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When knowledge fades but loyalty persists: examining the contextual dynamics of media effects on vaccination intentions in China

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Introduction: Media exposure shapes health behaviors directly and via
cognitive and affective/attitudinal mediators. However, how different types
of mediating route's function and how evolving environments affect these
mediators remains understudied.

Methods: Drawing on three national survey waves fielded at distinct stages
of China's COVID-19 response (April 2021 vaccine rollout; April 2022 zero-
COVID debate; January 2023 post-lockdown), this study compares the
mediating roles of biomedical knowledge, perceived risk, trust in scientists,
and nationalism in linking media use to vaccination intentions.

Results: Across phases, affective/ attitudinal pathways—especially nationalism,
and trust in scientists except—were the most stable and consequential
mediators. By contrast, cognitive pathways were weaker and context-
dependent. These shifts track changes in vaccine novelty, policy coherence,
and the intensity of state mobilization, suggesting that strong mobilization
and conflicting expert cues can dampen cognitively demanding routes while
amplifying identity- and authority-based heuristics.

Discussion: The findings underscore that evolving sociopolitical contexts
reshape how media influence health behaviors and point to culturally informed,
context-sensitive strategies that balance appeals to collective identity with
clear, credible information.

KEYWORDS

media exposure, vaccination willingness, cognitive-oriented mediators, affective/
attitudinal-oriented mediators, zero-COVID

1 Introduction

Studies have indicated that media exposure can alter public decisions regarding health
behaviors such as vaccination (Wakefield et al., 2010; Wilson and Wiysonge, 2020). These
influences rarely occur in a direct and immediate fashion; rather, media messages exert
their impact through a set of cognitive and affective mediating pathways through which
individuals interpret, evaluate, and respond to health-related information. To conceptualize
these mediating mechanisms, it is useful to draw on the core insights of information-
processing theories such as the Elaboration Likelihood Model (ELM, Petty and Cacioppo,

1986) and the Heuristic–Systematic Model (HSM, Chaiken, 1980; Chaiken et al., 1989): individuals may rely on cognitively effortful evaluations of substantive evidence, or they may depend on peripheral, affective, or socially embedded cues when forming judgments. While these models were originally formulated to explain how people process specific messages, we can rely on the fundamental duality in human information processing these models reveal to understand the longitudinal and accumulated effect of media exposure.

This theoretical distinction provides a useful set of dimensions for organizing the mediators that connect overall media exposure—not merely a single persuasive message—to health behaviors. Accordingly, this study conceptualizes two broad types of mediating processes. The first type consists of cognitive-oriented mechanisms, which involve acquiring and evaluating factual, biomedical, or epidemiological information that requires substantial cognitive resources. Media-induced knowledge about vaccines and media-shaped perceptions of health risks exemplify this pathway. The second type consists of affective/attitudinal-oriented mechanisms that reflect heuristic-like processing. These mechanisms include trust in scientific institutions and social-normative orientations such as nationalism, which, as a form of social identity, can be strongly mobilized through media narratives and may guide behavior with relatively little cognitive elaboration. Although the ELM and HSM focus on mechanisms of information processing, cognitively demanding mediators such as knowledge and risk perception represent outcomes of central or systematic processing, while affective or identity-based mediators like trust or nationalism emerge more from peripheral or heuristic processing.

Information environments—characterized by information overload, uncertainty, and emotionally charged content—may further amplify this dual structure, pushing some individuals toward cognitively demanding processing while prompting others to rely on affect-driven or identity-based cues (Ting et al., 2024). Existing scholarship supports the relevance of both pathways: individuals with greater knowledge are more receptive to scientific information and more likely to adopt recommended health behaviors (Zhang et al., 2015) and risk perception is a pivotal consideration in health communication (Rogers, 1975; Rosenstock, 1974). In general, knowledge and risk perception consistently influence public acceptance of health information and corresponding behavioral responses in a cognitively consuming way (An et al., 2021; Chen et al., 2024).

However, the adoption of health behaviors based on scientific information is not entirely driven by knowledge and perceived risks that are cognitively demanding. In certain public health contexts, institutional power exerts a substantial influence on public health intentions. Governments and medical institutions, as embodiments of institutional power, have a far-reaching impact on public health beliefs and behaviors through their actions and policies. For example, as public compliance with national policies on epidemic control has been linked to identification with the nation (Van Bavel et al., 2022) and trust in scientists (Hmielowski et al., 2013).

Despite these insights, it remains unclear which type of mediator—cognitive-oriented or affective/attitudinal-oriented—plays a more dominant role in translating media exposure into

health behaviors, and whether the relative importance of these pathways shifts across different policy contexts or stages of a public health crisis. The COVID-19 vaccination campaigns in China, which unfolded across multiple phases of pandemic control over a three-year period, offer a unique context for investigating how media exposure shapes health behaviors through distinct mediating mechanisms in a longitudinal setting. Drawing on data from three waves of national surveys, this study explores how cognitive-oriented and affective/attitudinal-oriented factors differently mediated the relationship between media exposure and COVID-19 vaccination intentions, and how shifts in the policy environment may have dynamically altered the relative influence of these mediators.

2 Literature review

To structure the psychological mechanisms linking media exposure to vaccination intentions, this study draws on the core insight of dual-process theories such as HSM: information may be processed either through cognitively effortful evaluation or through heuristic, affective, and identity-based cues. While these theories were originally developed for single-message processing, their distinction between systematic and heuristic routes provides a conceptual dimension for organizing the mediators examined here. Accordingly, the subsequent sections classify mediators into cognitive-oriented and affective/attitude-oriented pathways. Having established this conceptual framework, the following sections review how media exposure shapes health behaviors and how these two types of mediators operate within such processes.

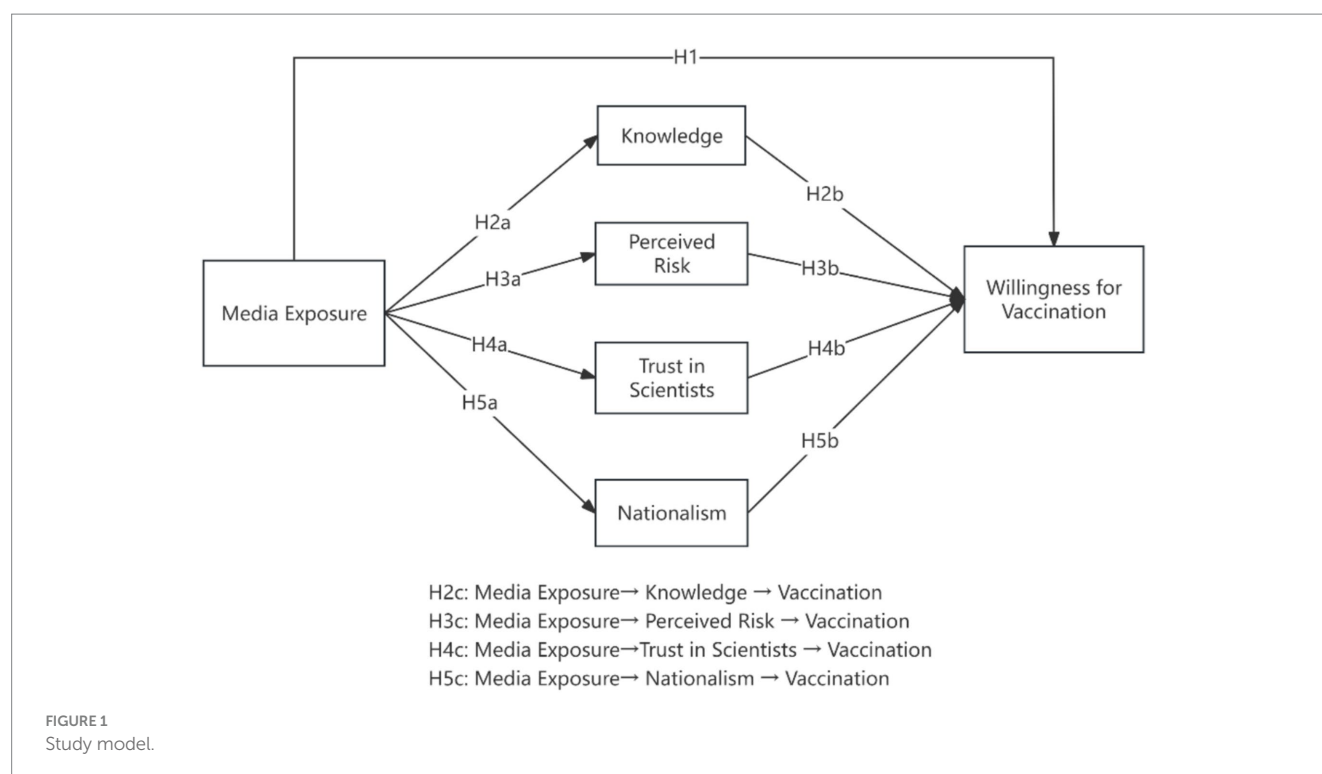
2.1 Media exposure and health behaviors

During health emergencies, individuals experience heightened uncertainty and increased information needs. Media dependence theory (MDT) posits that such conditions strengthen reliance on media as sources of surveillance, interpretation, and behavioral orientation (Ball-Rokeach and DeFleur, 1976). Media exposure can directly impact individual health behaviors; for example, studies of U.S. college students exposed to H1N1 have shown that media use positively influences the adoption of preventive behaviors (Zhang et al., 2015). Similarly, parents' exposure to media messages significantly influences their decisions about whether to vaccinate their children (Galarce et al., 2011).

In a health emergency setting, media often actively deliver the threat of diseases and officially endorsed medical solutions, and their readership was found to be positively associated with health behaviors or willingness to vaccinate (Kim and Jung, 2017). Given MDT's premise of intensified media influence in crises, this study first examines the direct relationship between media exposure and vaccination willingness:

H1. More frequent media exposure is positively associated with willingness to receive COVID-19 vaccination.

Based on the above literature, this paper constructs the following theoretical model (Figure 1).



2.2 Cognitive-oriented mediators: knowledge and risk perception

Research has compellingly demonstrated that media information not only plays a fundamental role in directly shaping attitudes and behaviors, but indirectly by enhancing the audience's relevant knowledge (Zahiruddin et al., 2018; Zhang et al., 2015). In health prevention contexts, media coverage often highlights disease threats and official medical solutions while also providing background biomedical knowledge. This pattern offers strong grounds to posit a positive relationship between media use and the public's level of health knowledge.

On the other end, the higher the level of health knowledge level, the higher the likelihood of taking health or preventive measures was found in a variety of topics such as physical fitness and exercise (Yang, 2017), AIDS (Swenson et al., 2010) and H1N1 prevention (Jang and Baek, 2019). Hence, health-related knowledge can be considered a mediator between media use and vaccination intentions. A Chinese COVID-19 study (Chen et al., 2022) showed that text-based (vs. video-based) media preference enhanced vaccine knowledge, which subsequently boosted vaccination willingness, evidencing knowledge mediation between media exposure and vaccination intention. Taken together, these findings highlight a pathway played by health-related knowledge between media exposure and health behaviors.

In this study, we operationalized health-related knowledge as vaccine knowledge and viral infection know-how. Both types of knowledge should be conducive for people to judge whether to vaccinate against the pandemic. The former explains to people the right role of vaccines against infections and the latter brings an understanding of how infection occurs and how it can be prevented.

Based on the above assumptions and findings, we propose the following hypothesis:

H2a. Media exposure is positively associated with health-related knowledge.

H2b. Higher levels of health-related knowledge are associated with greater willingness to receive the COVID-19 vaccine.

H2c. Health-related knowledge mediates the relationship between media exposure and vaccination willingness.

Processing and applying health-related knowledge from the media—whether to understand vaccine science or to weigh vaccination options—demands substantial cognitive resources. Individuals must attend to the content of the information, evaluate its validity, and compare alternatives, making knowledge acquisition a prototypical cognitive-oriented mediator.

Likewise, perceived risk also requires individuals to integrate media and external information in assessing the likelihood and severity of potential health threats through deliberate evaluation and judgment. In general, individuals do not always experience risk directly but rely on the media to recognize and categorize risk (Ader, 1995). Multiple studies of the perceived risk of disease have confirmed this idea (Fung et al., 2011), demonstrating that greater perceived risk is associated with the higher likelihood of vaccination or other preventive actions. The media's influence on risk perception, together with the established link between risk perception and preventive actions, supports conceptualizing risk perception as a cognitively demanding mediator. From the perspective of dual-process frameworks such as ELM and HSM, the formation and strengthening of risk perception typically involve the central or systematic processing

routes, which require more elaborate cognition, particularly when such processing unfolds in a longitudinal manner.

Empirical evidence supports this mediation in vaccination contexts: greater diversity in digital media exposure heightens perceived severity, indirectly promoting vaccination intention via coping appraisal and social influences (Chen et al., 2025); similarly, Zhao et al. (2022) found that digital media exposure increases vaccination willingness by elevating perceived susceptibility and perceived severity—two widely adopted dimensions of risk perception. In decades, various health behavior frameworks all propose that an individual's perception of the risk associated with a specific health threat drives them to adopt preventive actions to mitigate that risk (Rosenstock, 1974; Rogers, 1975; Weinstein and Sandman, 1992). Accordingly, this study proposes the following hypotheses:

H3a. More frequent media exposure is associated with perceived risk of COVID-19 infection.

H3b. Higher perceived risk is associated with greater willingness to be vaccinated.

H3c. Perceived risk mediates the relationship between media exposure and vaccination willingness.

2.3 Affective/attitudinal-oriented mediators: trust in scientists and nationalism

Compared with cognitively oriented mediators such as knowledge and perceived risk, certain pathways from media exposure to health behaviors operate with minimal cognitive effort and depend instead on affective or identity-based mediation. Trust in scientists and nationalism can be categorized as this type of mediating channels which link media use to behavioral decisions primarily through emotional alignment, value orientations, and social identification, rather than through intensive analytical processing. In our case, trust in scientists reflects confidence in the credibility and benevolence of scientific authorities, enabling individuals to rely on perceived expertise without exhaustively verifying technical details (Gauchat, 2012).

Similarly, nationalism draws on a shared sense of identity and collective loyalty, prompting individuals to support health behaviors framed as serving national interests (Huddy and Khatib, 2007). Together, these affective and identity-based orientations can exert powerful influence on public responses to health communication, particularly in contexts where collective solidarity and perceived authority are emphasized in the media.

Trust in scientists usually represents a form of social or institutional trust that often brings positive attitudes to emerging technologies and socially desirable behaviors (Chrysoschoidis et al., 2009). Scientific contents in media shape were found to influence individuals' trust in scientists (Anderson et al., 2012). In China, among the indicators of media use, following scientific information in mainstream media was found to be significantly and positively correlated with overall trust in scientists (Jin and Chu, 2015). Indeed, prior research shows that trust in scientists mediates the relationship between media use and both attitudes toward scientific issues and

behavioral intentions, such as support for climate change mitigation (Hmielowski et al., 2013) and COVID-19 vaccination (Brewer and Ley, 2012). Given that the positive relationship between media use and trust in scientists exists, as well as trust's association with vaccine uptake (which often involves limited cognitive processing), trust's role as an affect-driven, cue-based mediator between media consumption and vaccination appears theoretically plausible. Accordingly, we propose the following hypothesis to test the affective/attitudinal-oriented mediators between trust in scientists and individuals' uptake of the COVID-19 vaccine:

H4a. Media exposure is positively associated with trust in scientists. *H4b.* Greater trust in scientists is associated with higher willingness to vaccinate.

H4c. Trust in scientists mediates the relationship between media exposure and vaccination willingness.

Like trust in scientists, nationalism should function as an affective/attitudinal mediator by activating a strong sense of collective identity and patriotic duty. According to social identity theory (SIT, Tajfel and Turner, 2004), when national identity becomes salient, individuals are motivated to conform to in-group norms, framing prosocial behaviors—such as vaccination—as acts of patriotic responsibility that protect the nation and its people (Brewer et al., 1996).

Similar to how they reinforced public trust in scientists, Chinese media have consistently highlighted national achievements and fostered a sense of loyalty to the nation. The promotion of nationalism—across both mainstream outlets and social media platforms—reached its peak during the pandemic. It has been found that exposure to media information will affect the public's level of nationalism to varying degrees (Müller, 2013). On the other hand, the virtual spatial-temporal field created by the Internet space cohesively strengthens and reinforces the individual's sense of nationalism and ethnicity (Huang, 2013). Meanwhile, multiple studies have found that nationalism was positively associated with individuals' willingness to engage in health behaviors such as wearing masks (Jia and Luo, 2023) and getting vaccinated (Zhang et al., 2023).

Building on the well-established associations between media exposure and nationalism, and between nationalism and health behaviors, it is reasonable to propose that nationalism functions as an affective or identity-oriented mediator between media exposure and vaccination. We therefore propose the following hypotheses:

H5a. Media exposure is positively associated with nationalism.

H5b. Higher level of nationalism is associated with stronger willingness to vaccinate.

H5c. Nationalism mediates the relationship between media exposure and vaccination willingness.

2.4 Contextual influences of mediating mechanisms

While we have analyzed the potential functions of cognitive-oriented and affective/attitudinal-oriented mediating mechanisms, it

is also essential to consider how social context—particularly shifts in the policy environment—may affect these mechanisms. As suggested, the broader policy regime changed the strength of the proposed mediating routes: cognitive routes (knowledge and risk perception) may saturate or desensitize over time, whereas identity-based routes (particularly nationalism) can be intensified under patriotic or collectivist framing.

When faced with a new vaccine, individuals must acquire factual information from the media and base their decisions partly on knowledge-driven evaluation. However, prior research suggests that knowledge gains may reach a “ceiling effect” once a certain threshold is achieved (Anderson, 1982). Moreover, prolonged pandemic coverage can lead to emotional desensitization, reducing public attention to relevant information and weakening the motivation for further knowledge updating over time (Fang et al., 2022; Reisdorf et al., 2021). Similar dynamics affect perceived risk. Qualitative and longitudinal studies show that perceived risk fluctuates with changes in case numbers, policy consistency, and public communication (Duan et al., 2021; Wright et al., 2022). In addition, the same contextual dynamics that affect cognitive processing also shape affective/attitudinal-oriented mechanisms such as trust in scientists and nationalism. Trust in scientists is sensitive to perceived transparency, consistency of expert messaging, and alignment between expert advice and lived realities (Bromme et al., 2022). During crises, inconsistent or politicized communication can undermine this trust, weakening its mediating effect on health behaviors (Plohl and Musil, 2021). Nationalism, as a form of social identity, can also be amplified or diminished by contextual cues—such as government framing of public health as a patriotic duty or narratives emphasizing collective resilience (Yang et al., 2022). Shifts in the political climate, international relations, or symbolic policies can thus recalibrate how nationalism shapes people’s health decisions, influencing whether individuals comply with or resist health measures (Luo et al., 2024; Figure 1).

Consequently, policy shifts—such as the abrupt lifting of strict pandemic shutdown in late 2022 in China—may recalibrate both cognitive and identity-based processing, altering the relative strength of mediating pathways. This leads to a guiding research question:

RQ: To what extent do changes in epidemic conditions and policy environments alter the mediating roles of knowledge, perceived risk, trust in scientists, and nationalism between media exposure and health behaviors?

3 Materials and methods

Our surveys were carried out in April 2021, April 2022 and January 2023 by Survey Bar (*Diaoyanba*), a Shanghai survey firm known for its substantial respondent database exceeding 5 million. The online cohort mirrored China’s demographic spread of regions, ages, and genders per China’s Statistical Yearbook 2020, using quota sampling to approximate the national distribution of age, gender, and region as reported in the China Statistical Yearbook 2020. Selected individuals received email invitations to partake in the survey, which was focused on adults aged 18–59,

reflecting the vaccination age limit at the time. Endorsed by an eastern China-based university’s leadership, in lieu of a formal IRB for social sciences, our approach ensured participant anonymity, privacy, and voluntary participation. After completing the questionnaire, respondents received remuneration from Survey Bar.

To elucidate the findings, we provide a condensed review of specific periods: In April 2021 (hereinafter referred to as W1), when China managed the COVID-19 crisis effectively with minimal new infections, the vaccination during the pandemic was just rolled out. In April 2022 (hereinafter referred to as W2), outbreaks affected regions like Shanghai and Shenzhen, leading to severe lockdowns and a huge expert debate on whether zero-COVID or coexistence with the virus was a better strategy for pandemic control (Luo et al., 2024). In December 2022, China suddenly lifted the strict quarantine policy and ended the oppressive vaccination campaigns carried out by the government. As a result, infections surged and the public was puzzled, but the society eventually restored to normal status. The third wave of survey completed in January 2023 (hereinafter referred to as W3) reflected this transitional period.

After eliminating invalid responses (short completion time, presence of missing values, etc.), we ended up with valid sample sizes of 2,038 for W1; 1,021 for W2; and 1,192 for W3. In sum, the three separated national surveys involved a total of 4,251 research participants.

3.1 Research variables and measurement

3.1.1 Willingness to vaccinate

The wording for the measurement of the willingness to receive the COVID-19 vaccine (for the latter two rounds of survey, the COVID-19 vaccine primarily referred to booster shot) was broadly consistent across all three instances: “I am very likely to get the COVID-19 vaccine (booster shot) soon”; “I plan to get the COVID-19 vaccine (booster shot) soon.” Reliability tests yielded a Cronbach’s alpha well above the acceptable threshold (Cronbach’s $\alpha_{W1} = 0.932$, Cronbach’s $\alpha_{W2} = 0.972$, Cronbach’s $\alpha_{W3} = 0.952$).

3.1.2 Media exposure

We used a multi-dimensional question to ask respondents how often they received information about COVID-19 from different sources: both traditional media outlets like newspapers, television and radio and their social media branches, as well as non-official accounts on various social media platforms. Respondents answered on a 5-point scale (1 for *never*, 2 for *occasionally*, 3 for *sometimes*, 4 for *often*, 5 for *always*). Subsequently, we summed and averaged these variables as the frequency of media exposure.

3.1.3 Knowledge

We conceptualized health-related knowledge as infection know-how on viral infections and vaccine knowledge. The former was measured in two questions (“Cov-SARS-2 can cause SARS and pneumonia, but it will not cause colds,” and “Antibiotics, such as penicillin, streptomycin, or cephalosporin, can kill both bacteria and viruses”) which were extracted from our routine science literacy measure that was included in our three rounds of surveys.

The science literacy measure (not provided here), which has been regularly tested in China, the United States and other countries for decades, cover basic scientific knowledge, analytical reasoning and familiarity with the scientific procedure (National Science Board, 2022). The vaccine knowledge scale (e.g., “Smallpox will not be eradicated unless vaccines are widely used”), which was developed by leading scholars and had been repeatedly used (Zingg and Siegrist, 2012), was adopted in W1 and W3. Unfortunately, we did not test vaccine knowledge in W2 because the survey was originally designed primarily for other purposes. So, we only used two infection-related items mentioned above in W2.

3.1.4 Perceived risks

In all three questionnaires, risk perception was divided into perceived susceptibility and perceived severity, all of which were measured using the two items: “There is a high probability that I will get COVID-19” and “Getting COVID-19 is a major threat to my health.” Both questions were measured on a five-point Likert scale (1 for *complete disagreement* and 5 for *complete agreement*).

3.1.5 Trust in scientists

Trust in scientists was measured in three questionnaires using a single item: How much do you trust the scientists in the process of COVID-19 control? The difference is that it is measured on a 10-point scale in W1 and W2, while in W3, it is measured on a seven-point scale, with higher values representing higher levels of trust. During the construction of the mediating model, we standardized the variable to unify the measurement and enhance the comparability.

3.1.6 Nationalism

The three surveys used slightly different scales for measuring nationalism. W1 integrated a commonly used scale (Tang and Darr, 2012): (1) I would prefer to be a citizen of China over any other country; (2) My homeland is better than most other countries; (3) Even if the government is wrong, it should be supported.

W2 used a scale from Luo et al. (2024) with questions: (1) I feel great when I see the Chinese flag flying; (2) Being Chinese is an important part of my identity; (3) I am proud and honored to be Chinese; (4) When a foreigner praises China, it feels like they are praising me.

W3 employed a different nationalism scale, which included five questions (Guillon and Kergall, 2021): (1) I would prefer to be a citizen of China over any other country; (2) My homeland is better than most other countries; (3) Even if the government is wrong, it should be supported; (4) I feel great when I see the Chinese flag flying; (5) Most countries in the world do not treat their citizens as well as China does. The scale's reliability was high across these surveys (Cronbach's $\alpha_{W1} = 0.856$, Cronbach's $\alpha_{W2} = 0.963$, Cronbach's $\alpha_{W3} = 0.893$).

Although the measurements of nationalism were slightly different, they were all widely used to measure Chinese people's nationalism scores. The Cronbach's alpha values for each of the scales indicate a very high level of internal consistency, which meets the criteria of reliability and validity. When they were, respectively, used as mediating variables in the mediating model, a standardized treatment was adopted in the subsequent analysis. The standardized treatment can effectively unify the measurement units and convert the data from different items into the same scale range, ensuring the comparability of the data.

3.2 Data analysis

The mediation analysis was conducted using the PROCESS macro for SPSS (version 3.4.1), with willingness for vaccination as the dependent variable, knowledge, perceived risk, trust in scientists and nationalism as mediators, and media exposure as the independent variables, respectively. Demographic variables (gender, age, education level, monthly income) are included in the study as control variables, with a confidence interval set at 95%. All VIFs < 1.2 (well below the conservative threshold of 5) and post-hoc Monte Carlo power analyses (20,000 reps) show that across all three datasets, the lowest power for any meaningful indirect effect ranges from 0.845 to 0.943, comfortably exceeding the 0.80 benchmark. The four-mediator model is therefore statistically feasible and well-powered in all cases.

4 Results

First, we output demographic variables for the sample to show composition (Supplementary Table 1). Then, we presented descriptive statistics (Supplementary Table 2) and correlations of key variables (Supplementary Table 3) across three periods, after controlling demographic factors. Then, we used mediation models to test the effects of perceived risk, knowledge, trust in scientists, and nationalism. Model 1 examined these mediators between media exposure and vaccination intentions in W1. The remaining two models tested these pathways in W2 (Model 2) and W3 (Model 3) separately.

4.1 Demographic description of respondents

The gender ratio among participants was nearly equal, with males slightly outnumbering females, accounting for approximately 51–53% and 47–49%, respectively.

The age distribution was broad, encompassing all age groups from young to old. The middle-aged group aged 30 to 59 made up the largest proportion of participants.

The education level was generally high, with most participants holding junior college and bachelor's degrees, accounting for over 60% combined. Those with junior high school or below and high school education made up a certain proportion but were relatively fewer. Participants with master's degrees or above accounted for a small percentage, too.

The monthly income levels exhibited diversity. Most participants earn between 3,001 and 10,000 RMB, accounting for over 60% of the total.

See Supplementary Table 1 for demographic details on participants.

4.2 Results of descriptive statistics and correlation

Overall, the mean values for media exposure ranged from approximately 3.01 to 5.65. The mean values for knowledge were relatively low, ranging from 0.48 to 0.58, suggesting limited

knowledge of the subject matter. Perceived risk showed a range of mean values from 2.96 to 3.89, indicating different levels of risk perception among the participants. Trust in Scientists had high mean values, ranging from 5.29 (on a scale of seven) to 9.39 (on a scale of ten), indicating a generally positive level of trust in scientists across the settings. Nationalism also had high mean values, ranging from 5.56 to 6.58 on a seven-degree scale, suggesting a strong sense of nationalism among the participants. Finally, the mean values for intention to vaccinate ranged from 4.81 to 5.94, indicating high levels of intention to vaccinate across the different settings. The standard deviations for each indicator provided information on the variability of the responses within each weighting, reflecting the diversity of opinions and experiences among the participants. For a comprehensive examination of the mean and standard deviation values pertaining to the studied variables, [Supplementary Table 2](#) offered more detailed information.

[Supplementary Table 3](#) demonstrated the correlation coefficients between the six variables we examined. They included media uses, knowledge, perceived risk, trust in scientists, nationalism, and willingness to vaccinate.

4.3 Results of mediation analyses

Next, the subsection presented three mediated paths for each of the three waves in chronological order. All mediated pathways included demographic data as control variables. The results of the validation of the assumptions and research questions for each model are presented in [Table 1](#), and the path analysis results are shown in [Figure 2](#). [Table 2](#) shows the direct effect, indirect effect and total effect of paths.

Across the models examined, there was a discernible pattern in the total effect of the predictor on the outcome variable. Model 1 revealed a significant total effect ($\beta = 0.179$, CI [0.1168, 0.2422]), with a substantial portion of this effect being direct ($\beta = 0.131$, CI [0.071, 0.192]) and the remainder mediated through other variables (indirect effect $\beta = 0.048$, CI [0.028, 0.071]), accounting for 26.82% of the total effect. In Model 2, the total effect increased to $\beta = 0.205$ (CI [0.070, 0.3393]), with a more pronounced mediation effect ($\beta = 0.108$, CI [0.039, 0.195]), now comprising 52.68% of the total impact. Finally, Model 3 exhibited the highest total effect ($\beta = 0.212$, CI [0.104, 0.319]), where the direct effect weakened ($\beta = 0.116$, CI [0.008, 0.224]) while the indirect effect remained significant ($\beta = 0.096^*$, CI [0.056, 0.140]), making up 45.28% of the total effect. These findings suggested that while the total impact of the predictor varied slightly across models, the role of mediation in shaping this impact was consistently significant and substantial.

4.3.1 Media exposure as an independent variable in W1

For H1, the direct effect of media exposure on vaccination ($b = 0.1314$, $p < 0.000$) exhibited significance.

For H2a, the relationship between media exposure and knowledge also demonstrated significance ($b = 0.0142$, $p < 0.05$). When exploring H3a and H5a, we observed significance in both perceived risk ($b = 0.0985$, $p < 0.01$) and nationalism ($b = 0.0836$, $p < 0.01$). For H4a, we found a significant relationship between media exposure and trust

TABLE 1 Results of the research hypotheses and research question.

Path		Results		
		W1	W2	W3
H1	Media exposure → Vaccination	Supported	Rejected	Supported
H2a	Media exposure → Knowledge	Supported	Rejected	Rejected
H2b	Knowledge → Vaccination	Supported	Rejected	Supported
H2c	M → K → V	Supported	Rejected	Rejected
H3a	Media exposure → Risk	Supported	Supported	Supported
H3b	Risk → Vaccination	Rejected	Supported	Rejected
H3c	M → R → V	Rejected	Supported	Rejected
H4a	Media exposure → Trust in scientists	Supported	Rejected	Supported
H4b	Trust in scientists → Vaccination	Supported	Rejected	Supported
H4c	M → T → V	Supported	Rejected	Supported
H5a	Media exposure → Nationalism	Supported	Supported	Supported
H5b	Nationalism → Vaccination	Supported	Supported	Supported
H5c	M → N → V	Supported	Supported	Supported

M refers to media exposure, V refers to willingness for vaccination, K refers to Knowledge, R refers to Risk, T refers to Trust in scientists, N refers to Nationalism. The bold sections in the text are intended to emphasize that the research hypothesis is supported.

in scientists ($b = 0.0961$, $p < 0.01$). This result supported H3a and H5a, indicating that perceived risk and nationalism were important factors associated with public behavioral intention.

For H2b, H3b, H4b and H5b, among the hypothesized mediators, knowledge ($b = 0.8538$, $p < 0.000$), trust in scientists ($b = 0.2286$, $p < 0.000$), and nationalism ($b = 0.1056$, $p < 0.01$) had significant positive effects on vaccination. H1, H4 and H6 were supported. H3 was rejected.

Overall, in W1, knowledge [$\beta = 0.0121$, SE = 0.0055, 95%CI = (0.0018, 0.0237)], trust in scientists [$\beta = 0.0257$, SE = 0.0070, 95%CI = (0.0134, 0.0406)] and nationalism [$\beta = 0.0101$, SE = 0.0048, 95%CI = (0.0026, 0.0212)] acted as effective mediators between media exposure and the vaccination willingness. The results supported H2c, H4c and H5c.

4.3.2 Media exposure as an independent variable in W2

For H1, the direct impact of media exposure on vaccination did not show statistical significance. Regarding H2a, the connection between media exposure and knowledge also failed to demonstrate statistical significance. In the case of H4a, our findings indicated a nonsignificant relationship between media exposure and trust in scientists. Upon examining H3a and H5a, we found statistical significance in both perceived risk ($b = 0.1474$, $p < 0.05$) and nationalism ($b = 0.1837$, $p < 0.000$). These results uphold H3a and H5a, suggesting that perceived risk and nationalism were crucial factors shaping public attitudes or behaviors.

For hypotheses H2b, H3b, H4b and H5b, among the proposed mediators, risk ($b = 0.1696$, $p < 0.01$) and nationalism ($b = 0.3674$,

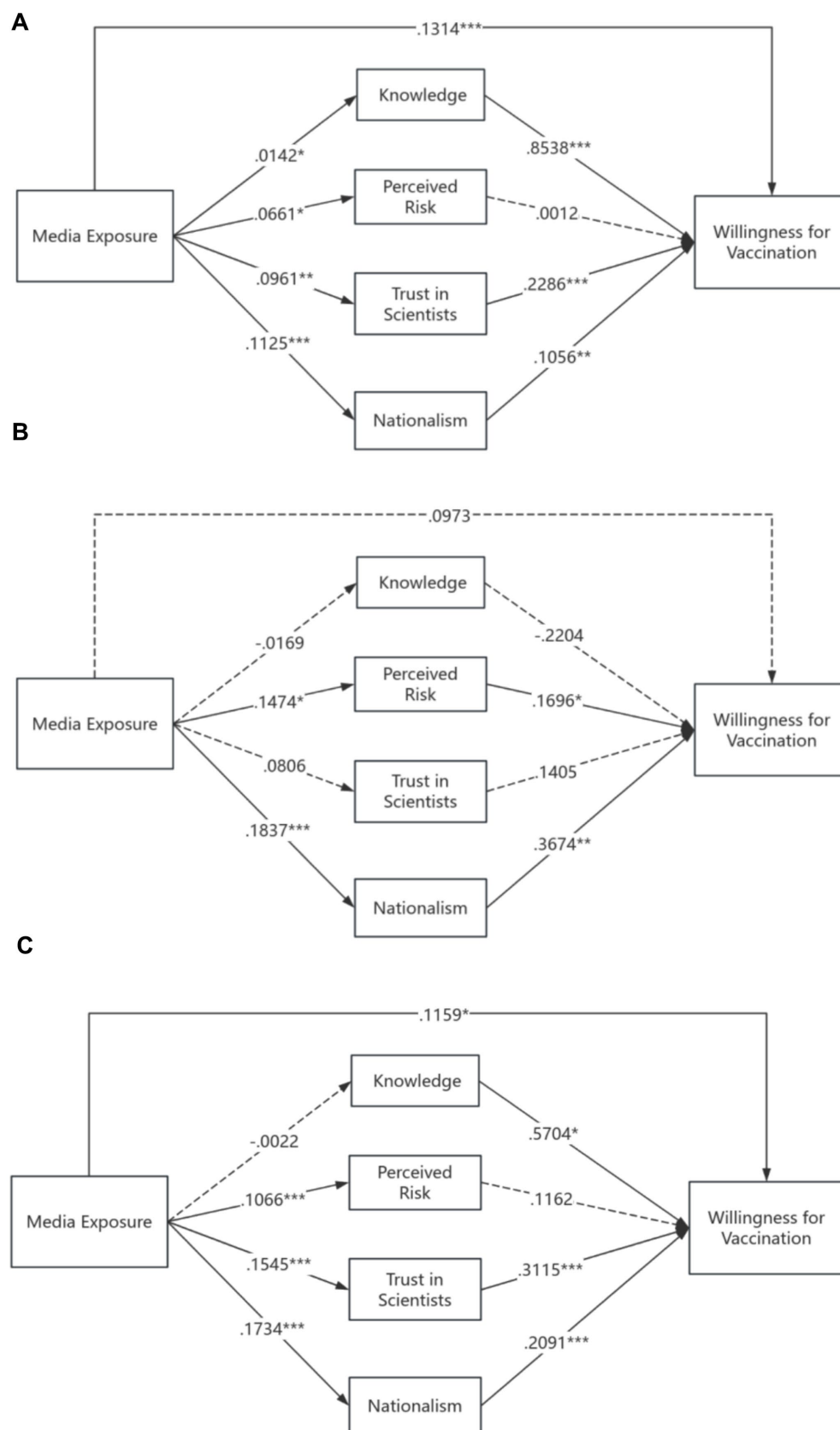


FIGURE 2

Path analysis results for W1, W2 and W3. (A) Model 1 (Media exposure in W1). (B) Model 2 (Media exposure in W2). (C) Model 3 (Media exposure in W3).

TABLE 2 Total, direct and indirect total effects of the models.

Model	Total effect β (SE) [95%CI]	Direct effect β (SE) [95%CI]	Indirect total effect β (SE) [95%CI]	Proportion of mediating effect
Model 1	0.179*** (0.032) [0.1168, 0.2422]	0.131*** (0.031) [0.071, 0.192]	0.048*** (0.011) [0.028, 0.071]	26.82%
Model 2	0.205** (0.068) [0.070, 0.3393]	0.097 (0.070) [-0.041, 0.236]	0.108** (0.039) [0.039, 0.195]	52.68%
Model 3	0.212** (0.055) [0.104, 0.319]	0.116* (0.055) [0.008, 0.224]	0.096* (0.022) [0.056, 0.140]	45.28%

* $p < .05$, ** $p < .01$, *** $p < .001$.

$p < 0.01$) exhibited significant positive effects on vaccination. Consequently, H3b and H5b were supported, while H2b and H4b were rejected.

In summary, in W2, risk ($\beta = 0.0250$, $SE = 0.0146$, 95% $CI = (0.0008, 0.0580)$) and nationalism ($\beta = 0.0675$, $SE = 0.0350$, 95% $CI = (0.0070, 0.1468)$) served as valid mediators between media exposure and willingness to vaccinate. The results supported H3c and H5c.

4.3.3 Media exposure as an independent variable in W3

For H1, the direct impact of media exposure on vaccination was statistically significant ($b = 0.1159$, $p < 0.05$). For H2a, the relationship between media exposure and knowledge did not show statistical significance. Regarding H4a, our findings indicated a significant correlation between media exposure and trust in scientists ($b = 0.1545$, $p < 0.0001$).

When examining H3a and H5a, we found statistical significance in both perceived risk ($b = 0.1066$, $p < 0.0001$) and nationalism ($b = 0.1734$, $p < 0.0001$). These results uphold H3a and H5a, suggesting that perceived risk and nationalism were crucial factors influencing public behavioral intention.

For hypotheses H2b, H3b, H4b and H5b, among the proposed mediators, knowledge ($b = 0.5704$, $p < 0.05$), trust in scientists ($b = 0.3115$, $p < 0.0001$), and nationalism ($b = 0.2091$, $p < 0.01$) had significant positive effects on vaccination. Consequently, H2b, H4b, and H5b were supported, while H3b was rejected.

Overall, in W3, trust in scientists ($\beta = 0.0481$, $SE = 0.0141$, 95% $CI = (0.0235, 0.0779)$) and nationalism ($\beta = 0.0363$, $SE = 0.0133$, 95% $CI = (0.0131, 0.0645)$) served as significant mediators between media exposure and vaccination willingness. The results supported H4c and H5c.

5 Discussion

Based on three rounds of national surveys conducted at different stages of the COVID-19 pandemic control in China, this paper revealed context-dependent variations in media exposure's direct and mediated association with vaccination across pandemic phases. For direct effect, media exposures were positively correlated with vaccination willingness during the vaccine rollout's early phase (April 2021) and the messy post-lockdown period (January 2023). However, in April 2022 (W2), amidst the overheated experts' open debates on whether to continue harsh zero-COVID measures, media exposure showed no direct link with vaccination intention. This varying pattern

may show that in China, media outlets played a vital mobilization role primarily when the public felt a coherent tone from the media. However, people's reliance on media for decisions in a public health crisis may decline when the media tones are in conflict amidst experts' open debates on zero-COVID policies (Luo et al., 2024).

For mediating pathways, nationalism demonstrated a consistent mediator role, with trust in scientists exhibiting secondary indirect associations. Comparatively, health knowledge and risk perception exhibited substantially weaker and unstable mediating capacity. The pattern shows affective/attitudinal pathways—nationalism, and trust in scientists except during the period of expert discord—exhibited stronger and more consistent statistical mediation than cognitive-oriented mediators like knowledge and perceived risks across different stages of China's pandemic control.

5.1 Knowledge as a conditional mediator: lamed cognitive-oriented mechanism

Data indicated that health-related knowledge did not play a constant and robust mediating role. In W1, when China began to roll out its vaccination program, knowledge was a positive mediator between media exposure and vaccination intention.

In W2, which unfortunately lacked vaccine knowledge measures, infection know-how failed as a significant mediator. The regular, strict quarantine measures during the period may steer people to decide on vaccination without resorting to knowledge for calculation.

In W3, which marked the post-lockdown chaotic stage, the louder voice of official encouragement of vaccination coexisted with surging infections in January 2023 when we administered this survey. As a result, knowledge was associated with vaccination willingness, possibly because amidst rocketing infection cases, people with better knowledge were more likely to seek vaccines as a self-defense measure. Yet, media exposure wasn't significantly linked to media use. It could be caused by the messy information provided by the media at a time of turmoil.

The case of knowledge as a mediator illustrates that cognitive-oriented mechanisms are highly contingent on contextual conditions. In the initial phase of the vaccine rollout—when novelty and uncertainty were high—knowledge was associated with systematic reasoning and informed decision-making. However, its associations diminished considerably in later stages, as the public grew less responsive to informational cues and attitudinal factors emerged as more salient determinants.

5.2 Risk perceptions as unstable mediator: the constrained cognitive-oriented mechanism

Existing research emphasizes perceived risk as a key driver of health behaviors (Savadori and Lauriola, 2021). However, the results of this study suggest that the influence of perceived risk may be overestimated, at least in China's COVID-19 control context. Only in W2 did perceived risk show a significant mediating association, although in the three survey periods, media exposures were repeatedly associated with higher perceptions of risk.

In W1, when China reported near-zero COVID-19 cases due to strict quarantines, individuals likely felt shielded from infection, limiting the association of personal risk with vaccination decisions. However, in W2 implemented in April 2022, when the Omicron variant recorded high infection and the open debate on zero-COVID or coexistence with the virus was heating up, media exposure may be associated with perceived infection, which was correlated with vaccination desire. In W3's post-lockdown period, although infections surged, people who were newly released from harsh quarantine seemed to keep an optimistic mood, thinking a quick infection might be the best immunization tool against the virus and hence risk information cannot motivate vaccination intention. Like knowledge, risk perception as a cognitive-oriented mediator is also contingent on context and subject to constraints.

5.3 Nationalism and trust: the more powerful affective/attitudinal-oriented mediators

As affective/attitudinal-oriented mediating associations, nationalism and trust in scientists showed effective and more consistent mediating associations in most rounds of our surveys. This is consistent with the findings of Wang et al. (2019) that in a collectivist culture, nationalism and trust in authority are significantly associated with public behaviors. In particular, nationalism as a stable, collectively associated affective/attitudinal mediator highlights how media narratives shaped by an authoritarian sociopolitical context were correlated with the Chinese public's behavioral decisions.

Trust in scientists significantly mediated the relationship between media exposure and vaccination intention in W1 and W3, but not in W2. One possible explanation is that during the initial vaccine rollout and the post-lockdown period, media coverage readily reinforced the credibility of scientists, enabling individuals to rely on this trust when making decisions. In contrast, in W2, the perceived authority of scientists was weakened by heated public debates among experts over whether zero-COVID policy or co-existence with the virus was a better strategy.

Taken together, nationalism and trust in scientists as affective/attitudinal-oriented factors have showed stronger mediating associations between media exposure and behaviors than knowledge and perceived risk, which are cognitive-oriented mediators. Given the unique social context of the COVID-19 pandemic, we cannot make such judgments in all scenarios, but this

result remains significant as a policy reference for major public health emergencies.

6 Conclusion

We revealed that nationalism and trust in scientists as affective/attitudinal-oriented mediators played an important role in mediating media effect on vaccination intentions, while the effects of knowledge and perceived risk as cognitive-oriented mediators were more contextually dependent. The roles of these mediators, however, can vary in accordance with concrete information environment, as indicated by China's changing COVID-19 pandemic control measures. This study also suggests that understanding the process of media effect as a division between affective/attitudinal-oriented and cognitive-oriented factors may be particularly useful in a context featuring the collective mobilization of human behaviors.

6.1 Theoretical contributions

Drawing on key insights from information-processing theories such as ELM (Petty and Cacioppo, 1986) and HSM (Chaiken et al., 1989), this study advances media effects research by not only distinguishing between cognitively oriented and affective or identity-based mediating pathways but also examining how these mechanisms evolve over time in response to shifting sociopolitical contexts. It further proposes that the relative influence of these mediators may change across different contexts, potentially reflecting variations in individuals' cognitive resources and attentional priorities. By situating the analysis within China's unique media environment, the study illustrates how state-driven narratives can amplify affective mediators—such as nationalism—thereby shaping public health behaviors through emotionally charged pathways. In doing so, it extends the understanding of how context modulates health communication effects (Cohen and Babey, 2012) and underscores the importance of integrating temporal and cultural dimensions into theoretical models of media influence.

Another significant theoretical contribution, especially relevant to scholars of China studies, lies in the study's illumination of the psychologically coercive dimension of state-led health mobilization. The imposition of stringent pandemic control measures substantially curtailed rational individual deliberation—manifested in knowledge-based information processing and cognitively demanding risk assessments—and instead channeled public responses toward more emotional and attitudinal pathways, such as heightened trust in scientists and intensified nationalism. While such mobilization can be an efficient crisis control strategy, it jeopardizes citizens' informed choices and their rational calculation (Luo et al., 2024).

6.2 Practical implications

Health communication should be staged and context-sensitive and should strategically emphasize stable affective mediators—such as nationalism and trust in scientists—to maintain consistent compliance across different stages of a health crisis while adjusting

the use of information and risk messages in accordance with evolving phases of the crisis. When policy signals are coherent and mobilization is strong, campaigns can legitimately lean on collective-identity frames (e.g., national solidarity) and trusted authorities to drive compliance. Pair these cues with concise, credible risk/efficacy facts to avoid overclaiming and reactance. During periods of expert discord or rapid policy change, simplifying guidance, aligning expert messages, and foregrounding transparent evidence can help stabilize trust.

At the same time, cognitive-oriented mediators should be actively leveraged during transitional periods, when individuals are more susceptible to misinformation or uncertainty. Such an approach enables communicators to reinforce collective heuristics while also engaging individual reasoning processes, thereby promoting sustainable protective behaviors. This balance is particularly critical in collectivist contexts, where appeals to shared identity can be powerful, but must be complemented with clear, credible information to avoid overclaiming or undermining the perceived validity of health measures (Lubell and Scholz, 2001). Otherwise, the strategy highly relying on trust in experts may be backfired when the authorities themselves failed to reach a consensus, as evidenced in the second wave of survey in this study featured with heated debates over zero-COVID.

6.3 Limitations of the study and future direction

There are some apparent limitations. First, although this study conducted longitudinal comparisons, the timeframe is still relatively limited, failing to fully cover post-pandemic periods. Therefore, the current study cannot be considered to have revealed a generalizable rule regarding “normal” vaccination intention and its contributing factors. Even in China, in other public health settings, such as flu shots, where the state intervention is not so strong (Zhang et al., 2017), the pattern may also vary.

Second, the non-quantification of context limits formal tests of antecedent or moderation effects. So, future research could incorporate time as a dummy variable to explicitly model these roles.

Then, the cross-sectional surveys examined in this study should be supplemented by experimentally designed studies which manipulate different mediated messages to observe their effects on public health decision-making. Other potential mediating variables, such as social norms and group identity, should also be explored to understand the full impact of media exposure on health behaviors.

Also, due to the limited number of items in the existing scale, PROCESS may not fully account for measurement error in multi-item constructs, potentially attenuating path estimates compared to SEM. Future research should consider SEM for latent variable modeling when all constructs are multi-item, allowing simultaneous error adjustment and potentially stronger causal inferences. Another limitation is the absence of vaccine knowledge items in W2, which hampers the direct comparability of mediation effects over time and may introduce bias in interpreting contextual variations in cognitive-oriented pathways.

Lastly, although this study distinguishes cognitively demanding mediators from affective or identity-based mediators by drawing on the fundamental duality of human information processing suggested by models such as the ELM and HSM, this categorization should not be interpreted as a literal mapping onto these theories. Central or systematic processing can sometimes incorporate affective or attitudinal cues—such as trust in scientists or nationalism—whereas peripheral or heuristic processing may involve cognitively effortful elements, including knowledge updating or risk evaluation. Thus, our findings illustrate a pragmatic distinction useful for understanding the mechanisms by which media affect behavior at the societal level. Similar to the ELM and HSM themselves—which provide metaphorical accounts of information processing rather than direct physiological observations—our framework offers an interpretive perspective for organizing the mechanisms through which media shape health behaviors. Future studies employing experimental or psychophysiological methods may help validate or refine these pathway distinctions and further illuminate how cognition and affect dynamically interact in media-driven decision-making.

Data availability statement

The database supporting the conclusions of this article is not publicly available due to ongoing analysis. Requests regarding the database can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by School of Communication at Soochow University. Since the Chinese social sciences discipline does not have a dedicated ethics committee, the survey ethics review approved by the leadership of the School of Communication at Soochow University, with which both the first author and corresponding author are affiliated as the research was conducted, was used in lieu of a professional IRB. 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

RZ: Methodology, Software, Writing – original draft, Conceptualization, Writing – review & editing. HJ: Conceptualization, Writing – review & editing, Writing – original draft, Formal analysis. FW: Conceptualization, Writing – review & editing. AC: Writing – review & editing. XL: Methodology, Writing – review & editing.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that Generative AI was not used in the creation of this manuscript.

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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.2025.1708185/full#supplementary-material>

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