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Twice-exceptional students: a systematic review to outline the distinctive characteristics through a multidimensional lens

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Introduction: Twice-exceptionality can be described as a complex interaction between giftedness and one or more co-occurring challenges. Existing literature indicates that this coexistence may result in the inhibition of some characteristics typically associated with each condition when considered in isolation, the exacerbation of others, or the identification of new traits. However, limited data are available on this complex interplay, due to the small number of empirical studies conducted in this field, the difficulty in recruiting large samples, and the heterogeneous nature of the profiles investigated. This systematic review aims to identify the distinguishing characteristics of twice-exceptionality emerging from empirical studies conducted between January 2013 and January 2025.
Methods: Qualitative, quantitative, and mixed-methods studies were included and analyzed within a convergent integrated framework. Data were coded using MAXQDA software and thematically organized into six domains of functioning.
Results: Findings revealed some significant differences between twice-exceptional students and control groups consisting of gifted peers, students with clinically diagnosed challenges, and typically developing students. In addition, some case studies confirmed persistent traits either associated with giftedness or with challenges that appear to endure despite their coexistence.
Discussion: The findings suggest the need to adopt a personalized approach that account for the dynamic interplay between high potential and challenges, supporting more accurate identification and effective intervention.
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KEYWORDS

twice-exceptional students, distinctive characteristics, domains of functioning, holistic approach, systematic review

1 Outlining the blurred and open borders of twice exceptionality

The initial response to a student experiencing difficulties is often an attempt to establish a diagnosis, a conceptual framework of meaning within which the signs of their struggle may be interpreted and confined. Conversely, children demonstrating extraordinary abilities are often identified as having high potential or as being gifted. Such a dichotomous approach seems to be the preferred method for identifying and addressing differences emerging in our contexts. However, the dynamics underlying individual behavior cannot always be clearly ascribed to a single personal factor that may—more or

less evidently—affect functioning (Canevaro, 2006, 2017). Therefore, the frameworks of meaning that lead to an authentic understanding of human functioning seem to be inherently blurred and open. Such boundaries imply the need to broaden one's perspective to include the coexistence of seemingly mutually exclusive conditions in the possible manifestations of reality.

This interpretive leap is necessary to regard twice-exceptionality as the result of a unique set of circumstances (Baldwin et al., 2015; Baum et al., 2021; Dare and Nowicki, 2015; Gilman and Peters, 2018; Pfeiffer, 2015; Reis et al., 2014). Twice-exceptional students (2e) are commonly described as individuals who demonstrate, or have the potential to demonstrate, high levels of ability or creativity in one or more domains (National Association for Gifted Children, 2019)—including mathematics, science, technology or other areas of human productivity—while simultaneously experiencing a condition of disability or special educational need due to one or more disorders or deficits (Assouline et al., 2006; Baldwin et al., 2015; Baum et al., 2014; Foley-Nicpon and Kim, 2018; Reis et al., 2014). Although this duality innately characterizes twice-exceptionality, recent studies have highlighted the need to go beyond a fragmented conceptualization of the phenomenon that considers such two or more interacting factors to be independent rather than interconnected. Giftedness may co-occur with multiple clinically significant conditions of challenge, which may not only result in a new different interpretive framework (Kircher-Morris, 2021; Lovecky, 2023; Reis et al., 2014; Renzulli and Gelbar, 2019), but can also make it difficult to identify the typical characteristics of single interacting factors when considered in isolation. This highlights the need to explore the complexity of the phenomenon, seen as a dynamic and integrated interaction between high potential and challenges.

Blurred boundaries are also essential to addressing the heterogeneous nature of twice-exceptional students' profiles. The asynchrony characterizing a gifted child's cognitive, social, emotional, and physical development increases when high levels of intelligence coexist with major weaknesses (Silverman, 1998, 2009, 2021). Asynchrony may be internal, when it refers to a mismatch among the different dimensions of a child's development, or external, when it describes the mismatch between a child's development and that of their peers. Both meanings of the concept of asynchrony significantly contribute to hindering the fulfillment of 2e students' need for belonging, as well as making it more challenging to conduct formal assessments, thereby increasing the risk of bias (Burger-Veltmeijer et al., 2016).

Firstly, asynchrony could play a fundamental role in relational dynamics between peers. On a cognitive level, twice-exceptional students may be perceived as being either too intelligent or not clever enough by their classmates and other gifted students, respectively (Cormier, 2022). On the other hand, they may consider their peers' behavior inappropriate, due to it hindering their making rapid progress in learning (Gómez-Arízaga and Conejeros-Solar, 2021). In terms of social and emotional functioning, twice-exceptional students may behave in a more mature way than expected for their age, while sometimes displaying behaviors typical of younger children (Lovecky, 2023). This complexity makes it challenging to address their need for belonging, which should not be interpreted as merely being part—either formally or informally—of homogeneous social groups, but rather as finding balance in the participation in the life and evolving dynamics of the world (Canevaro, 2015). When such a need remains unmet, an individual may attempt to bridge the perceived gap between themselves and others by adopting strategic behaviors aimed at demonstrating social competence. However, sacrificing authenticity in order to fulfill one's need for belonging could significantly hinder identity development (Silverman, 1998).

Secondly, the cognitive profiles of twice-exceptional students are characterized by marked discrepancies across different abilities (Foley-Nicpon and Kim, 2018). Although intellectual giftedness is a complex, dynamic, and multidimensional construct (Cornoldi, 2020; Gagné, 2004; Mönks and Katzko, 2005), students still often need to score a minimum of 130 on an intelligence test to be identified as gifted (Montgomery, 2015). Due to the major discrepancies in the profiles of twice-exceptional children and teenagers, consensus has been reached on the need to use a threshold score of 120 for this group of students (Beckmann and Minnaert, 2018; Lovett and Sparks, 2013; Maddocks, 2020; Silverman, 1989). However, owing to both the inconsistent scores achieved across different abilities that affect total scores and the frequent use of the Full Scale Intelligence Quotient (FSIQ) as a sole criterion for selection, numerous twice-exceptional students are not identified as such. As a result, they are excluded from opportunities to participate in enrichment and talent development programmes (Baum et al., 2021; Crim et al., 2008), with their educational needs failing to be recognized and met. Furthermore, major discrepancies are often found in the Working Memory Index and Processing Speed Index (Sparaciari and Zanetti, 2023). Not only are these the most significant weaknesses in the most investigated twice-exceptional profiles, which include giftedness in co-occurance with either Specific Learning Disabilities (SLD), Attention Deficit Hyperactivity Disorder (ADHD), or Autism Spectrum Disorder (ASD), but they are also connected—to a lesser degree—with the level of intelligence of the general population (Cornoldi et al., 2023). Recent meta-analytic evidence confirms these discrepancies: 2e individuals with learning disabilities tend to perform lower than their gifted peers in Full-Scale IQ, working memory, and processing speed (Atmaca and Baloglu, 2022). In contrast, among individuals with giftedness and ADHD, only processing speed differs significantly from that of their gifted peers (Atmaca and Baloglu, 2022). These findings provide further evidence that relying on a single IQ score in the identification process may be misleading, as composite indices tend to obscure the distinctive configuration of strengths and weaknesses that characterizes twice-exceptionality. This explains why the General Ability Index is usually considered the most reliable measure to estimate a twice-exceptional student's cognitive abilities (Assouline et al., 2010). Yet, it remains difficult to go beyond the use of IQ as the sole criterion when assessing a multi-component construct such as intellectual giftedness or—to a greater extent—twice-exceptionality. An approach should be adopted that may go beyond the assessment of an individual's intellectual abilities, integrating this necessary—but insufficient—indicator with other evaluative dimensions, including creative skills, motivational factors, critical thinking, and caring thinking, among others. Nevertheless, limited attention has been paid to the need for a paradigm shift toward dynamic assessment of

learning potential (Tiekstra et al., 2016), in contrast to the persistent reliance on static approaches predominantly anchored in IQ scores. In support of this argument, Meijer (2001) demonstrated that dynamic assessment procedures are less susceptible to bias than static measures, particularly in relation to test anxiety and low self-confidence. Ultimately, an IQ-centered perspective is grounded in a primarily clinical approach to analyzing the phenomenon, thereby highlighting the need for complementary pedagogical *care*.

Finally, the interaction between co-occurring factors may affect an individual's functioning to varying degrees, becoming a dynamic that, together with contextual factors, can impact observable outcomes. Consequently, the three well-known outcomes of the masking effect may occur (Brody and Mills, 1997; McCoach et al., 2001): challenges may obscure the identification of giftedness; giftedness may contribute to reducing difficulty, thereby concealing disability; or each condition may mask the other. In such cases, a student's needs may not be recognized, as they would be able to follow the class curriculum and achieve results that apparently meet expectations, despite their performing below their potential (Baum et al., 2021). The interaction of these factors can lead to the inhibition of certain characteristics typically associated with each condition when considered in isolation, the exacerbation of others, and the emergence of entirely new behavioral traits. This dynamic blur the boundaries between diagnostic and evaluative frameworks which were once considered mutually exclusive (Kaufman, 2018). Although not a radical shift, this openness facilitates the intertwining, movement, and reshaping of these still essential boundaries.

2 Lights and shadows: reviews on the distinctive characteristics of twice exceptional students

Only a limited number of studies have examined in depth the distinctive outcomes emerging from the coexistence of giftedness and challenge. In a recent systematic review, Beckmann and Minnaert (2018) investigated the non-cognitive characteristics of gifted students with specific learning disabilities (G/LD). As part of their broader analysis, they compared G/LD students with three control groups—gifted students, students with learning disabilities, and typically developing peers—to determine whether G/LD students exhibited a distinct constellation of characteristics. Findings suggested a potential uniqueness, revealing significant differences in terms of self-efficacy, creativity, coping strategies, and metacognitive skills. However, the authors urged caution in interpreting these results due to the limited sample sizes and the inclusion of control groups in only seven of the studies reviewed.

A narrative review conducted by Foley-Nicpon et al. (2011) examined the characteristics of twice-exceptional students within the most frequently investigated profiles—gifted students with ASD, ADHD, or SLD—and concluded that no single diagnostic profile of twice-exceptionality can be identified, although recurrent patterns may serve as meaningful indicators of the coexistence of high potential and disability.

More recently, Atmaca and Baloglu (2022) conducted a three-level Bayesian meta-analysis comparing Wechsler scores of twice-exceptional and gifted learners. Based on 15 studies, they found that twice-exceptional students with learning disabilities scored lower on Full-Scale IQ, working memory, and processing speed, whereas those with ADHD differed from gifted peers only in processing speed. These results highlight the need to move beyond linear models of ability assessment.

The present review therefore seeks to advance this line of inquiry by examining how the interaction between two or more co-occurring conditions gives rise to functional configurations and recurring patterns across different functioning domains.

3 Aims of the study

This study aims to explore the distinguishing characteristics of twice-exceptionality that have recently been identified through empirical research. The scientific literature indicates that the coexistence of intellectual giftedness and disabilities may give rise to a distinctive constellation of characteristics. However, the data supporting and elucidating these findings remain limited, due to the small number of empirical studies carried out on the topic, the difficulty in recruiting larger samples, and the high heterogeneity both within and between individual profiles (Beckmann and Minnaert, 2018; Foley-Nicpon, 2021). It seems crucial to investigate how a challenge affects the expression of a student's potential and how that potential may help them to cope with difficulties, influencing their overall functioning. This analysis adopts a holistic approach, in an attempt to examine the distinguishing characteristics related to multiple dimensions of a student's functioning, at a cognitive, metacognitive, academic, emotional, social and physical level.

To this end, the research question was formulated using the SPIDER tool, which has been identified as the most appropriate and effective framework for systematic reviews seeking to explore behaviors and experiences within complex and heterogeneous phenomena (Cooke et al., 2012). Given the inclusion of qualitative, quantitative, and mixed-methods studies, no restrictions were imposed on either the methodological approach or the research design. These choices resulted in the following research question:

> RQ: *Is it possible to identify (E) distinctive characteristics (PI) in twice-exceptional students (S)?*

4 Method

The study analyses empirical research published in scientific journals between January 2013, the year of publication of the DSM-5, and January 2025. The inclusion criterion based on the publication of the DSM-5 (American Psychiatric Association, 2013) ensured terminological and conceptual consistency across studies, as diagnostic categories were redefined in terms of dimensional continua rather than categorical boundaries. Furthermore, given the wide variability of diagnostic criteria used in the assessment of one or more areas of difficulty, the choice of this time frame aims to ensure greater comparability between the results. In order

to provide a transparent and accurate account of the review process, the study has been developed according to the PRISMA guidelines (Page et al., 2021).

4.1 Eligibility criteria

The papers included in this systematic review had to meet the following eligibility criteria.

(S)ample: the studies were required to include twice-exceptional students up to 19 years of age. Students were considered gifted if they had achieved a score of 120 or higher on the Full Scale Intelligence Quotient, or on at least one of the two composite indexes — the General Ability Index (GAI) or the Cognitive Competence Index (CCI) — according to the Wechsler Intelligence Scale for Children (WISC), or equivalent indices from other standardized cognitive assessments. Although this model has some limitations as already underpinned, it remains, thus far, the most widely recognized in the scientific literature to identify twice-exceptional students. Notwithstanding the aforementioned considerations, it has been adopted in this study to allow comparability with existing research. The students also had to be formally diagnosed with a disorder or deficit, based on specific criteria used in their country of residence or according to the DSM-5. This combination of criteria ensures consistency in the analysis and interpretation of findings.

(P)henomenon of (I)nterest: this analysis adopts a holistic approach, in an attempt to examine the distinguishing characteristics related to multiple dimensions of a student's functioning, at a cognitive, metacognitive, academic, emotional, social, and physical level.

(D)esign: studies adopting any type of research design were eligible for inclusion, such as interviews, focus groups, case studies, observations, experiments and correlational studies.

(E)valuation: the studies had to provide sufficient details on the experiences, perspectives, and processes of evaluation and identification, thereby enabling an analysis of the phenomenon of interest.

(R)esearch type: quantitative, qualitative, or mixed-methods empirical studies were eligible for inclusion.

Informants: the studies could involve a wide range of informants, including twice-exceptional students themselves, their parents, teachers and peers.

Context: no restrictions were imposed on the type of setting in which the studies were conducted.

Publication: studies published over the last 12 years, from 2013 to 2025, were eligible for inclusion.

Language: studies conducted in any country were eligible for inclusion, provided the papers were written in English.

4.2 Information sources and search strategy

This review included databases selected for their relevance in the field of educational sciences: Web of Science, SCOPUS, EBSCO Education Source, and ERIC (Table 1). The most recent search was conducted at the end of January 2025. Filters were applied with respect to the publication year (2013–2025), language (English), document type (peer-reviewed journal articles), and search fields.

In line with the requirements of a systematic approach aimed at ensuring comprehensive and reliable results, key terms were first identified and subsequently expanded to include synonyms and terminological variations.

4.3 Selection process

The identified records were imported into the Rayyan platform, a widely adopted platform for conducting systematic reviews in education (Zhang and Neitzel, 2024). The removal of duplicates and the initial screening of titles and abstracts were performed manually using the platform. Its use ensured greater transparency in the selection process by the researchers involved. This was followed by a second screening phase, in which the contributions were fully examined and assessed based on their adherence to the defined eligibility criteria. The reasons for the exclusion of studies were systematically recorded.

4.4 Data analysis and collection process

The analysis was conducted using *MAXQDA 24*, within a convergent integrated mixed methods approach (Stern et al., 2020). Quantitative findings were qualitized through paraphrasing, allowing for their integration with data from qualitative studies. The mixed-methods studies were analyzed in a dual-analytic approach, with quantitative components contributing to the qualitized dataset and qualitative components incorporated into the thematic synthesis. All results sections from the included studies were systematically analyzed through a two-dimensional coding framework combining the types of attributes—enduring gifted traits, enduring challenge traits, masking and compensation, and coexistence—with the domains of functioning—cognitive, academic, metacognitive, emotional, social, and physical. This structure enabled the simultaneous documentation of each coded segment according to its functional domain and phenomenological configuration.

Each subcode was assigned to the predominant domain in which it most clearly emerged within the empirical context. Nonetheless, given the ecological and interdependent nature of developmental processes, several characteristics were observed to traverse multiple domains, underscoring the inherently systemic nature of human functioning. In twice-exceptional profiles, these interrelations become particularly salient, offering teachers, specialists and parents valuable insights into how a student's functioning may manifest across domains.

The coding process revealed four overarching functional configurations that recur across the literature. *Enduring gifted traits* refer to characteristics conventionally associated with high intellectual potential that remain discernible despite challenges. *Enduring challenge traits* describe characteristics typically linked to challenges that persist in twice exceptional students. *Masking and compensation* denote phenomena in which one condition obscures or counterbalances the other. Finally, *coexistence*, or *emergent traits*, encompasses characteristics

TABLE 1 Included databases.

Database	Field	Language	Publication type	Year
Web of Science	Topic	English	Article	2013–2025
SCOPUS	TITLE-AB-KEY	English	Article	2013–2025
Education Source—EBSCOHost	All fields	English	Academic papers	2013–2025
ERIC (via EBSCO)	All fields	English	Academic papers	2013–2025

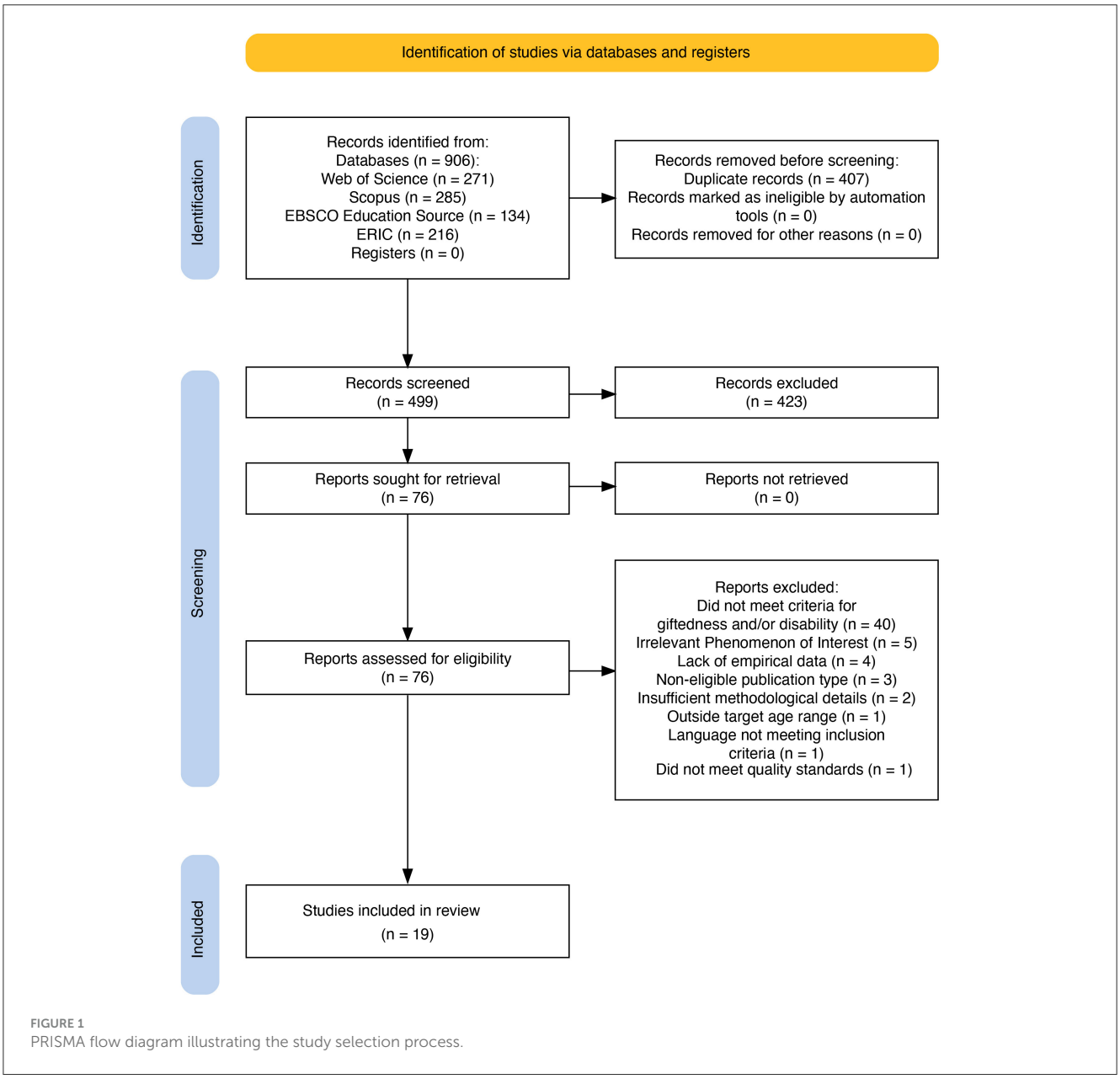

FIGURE 1
PRISMA flow diagram illustrating the study selection process.

that arise specifically from the dynamic interaction between giftedness and disability. The boundaries between these configurations are often fluid, as many characteristics may cut across multiple types.

Analyses of code co-occurrence and proximity within *MAXQDA* facilitated the identification of recurrent relationships among codes.

5 Results

5.1 Study selection

The search string yielded 906 results. The flow diagram (Figure 1) provides detailed information on the number of records identified, the reasons for study exclusion, and the number of

studies included. The initial screening based on titles led to the exclusion of 407 studies. Research investigating the association of giftedness with variables related to ethnicity, gender identity, and/or sexual orientation was not included in this review, as these factors are not considered determinants for defining a condition of disability according to the previously established criteria. At the end of the selection process, 19 empirical studies were included.

5.2 Study characteristics

The characteristics of the selected studies are summarized in Table 2. The methodological quality of both qualitative and quantitative studies was evaluated using the Standard Quality Assessment Criteria (Kmet et al., 2004). For the mixed methods study, quality appraisal was conducted using the Mixed Methods Appraisal Tool (Hong et al., 2018). Only ten of the included studies incorporated control groups, allowing for a systematic comparison of the distinguishing characteristics of the examined samples.

Among the 76 studies that passed the initial screening phase, 40 were excluded during the full-text assessment stage, as they did not meet the established criteria for evaluating giftedness or challenges. In addition, studies were excluded if they presented insufficient methodological or empirical information, focused on age groups outside the predefined range, were published in languages other than English, or did not constitute empirical research. The studies ($n = 5$) that did not align with the phenomenon of interest addressed topics related but not central to the research focus, such as structural aspects of the educational system, predictive models of developmental trajectories, and the influence of cultural factors on family support. In cases where the eligibility of a study remained unclear, the authors were contacted to obtain clarifications. The included studies employed qualitative (7), quantitative (9), and mixed-methods (3) approaches.

The most frequently investigated profiles were those involving the coexistence of giftedness with ADHD, ASD, and SLD. Only one study analyzed Developmental Coordination Disorder, while two studies included samples with diverse challenges, such as Central Auditory Processing Disorder, Sensory Processing Disorder, Obsessive-Compulsive Disorder, Oppositional Defiant Disorder, Generalized Anxiety Disorder, Tourette Syndrome, and Major Depressive Disorder.

5.3 Summary of the findings

In most cases, the analysis of the studies included in this review led to identifying significant differences between twice-exceptional students and control groups consisting of gifted students, students with clinically diagnosed challenges, or typically developing students. Persistent traits emerged, either associated with giftedness or with challenges, that appeared to endure despite their coexistence.

To capture this complexity, the synthesis of results is organized across six previously identified domains of functioning, providing a multidimensional representation of the empirical findings reported in the literature.

5.3.1 Domain one: cognitive functioning

The cognitive domain emerged as one of the most central dimensions within the literature on twice-exceptionality, delineating a configuration in which strengths and challenges coexist within a complex and dynamic interplay. Across the reviewed studies, cognitive functioning was consistently described as characterized by high intra-individual variability, confirming that twice-exceptionality rarely manifests as a homogeneous cognitive pattern but rather as an uneven constellation of abilities.

Comparative analyses consistently revealed significant intra-individual discrepancies, as well as inter-group differences between twice-exceptional students and various comparison groups (Al-Hroub, 2013, 2020, 2021; Cornoldi et al., 2023; Desmet et al., 2024; François-Sévigny et al., 2022; Melogno et al., 2015). Al-Hroub (2013, 2020, 2021) found that learners identified as gifted with learning disorders exhibited greater score dispersion across subtests compared to peers with learning difficulties alone, suggesting that the defining characteristic of their cognitive configuration lies in variability rather than uniformity. Similarly, Cornoldi et al. (2023) observed that, among students identified as gifted with ADHD, the discrepancies between the General Ability Index (GAI) and the indices of processing speed and working memory were nearly twice as large as those observed in the ADHD-only group. The authors interpreted this pattern as reflecting an intermediate cognitive profile, where the pronounced weaknesses in the latter indices appeared more attributable to ADHD than to giftedness, in which such declines are generally milder.

Within this uneven structure, several studies identified consistent areas of strength, particularly in abstract reasoning, reflective thinking, verbal abilities and creative problem solving (Al-Hroub, 2013; Baum et al., 2014; Dare and Nowicki, 2015; Hidalgo, 2018; Huey, 2024; Lo and Yuen, 2014; Ronksley-Pavia et al., 2019). These abilities often coexisted with rapid learning (Al-Hroub, 2013, 2021; Desmet et al., 2024; Holmgren et al., 2023; Ronksley-Pavia et al., 2019) and a clear preference for complex, self-directed, and intellectually demanding tasks, reflecting high levels of epistemic curiosity and intrinsic motivation for cognitive challenge (Al-Hroub, 2013, 2020; Baum et al., 2014; Dare and Nowicki, 2015; Hidalgo, 2018; Lo and Yuen, 2014). Such traits appeared to function as compensatory resources that enable students to engage effectively with demanding conceptual content despite executive functions challenges (Holmgren et al., 2023).

Conversely, persistent weaknesses were reported in areas related to automatization and the sequential organization of cognitive output. Difficulties in processing speed, working memory, and short-term recall emerged as the most frequently documented challenges (Al-Hroub, 2013, 2021; Cornoldi et al., 2023; Desmet et al., 2024), alongside specific deficits in language, literacy and auditory processing skills (Al-Hroub, 2013, 2021; Dare and Nowicki, 2015; Hidalgo, 2018; Melogno et al., 2015). For twice-exceptional students, these patterns often are associated to slower consolidation or retrieval of information (Desmet et al., 2024) and reduced fluency in written or verbal production (Al-Hroub, 2013, 2021; Dare and Nowicki, 2015; Holmgren et al., 2023).

A further, though more variably reported, trait emerging across studies concerned patterns of cognitive rigidity (Baum et al., 2014;

TABLE 2 Characteristics of the studies included in the systematic review (see Supplementary material for the complete version).

Study	Sample	Area of challenge	Instruments	Country
Al-Hroub (2013)	$n = 30$ MG/LDs; $n = 22$ Average-LDs Age: 10–11 years	SLD	WISC-III; Group of Perceptual Skills Tests; Diagnostic Scale of Arabic Language Basic Skills; Dynamic Math Assessment; Documentation; Interviews with teachers and parents	Jordan
Al-Hroub (2020)	$n = 30$ MG/LDs; $n = 22$ Average-LDs Age: 10–11 years	SLD	WISC-III	Jordan
Al-Hroub (2021)	$n = 30$ MG/LDs; $n = 22$ Average-LDs Age: 10–11 years	SLD	WISC-III; Group of Perceptual Skills Tests; Diagnostic Scale of Arabic Language Basic Skills; Dynamic Math Assessment	Jordan
Baum et al. (2014)	$n = 10$ 2e students Age: 11–13 years	ADHD, ASD, OCD, ODD, GAD, Tourette's Syndrome, Major Depressive Disorder	Retrospective, semi-structured video and audio interviews with students, teachers and parents; Focus group with students and parents; Student Portfolio	USA
Cederberg et al. (2018)	$n = 23$ parents of 2e-ASD; $n = 60$ parents of non-gifted with ASD Age: 4–17 years	ASD	ASSQ; SRS	USA
Cervantes et al. (2022)	$n = 44$ gifted; $n = 10$ 2e-ADHD; $n = 15$ ADHD; $n = 11$ control group Age: 7–10 years	ADHD	CPT-II; BANFE-2	Mexico
Cornoldi et al. (2023)	$n = 82$ 2e-ADHD; $n = 680$ Average-ADHD; $n = 129$ 2e-SLD Age: 6–16 years	ADHD	WISC-IV	Italy
Dare and Nowicki (2015)	$n = 1$ parent of a child with 2e-SLD (Jessica) Age: grade 6	SLD	Interview	Canada
Dempsey et al. (2021)	$n = 51$ 2e-ASD; $n = 51$ Average-ASD $n = 51$ Intellectual disability-ASD Age: 4–17 years	ASD	VABS-II	USA
Desmet et al. (2024)	$n = 25$ 2e-DCD Age: 6–17 years	DCD	WISC-V; BOT-2; SRS-2; ToM-R; RCFT; interviews	Belgium
François-Sévigny et al. (2022)	$n = 174$ parents and $n = 92$ teachers of: $n = 35$ 2e-ADHD; $n = 35$ ADHD; $n = 22$ Gifted Age: 6–16 years	ADHD	WISC-V; Conners 3	Canada
Gomez et al. (2020)	$n = 18$ 2e-ADHD; $n = 350$ ADHD; $n = 15$ Gifted; $n = 124$ control group Average age: 10–12 years	ADHD	ADISC-IV-P; SWAN	Australia
Hidalgo (2018)	$n = 1$ parent of: $n = 1$ 2e-ADHD-SLD student Age: Year 2 High School (USA)	SLD, ADHD	Semi-structured interview	USA
Holmgren et al. (2023)	$n = 1$ 2e-ADHD n = 2 guardians Age: Year 7 (Sweden)	ADHD	Semi-structured individual interviews (student and guardians)	Sweden
Huey (2024)	$n = 1$ 2e-ASD $n = 1$ 2e-ASD-ADHD Age: 13 years; 6 years	ASD, ADHD	WISC-V; CARS 2-HF; GARS-3; ASRS; D2 Test of Attention; CTMT; ADHDT-2; Conners CI-Self; CPRS–R:L; clinical observation; unstructured interview	Malaysia
Lo and Yuen (2014)	$n = 3$ 2e-SLD Age: 15–19 years	SLD	Semi-structured interview	China
Melogno et al. (2015)	$n = 1$ 2e-ASD student Age: 9 years	ASD	TAM-2; TCM	Italy

(Continued)

TABLE 2 (Continued)

Study	Sample	Area of challenge	Instruments	Country
Ronksley-Pavia et al. (2019)	$n = 8$ 2e students Age: 9–16 years	CAPD, Anxiety, ASD, SLD, ADHD, Sensory Processing Disorder	Semi-structured interviews; parent interviews; school reports; specialist assessments; memory box artifacts	Australia
Rubenstein et al. (2015)	$n = 3$ 2e-ASD (Colton, Pete, Manny) Age: 7–12 years	ASD	Semi-structured interviews	USA

Holmgren et al., 2023; Ronksley-Pavia et al., 2019; Rubenstein et al., 2015). These students often exhibited a marked preference for structure, predictability, and rule-based contexts, tendencies that appeared to limit their flexibility and capacity to adapt to novel or ambiguous tasks.

5.3.2 Domain two: metacognitive functioning

Patterns of asymmetry emerge not only in cognitive and academic performance but also within the metacognitive processes that sustain them, suggesting that the quality of self-regulation, rather than ability alone, often plays a decisive role in shaping learning outcomes. Metacognitive functioning thus emerges as an adaptive system in which self-awareness, executive regulation, and emotional control interact dynamically, a process often characterized by imbalance and internal tension.

A recurrent theme across studies concerns the coexistence of advanced self-reflective awareness and uneven self-regulatory control. Many twice-exceptional learners demonstrate an accurate understanding of their own cognitive profiles—acknowledging, for instance, their distractibility, impulsivity, or organizational weaknesses—yet experience persistent difficulty in sustaining effort, regulating impulses and maintaining focus across tasks (Baum et al., 2014; Gomez et al., 2020; Holmgren et al., 2023; Huey, 2024). This heightened self-awareness can paradoxically intensify frustration, fatigue, and emotional distress when learners are unable to align intentions with outcomes (Dare and Nowicki, 2015). Holmgren et al. (2023) describe how moments of intense hyperfocus may be followed by intense fatigue, reflecting the cost of sustained compensatory effort.

Furthermore, twice-exceptional learners often display the capacity to develop autonomous compensatory strategies that leverage areas of strength to maintain functional performance despite underlying weaknesses (Desmet et al., 2024; Lo and Yuen, 2014). Students were reported to rely on visual–spatial mediation, reflective organization, and individual working modalities to circumvent executive demands or processing challenges. However, difficulties in planning, organization, and sequencing hinder the translation of complex conceptual thinking into accomplished tasks. As a result, learners' high-level reasoning and originality may remain underrepresented in their tangible academic output. Such compensatory processes may support sustained engagement in high-level reasoning, yet often entail considerable effort, accompanied by fatigue and alternating episodes of distractibility (Holmgren et al., 2023; Huey, 2024).

Metacognitive challenges also extend to the emotional and social domains. Learners frequently report low self-confidence, diminished self-esteem, and feelings of hopelessness, arising both from academic struggles and from difficulties in social interaction (Baum et al., 2014; Dare and Nowicki, 2015; Ronksley-Pavia et al., 2019). Indeed, among the most frequently emerging co-occurrences, attentional control weaknesses and hyperactivation appeared as recurrent elements often intertwined with emotional dysregulation and social challenges. Furthermore, challenges in emotional regulation were consistently linked to feelings of hopelessness, disengagement, and heightened sensitivity.

At the same time, traits commonly associated with giftedness, such as boredom, under-stimulation, and disengagement, tend to emerge when learning environments fail to provide sufficient cognitive challenge (Baum et al., 2014; Desmet et al., 2024; Holmgren et al., 2023; Lo and Yuen, 2014; Ronksley-Pavia et al., 2019). Repetitive or overly simple tasks often diminish motivation, thereby undermining self-regulatory engagement (Snikkers-Mommer et al., 2024).

Comparative evidence from subgroup analyses further refines this picture. Cornoldi et al. (2023) observed that within the 2e-ADHD population, inattentive symptoms were more prevalent, whereas hyperactive–impulsive subtype predominated in the ADHD-only group. Conversely, Gomez et al. (2020) found that students with ADHD-only exhibited higher levels of inattention compared to their twice-exceptional peers, while hyperactive–impulsive behaviors were generally comparable between the two groups. However, twice-exceptional students scored higher on three specific items—modulation of motor activity, modulation of verbal activity, and reflective thinking about questions—which may serve as specific distinctive indicators for identifying ADHD in gifted students.

Further evidence from François-Sévigny et al. (2022) indicates that, according to teachers, twice-exceptional students were distinguished from their peers with ADHD-only by a greater propensity to exhibit hyperactive–impulsive behaviors, yet fewer difficulties in learning and executive functioning. However, parent reports diverged, describing greater inattentive behaviors, executive weaknesses, and emotional reactivity, including oppositional and aggressive tendencies that were not consistently observed within school contexts or among gifted peers. These discrepancies highlight the contextual nature of metacognitive regulation, which may vary according to environmental demands.

Finally, Cervantes et al. (2022) explored executive functioning in twice-exceptional and control groups aged 7–10. The considerable variability observed suggests that specific executive components, rather than overarching patterns, may differentiate profiles. Despite ADHD-related challenges, twice-exceptional students appeared to show preserved cognitive flexibility, verbal working memory, verbal fluency, and reaction times in inhibition

tasks. Nevertheless, ADHD appeared to affect inhibitory control, leading to increased response perseveration. However, as executive functions develop over an extended trajectory, the difficulties observed may reflect developmental asynchrony rather than stable deficits and should be interpreted in relation to participants' age (Ferguson et al., 2021; Tervo-Clemmens et al., 2023).

5.3.3 Domain three: academic functioning

Across the reviewed studies, achievement was frequently described as uneven and discontinuous, with notable discrepancies between conceptual understanding and the quality or consistency of academic output (Al-Hroub, 2013, 2021; Baum et al., 2014; Dare and Nowicki, 2015; Desmet et al., 2024; Holmgren et al., 2023; Lo and Yuen, 2014; Ronksley-Pavia et al., 2019). Nonetheless, several studies also documented instances of high academic performance (Baum et al., 2014; Holmgren et al., 2023; Lo and Yuen, 2014; Ronksley-Pavia et al., 2019; Rubenstein et al., 2015). This variability highlights that academic achievement in 2e learners should not be regarded as a stable indicator, but rather as the dynamic outcome of interactions among high potential, regulatory functioning, and contextual responsiveness.

Twice-exceptional students frequently exhibited advanced reasoning abilities, rapid learning, and strong curiosity toward abstract or complex material; however, their performance often declined when required to translate understanding into written or procedural form (Al-Hroub, 2013, 2021; Baum et al., 2014; Dare and Nowicki, 2015; Holmgren et al., 2023). Despite their rapid learning, tasks involving the consolidation of knowledge or skills emerged as a critical point of vulnerability (Desmet et al., 2024). High levels of verbal and mathematical reasoning were frequently accompanied by difficulties in productivity and organization, where thought appeared to encounter a bottleneck at the level of execution. Weaknesses in literacy, graphomotor coordination, or language processing further contributed to variable or inconsistent achievement, even when strong conceptual insight was evident (Al-Hroub, 2013, 2021; Dare and Nowicki, 2015; Desmet et al., 2024; Hidalgo, 2018; Huey, 2024; Lo and Yuen, 2014; Melogno et al., 2015; Ronksley-Pavia et al., 2019).

A related body of evidence highlights the emergence of adaptive and compensatory strategies through which twice-exceptional students sustain functional achievement despite inefficiencies in executive and emotional regulation (Desmet et al., 2024; Holmgren et al., 2023; Lo and Yuen, 2014). As poignantly articulated by one participant, "*I'm always the one who has worked alone. Because otherwise I get like this, 'But my god how unsmart can one be?' and then I just get so impatient in the end and then I just get angry and grumpy*" (Holmgren et al., 2023). These strategies, including selective engagement with complex and autonomous tasks or the use of mental imagery, may help prevent overt failure but often mask the cognitive effort required to sustain performance. Consequently, achievement can appear deceptively average, concealing both potential and difficulty. This masking is further reinforced by under-stimulation and disengagement, frequently reported among students for whom standard curricula do not provide sufficient intellectual challenge. In such contexts, reports of schoolwork being "too easy" or of students "losing interest" (Holmgren et al., 2023, p. 11; Lo and Yuen, 2014, p. 130; Rubenstein et al., 2015, p. 294) illustrate a form of cognitive withdrawal rooted not in disinterest but in the mismatch between high potential and limited opportunities for expression.

5.3.4 Domain four: social functioning

The social domain emerges in the reviewed literature as one of the most heterogeneous and complex dimensions of twice-exceptional functioning. Across studies, it displays the highest density of co-occurrence patterns, in which interaction challenges with peers, emotional dysregulation, internalizing symptoms, and experiences of isolation and stigma appear closely interconnected.

Several studies report difficulties in establishing and maintaining peer relationships, engaging in reciprocal social exchanges, and adjusting communication to group expectations and dynamics (Al-Hroub, 2013; Baum et al., 2014; Dempsey et al., 2021; Desmet et al., 2024; Hidalgo, 2018; Holmgren et al., 2023; Huey, 2024; Lo and Yuen, 2014; Melogno et al., 2015; Ronksley-Pavia et al., 2019; Rubenstein et al., 2015). Although some twice-exceptional students demonstrate advanced verbal abilities, these strengths do not necessarily translate into effective social communication (Huey, 2024; Rubenstein et al., 2015). In some cases, their expressive style may be perceived by peers as overly formal or pedantic, potentially limiting opportunities for reciprocal interaction and social inclusion (Melogno et al., 2015).

Reports of bullying and exclusion are recurrent (Holmgren et al., 2023; Huey, 2024; Ronksley-Pavia et al., 2019), frequently accompanied by social isolation, stigma, and a diminished sense of belonging (Baum et al., 2014; Dare and Nowicki, 2015; Hidalgo, 2018; Huey, 2024; Rubenstein et al., 2015). These dynamics are often interpreted through the lens of asynchronous development, wherein discrepancies across cognitive, emotional, and social domains shape the quality of peer interactions. As a twice exceptional adolescent poignantly expressed, "*I'm stuck in this sort of weird time-warp thing where I'm at the same time younger and older than kids my age*" (Baum et al., 2014, p. 320).

In addition, many learners describe a pervasive sense of being misunderstood or unrecognized for their authentic selves, particularly when giftedness coexists with visible behavioral, emotional, or academic challenges (Dare and Nowicki, 2015; Lo and Yuen, 2014; Ronksley-Pavia et al., 2019; Rubenstein et al., 2015).

Despite these challenges, some studies also report instances of positive social adjustment among twice-exceptional learners (Al-Hroub, 2013; Baum et al., 2014). Some students are able to cultivate meaningful and supportive peer relationships that enhance both organizational functioning and emotional wellbeing (Baum et al., 2014; Desmet et al., 2024; Hidalgo, 2018; Lo and Yuen, 2014), acting as contextual protective factors that foster social confidence and emotional regulation.

Comparative research further elucidates the complexity of social adaptation among twice-exceptional students with co-occurring ASD. Dempsey et al. (2021) examined adaptive functioning trajectories among students with ASD and (1) giftedness, (2) intellectual impairment, or (3) average intelligence.

Better communicative abilities were found to distinguish 2e-ASD students from those with average intelligence. However, findings indicated that, although a decline in communication characterized all the groups, only twice-exceptional students exhibited a significant decline in adaptive functioning over time across all domains examined—communication, socialization, and daily living skills. High cognitive abilities, therefore, do not appear to serve as a protective factor in adapting to social demands or meeting age- and grade-level developmental expectations.

Further findings from Cederberg et al. (2018), based on the comparative dataset of Cholemkery et al. (2014), refine this understanding by examining phenotypic distinctions between gifted students with ASD and their non-gifted peers. The study identified significant group differences in social cognition, social communication, and social motivation. Twice-exceptional students exhibited a greater capacity to interpret social cues and reciprocal behaviors, stronger expressive components of mutual social interaction—such as turn-taking in conversations—and a higher degree of interest and engagement in interpersonal relationships. However, no significant differences were observed in social awareness—which concerns social pragmatics and perspective-taking—or in mannerisms related to restricted or repetitive behaviors. Giftedness thus appears to act as a partial compensatory factor, facilitating the acquisition of certain social skills without fully mitigating underlying social challenges.

5.3.5 Domain five: emotional functioning

The reviewed studies delineate a complex emotional profile characterized by intertwined difficulties in self-regulation, heightened emotional reactivity and recurrent internalizing symptoms (Al-Hroub, 2013; Baum et al., 2014; François-Sévigny et al., 2022; Holmgren et al., 2023; Ronksley-Pavia et al., 2019).

Challenges in emotional self-regulation emerge as a recurrent theme, often reflected in anger, withdrawal, or oppositional and defiant behaviors (Al-Hroub, 2013; Baum et al., 2014; Desmet et al., 2024; Holmgren et al., 2023; Huey, 2024; Melogno et al., 2015; Ronksley-Pavia et al., 2019). In several studies, learners displayed a nuanced awareness of their emotional states yet lacked the regulatory strategies to modulate them effectively. Recurrent internalizing difficulties were widely reported, ranging from anxiety, depressive symptoms, and somatic complaints to more severe manifestations such as school avoidance, panic attacks, and suicidal ideation (Baum et al., 2014; Dare and Nowicki, 2015; Desmet et al., 2024; Hidalgo, 2018; Huey, 2024; Ronksley-Pavia et al., 2019; Rubenstein et al., 2015).

Furthermore, heightened sensitivity emerged as a defining element of this emotional configuration, operating simultaneously as a personal resource and a vulnerability factor (Al-Hroub, 2013; Baum et al., 2014; Hidalgo, 2018; Holmgren et al., 2023). Learners are frequently portrayed as deeply empathic and emotionally attuned, yet prone to overstimulation, disappointment, and emotional overload, particularly in contexts characterized by social misunderstanding, interpersonal conflict, or evaluative pressure (Holmgren et al., 2023; Ronksley-Pavia et al., 2019).

Lastly, feelings of frustration frequently emerged in response to the perceived gap between potential and performance, as well as to social challenges, often accompanied by low self-concept, self- criticism, and feelings of hopelessness (Al-Hroub, 2013; Baum et al., 2014; Desmet et al., 2024; Lo and Yuen, 2014). Perfectionism and fear of failure further contributed to this dynamic, fostering avoidance behaviors (Al-Hroub, 2013; Baum et al., 2014).

5.3.6 Domain six: physical domain

The physical dimension, although less extensively explored in the literature, emerges as a crucial yet often underestimated component in understanding the observable manifestations of twice-exceptionality. Across the reviewed studies, motor coordination and energy regulation emerged as key mediators in translating cognitive potential into effective performance (Baum et al., 2014; Desmet et al., 2024). Fine-motor weaknesses were consistently identified, particularly in tasks involving handwriting and sequential coordination, often resulting in fatigue, disorganization, and reduced fluency of execution that constrained the expression of advanced conceptual reasoning (Al-Hroub, 2013; Desmet et al., 2024; Holmgren et al., 2023; Ronksley-Pavia et al., 2019).

Physical regulation appeared closely interrelated with attentional and cognitive functioning, often manifesting in cycles of hyperfocus and subsequent fatigue (Holmgren et al., 2023). Heightened sensitivity to environmental stimuli—particularly noise—was found to interfere with self-regulation and wellbeing in learning contexts (Huey, 2024; Ronksley-Pavia et al., 2019). Moreover, motor restlessness and impulsive behaviors, including difficulty remaining seated and touching peers' belongings, were documented as behavioral expressions of hyperactivity (Holmgren et al., 2023; Huey, 2024).

Physical functioning may be conceptualized as a context-dependent mediator of twice-exceptional performance: responsive educational contexts, characterized by flexible pacing, multimodal expression, and opportunities for movement, may foster self-regulation and sustained engagement, whereas rigid or overstimulating contexts tend to exacerbate fatigue and discomfort (Huey, 2024; Ronksley-Pavia et al., 2019).

6 Discussion

This systematic review was conducted in order to explore the complexity of twice-exceptionality as a dynamic and integrated interaction between giftedness and challenges. An attempt was made to investigate how the challenges faced by twice-exceptional students influence the expression of their potential, how that potential may compensate for their weaknesses, and what characteristics typically associated with either giftedness or disability remain unchanged despite their coexistence. An analysis of the selected studies confirmed the complexity and considerable high degree of inter- and intra-individual variability (Beckmann and Minnaert, 2018) of twice-exceptional profiles. Some distinguishing characteristics of twice-exceptionality were highlighted, along with the sustained presence of traits related to

giftedness or to co-occurring challenges that continue to persist despite their coexistence.

Some of the empirical studies included in this review involved a comparison between twice-exceptional students and control groups consisting of gifted students, students with disability, and typically developing students. In some cases, significant differences were found in cognitive (Al-Hroub, 2020; Cervantes et al., 2022; Cornoldi et al., 2023), behavioral (François-Sévigny et al., 2022; Gomez et al., 2020), and adaptive profiles (Cederberg et al., 2018; Dempsey et al., 2021). However, such differences did not seem to be linked to a uniform twice-exceptionality profile (Al-Hroub, 2020; Cervantes et al., 2022). Therefore, the findings confirmed what Foley-Nicpon et al. (2011) pointed out, indicating that no single, diagnostic profile can be identified, although recurring patterns may serve as useful indicators of the coexistence of high potential and difficulty. Some characteristics appear to lie at the intersection between giftedness and widely recognized diagnostic frameworks. An illustrative example can be found in twice-exceptional students with ASD, who tend to show enhanced communication abilities, a more accurate interpretation of social cues, and increased engagement in peer relationships when compared to non-gifted autistic students (Cederberg et al., 2018; Dempsey et al., 2021). Yet, their advanced cognitive abilities do not, in some cases, seem to buffer challenges related to perspective-taking, managing social pragmatics, cultivating narrow interests, engaging in flexible behavior, and sustaining adaptive functioning over time. Indicators of twice-exceptionality in students with ADHD may include challenge in perseverative responses, reflective thinking about questions, and modulation of motor and verbal activity (Cervantes et al., 2022; Gomez et al., 2020). However, the findings remain inconsistent regarding the most frequently identified ADHD subtype—inattentive or hyperactive/impulsive—within this population (Cornoldi et al., 2023; Gomez et al., 2020), a variability that may stem from developmental trajectories influencing behavioral expression (Galéra et al., 2011; Larsson et al., 2011; Pingault et al., 2011; Vergunst et al., 2019). Future research should therefore employ multivariate analyses to account for this potential confounding factor. Moreover, this variability may be attributed to contextual factors and the differing perspectives of the various informants involved, as François-Sévigny et al. (2022) pointed out.

The case studies analyzed confirmed the consistent presence of some distinguishing characteristics of twice-exceptionality, offering useful frameworks of interpretation to better understand the dynamic and integrated interaction between high potential and challenges in both educational and everyday life contexts. Although twice-exceptionality is a complex and multifaceted phenomenon that manifests uniquely in each individual, recurring patterns have emerged. These may include excellent verbal skills coexisting with communication challenges or reduced achievement in written expression (Al-Hroub, 2013; Holmgren et al., 2023; Melogno et al., 2015; Silverman, 2024). Uneven academic performance was frequently reported and should be interpreted as the dynamic outcome of complex interactions among high potential, specific challenges, self-regulatory processes, and contextual factors, which may also lead to positive outcomes. Students may learn quickly but struggle to consolidate acquired skills (Desmet et al., 2024). In the social domain, twice-exceptional students may experience challenges in peer interactions, often accompanied by a sense of isolation and the feeling that their authentic self is not fully acknowledged or understood (Baum et al., 2014; Dare and Nowicki, 2015; Hidalgo, 2018; Holmgren et al., 2023; Lo and Yuen, 2014; Ronksley-Pavia et al., 2019). These difficulties may stem from the stigma associated with twice-exceptionality and the general limited awareness of the phenomenon, which prevent an adequate understanding of these students' specific needs and individual characteristics. However, peer relationships may become a source of both emotional and organizational support (Lo and Yuen, 2014). As it has already been pointed out in relation to other dimensions, also when it comes to social functioning, discrepancies are often found between what is observed in the school context and what is reported by family members (Al-Hroub, 2013).

Among the characteristics commonly associated with pure giftedness, high sensitivity, low frustration tolerance, heightened emotional intensity, excellent creative problem-solving skills, advanced reflective thinking, and insatiable curiosity appear to persist (Baum et al., 2014; Dare and Nowicki, 2015; Hidalgo, 2018). Reduced processing speed may, in some cases, stem not from an actual deficit, but rather from a non-linear thinking style and a tendency to engage in complex reasoning. Furthermore, difficulties such as failing to complete assignments on time or requiring extended periods to carry out tasks are common challenges shared by both gifted and twice-exceptional (2e) students, especially in the latter when written production is involved (Baum et al., 2014; Dare and Nowicki, 2015; Holmgren et al., 2023). Considering the interaction between strengths and weaknesses, advanced visual-perceptual abilities—frequently found in gifted profiles and also recognized as preferred learning modalities among students with specific learning disorders—were found to foster the independent development of coping strategies aimed at mitigating the impact of difficulties (Lo and Yuen, 2014).

Furthermore, the analysis conducted with MAXQDA to examine the convergence of findings across methodological approaches revealed a substantial overlap between quantitative and qualitative evidence. In most cases, traits identified through quantitative analyses—although fewer in number—were corroborated by qualitative data, indicating a high degree of consistency between the two strands. The strongest overlaps concerned weaknesses in attentional control, and pronounced intra-individual discrepancies, the latter emerging as the most recurrent element in the in-depth exploration of twice-exceptionality. Lower, yet notable, convergence also emerged regarding rapid learning, weaknesses in pragmatic language, difficulties in emotional regulation and adaptive functioning, inconsistent academic performance, and vulnerabilities in executive control, planning and organization. However, while qualitative evidence more clearly highlights the emotional impact of peer interaction challenges reported by twice-exceptional students and their parents, quantitative findings indicate comparatively lower levels of challenge in certain components of the social domain, although specifically observed among twice-exceptional students with autism when compared to peers with ASD only.

The lower degree of convergence may stem from the tendency of quantitative studies to capture specific facets and measurable dimensions of functioning, as evidenced by results showing a decline in adaptive functioning skills over time among individuals with ASD, as well as more detailed assessments of learning difficulties, executive functioning, and hyperactive or inattentive behaviors in gifted students with ADHD. In contrast, qualitative investigations yield richer, context-sensitive insights into how such characteristics are experienced and expressed. They captured subtle dynamics such as the fatigue associated with sustained compensatory effort, feelings of being misunderstood or unrecognized due to twice-exceptionality, performance-related frustration, social withdrawal, internalizing and externalizing tendencies, disengagement and reduced motivation in contexts offering limited opportunities for cognitive challenge. Moreover, qualitative evidence contributed to understanding contextual moderators that either facilitate or hinder the expression of both potential and difficulty. Factors such as the classroom climate or the misinterpretation of a student's profile emerged as key determinants shaping both observable outcomes and underlying cognitive, emotional, and motivational processes.

7 Conclusion

In response to the research question that guided this systematic review on the distinguishing characteristics of twice-exceptional students, the findings have shown significant differences between these students and control groups, in terms of factors associated with various dimensions of their functioning. However, these differences do not seem to be linked to a single, cohesive twice-exceptionality profile (Al-Hroub, 2020; Cervantes et al., 2022), although they may serve as indicative patterns of the phenomenon. Greater variation and significant discrepancies were found in the scores obtained by twice-exceptional students across various subtests of cognitive functioning (Al-Hroub, 2020; Cornoldi et al., 2023). When considering the metacognitive dimension, challenges in in reflective thinking about questions, and modulation of motor and verbal activity may serve as useful indicators to identify gifted students with ADHD (Cervantes et al., 2022; Gomez et al., 2020). In terms of adaptive functioning, some evidence suggests that autistic students identified as gifted may display relatively more favorable outcomes compared to their non-gifted peers with ASD. In particular, they are described as exhibiting enhanced social communication, social cognition, and social motivation when compared to their non-gifted autistic peers (Cederberg et al., 2018; Dempsey et al., 2021). Yet, such advanced intellectual abilities do not seem to reduce difficulties in perspective-taking, social pragmatics, mannerisms, and the development of long-term adaptive behaviors.

The findings further revealed patterns characteristic of twice-exceptionality, such as advanced verbal skills that may coexist with significantly poor performance in written production or fatigue resulting from the sustained effort required to uphold gifted-level reasoning in the presence of executive functioning weaknesses. Uneven academic performance has also been consistently reported across studies, with rapid and effortless learning processes often coexisting with difficulties in automaticity, planning, consolidation of acquired competences, and knowledge retrieval. Peer interactions appear particularly challenging, owing to asynchronous development, the perception that their abilities are not understood or recognized, social stigma, and limited awareness of the phenomenon of twice-exceptionality. The discrepancies reported by various informants highlight the importance of considering contextual variables when interpreting behaviors across different dimensions of functioning.

However, definitive conclusions cannot yet be drawn, given the limited number of empirical studies employing rigorous and appropriate methodologies to address the research question. It is first essential to consider the jaggedness that manifests both between and within groups, highlighting the need to include all relevant comparison groups. Moreover, the masking effects frequently observed in twice-exceptional students remain both intriguing and difficult to capture. Signs of distress or need are often subtle or entirely absent from observable classroom behavior, thus escaping the attention of both educators and clinicians. This issue is further exacerbated by the fact that the concept of twice exceptionality remains largely underrepresented in most teachers' and diagnosticians' professional training. As a result, many 2e students risk being overlooked, misdiagnosed, or misunderstood, with major consequences for their educational and personal development (Burger-Veltmeijer et al., 2016).

The findings reveal significant implications for educational practice. Improving both identification and intervention strategies is essential to effectively address the needs of twice-exceptional students. Their profiles are often jagged and highly uneven across cognitive, metacognitive, academic, social emotional, and physical domains, making standardized educational approaches inadequate. Evidence confirms that current educational practices tend to focus on weaknesses, overlooking the development of students' potential. Paying more attention to the dynamic and integrated interaction between intellectual giftedness and difficulty implies adopting an approach that may synergically and effectively address the needs arising from both dimensions. It is therefore crucial to adopt strategies capable not only of making sense of such jagged and heterogeneous profiles, but also of simultaneously supporting areas of difficulty while enhancing individual strengths (Burger-Veltmeijer and Minnaert, 2023; Renzulli and Gelbar, 2019). In this regard, the development of tools and practices that function as foundational building blocks within a broader, integrated framework represents a key step toward a more accurate and responsive identification and intervention process.

At a social level, limited awareness of the phenomenon contributes to the growing social isolation and frustration experienced by twice-exceptional students. Ecologically oriented support programmes that actively involve families and the broader school community can play a crucial role in increasing awareness of twice-exceptional students' needs, reducing stigma, and fostering a supportive environment for their social development.

7.1 Limitations

Although a rigorous approach was used to ensure a transparent, comprehensive, and accurate review process, this study presents some limitations. Firstly, significant variation can be observed across the studies analyzed, due to both the diverse weaknesses

investigated and the different dimensions of twice-exceptional students' functioning explored. Nevertheless, this methodological choice was made to avoid rigid categorisations. Therefore, future research could focus on the coexistence of intellectual giftedness and specific, clinically diagnosed weaknesses, with a more comprehensive analysis of the traits characterizing each specific dimension of functioning. Furthermore, such variation seems to be linked to the various methodological approaches and tools used, which makes it more challenging to compare findings, even when the same construct has been investigated within the same twice-exceptional profile.

A second limitation concerns the number of studies excluded from this review, due to the inclusion criteria established for the assessment of intellectual giftedness or the diagnosis of disabilities. In some cases, studies were excluded because giftedness was identified using criteria that were not based on intellectual functioning, but rather on teachers' nominations or academic achievement tests. This choice was made to ensure comparability with the criteria most commonly employed for the inclusion of twice-exceptional students, while at the same time highlighting their limitations. As discussed earlier, adopting a broader understanding of 2e profiles could prevent the exclusion of potentially relevant data, allowing for a deeper examination of the different dimensions of their functioning. Additionally, no rigid criteria for the diagnosis of weaknesses were established.

Finally, it should be acknowledged that some data might have been overlooked due to the interpretation of the characteristics described in different studies. Despite the rigorous approach used in the data-gathering process, some characteristics may not have been adequately identified.

7.2 Implications and research perspectives

Multiple implications for future research may be identified. Firstly, although the number of empirical studies on twice-exceptionality has recently increased, the comparability of results is currently limited by the large variety of inclusion and exclusion criteria adopted. Twice-exceptional profiles involving weaknesses that differ from the most investigated ones—ADHD, ASD, SLD—remain notably underrepresented in the literature.

The interaction between individual characteristics and contextual factors remains complex to investigate and has been only marginally explored, partly due to cultural influences that may affect both data collection and analysis. Longitudinal studies may provide a broader perspective on the evolution of developmental trajectories and the role of contextual variables in determining individual outcomes.

The analysis of the studies included in this review has highlighted the need to adopt personalized, tailor-made approaches—capable of "weaving bespoke garments" for each student—that may help to capture the wide range of characteristics arising from the interaction between high potential and challenges, thereby ensuring more effective processes of identification and intervention. As Silverman (1998) pointed out, "giftedness creates a different organization of the Self." In the context of twice-exceptionality, individual functioning arises from a complex configuration of characteristics, often marked by greater qualitative diversity as a result of heightened developmental asynchrony. These characteristics can be ascribed to different functional dimensions that dynamically interact with one another, giving rise to broad spectrum of intra-individual patterns. Moreover, contextual influences and the subjective meanings attributed to personal experience dynamically interact with these internal dimensions, further contributing to the complexity of each student's developmental profile. Addressing twice-exceptionality calls for moving beyond observable outcomes, as the coexistence of giftedness and disability often produces hidden strengths and masked challenges that elude traditional assessment. In line with recent developments in person-centered modeling (Woo et al., 2024) and its growing relevance in educational research (Minnaert, 2023), person-centered approaches that focus on individuals allow researchers and practitioners to identify not only shared characteristics within subgroups, but also meaningful patterns of variability often overlooked by variable-centered methods. These approaches are particularly well-suited to capturing the heterogeneity of 2e profiles and to informing identification and support strategies that offer a more ecologically valid understanding of twice-exceptionality.

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

LR: Conceptualization, Writing – review & editing, Formal analysis, Methodology, Data curation, Visualization, Investigation, Resources, Writing – original draft. SP: Resources, Writing – review & editing, Writing – original draft, Conceptualization, Validation, Investigation, Supervision, Methodology. AM: Supervision, Writing – original draft, Writing – review & editing, Investigation, Methodology, Resources, Validation.

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Supplementary material

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