the involvement of the same mechanisms (i.e., comparison mechanisms) in understanding both conventional and novel similes. Furthermore, employing the high temporal resolution ERP technique, this study elucidated that the differences in neurocognitive processing between "comparison" (simile and novel metaphor) and "categorization" (conventional metaphor) occur within the 300–800 ms timeframe.

The distinction in neurocognitive mechanisms between metaphor and simile is also supported by a previous fMRI study conducted by Shibata et al. (2012). This study observed higher activation levels in the medial frontal region for similes and more right-sided prefrontal activation for metaphors, while both conditions exhibited similar activation patterns in the left frontal region. However, this fMRI study directly compared metaphor and simile without considering the level of conventionality. The present findings, along with previous perspectives in cognitive linguistics, suggest that the level of conventionality is a critical factor that modulates the processing mechanisms underlying novel and conventional metaphors. Therefore, future investigations are needed to elucidate the neural substrates involved in the comprehension of metaphor and simile at different levels of conventionality.

5 Conclusion

The current study employed novel metaphors, conventional metaphors, novel similes, and conventional similes as experimental conditions to assess the Career of Metaphor Theory from a neurophysiological perspective using ERP technology. We observed a significant N400 difference between conventional and novel metaphors, while no significant N400 difference was observed between conventional and novel similes. Our findings, which differentiate between novel and conventional metaphors and assimilate novel and conventional similes, lend support to the Career of Metaphor Theory and the comparison view of simile.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by the Biomedical Research Ethics Committee of Sichuan University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

YY: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing – original draft. FG: Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – review & editing. YL: Data curation, Investigation, Writing – review & editing. JH: Funding acquisition, Project administration, Resources, Supervision, Validation, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2024.1404498/full#supplementary-material

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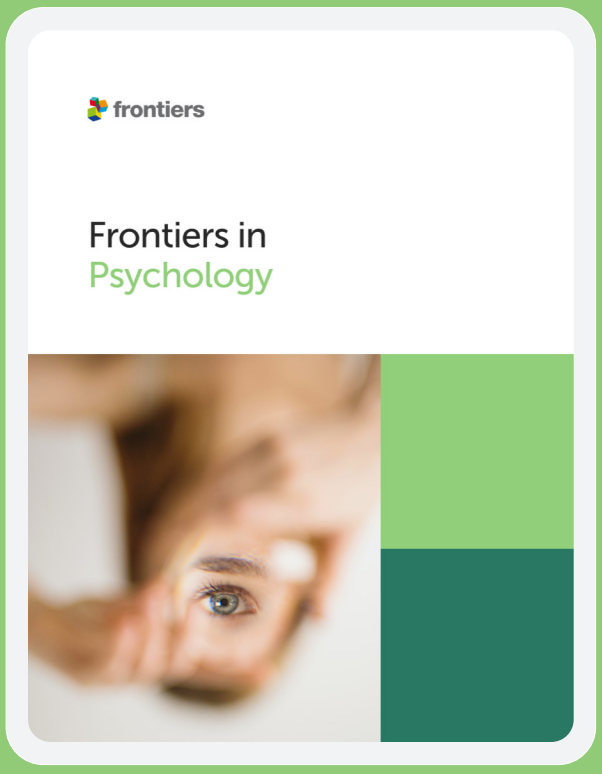

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