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Reading and Writing Outcomes in Students with Intellectual Giftedness and Dyslexia: A Gender-Based Analysis

Samuel Alonso Benito *, Luz Florinda Pérez Sánchez and Ángeles Bueno Villaverde

Department of Education, Faculty of Education, Universidad Camilo José Cela, 28692 Madrid, Spain
* Correspondence: samuel.alonsob@alumno.ucjc.edu

Abstract

Research on twice-exceptional students, those who simultaneously present intellectual giftedness and dyslexia (G-D), remains limited, particularly with regard to gender differences in reading and writing processes. The present study examines these differences in a sample of 39 Spanish students (21 boys and 18 girls) aged 8 to 12 years, with the aim of determining whether significant differences exist in literacy-related scores within this population. Using a comparative design, the results show that most assessed variables do not reveal significant differences between boys and girls. However, some specific differences in test scores were identified: boys obtained higher scores in syllable dictation, whereas girls outperformed boys in story writing and in tasks related to grammatical structures and punctuation marks. These differences suggest the use of differentiated strategies, with greater reliance on visual and visuospatial resources among boys and more efficient use of verbal and linguistic processing among girls. The interaction inherent in this twice-exceptionality appears to modify the gender differences typically reported in other profiles with respect to literacy performance, highlighting the need for specific approaches to identification, assessment, and educational intervention tailored to this G-D population.

Keywords: intellectual giftedness; dyslexia; twice-exceptionality; gender; literacy skills

1. Introduction

Understanding gender differences in reading and writing variables constitutes a relevant field of research in psychology and education, especially when these differences are examined in populations with less common cognitive profiles. Within this framework, twice-exceptional students (2e), those who combine giftedness with a specific learning disorder such as dyslexia, represent an underexplored group whose unique characteristics must be recognized to fully understand their potential and educational needs.

Giftedness refers to a set of characteristics that enable certain students to perform at levels significantly higher than their peers in one or more academic or intellectual domains, placing them within the top 10% of the population, and demonstrating a remarkable capacity to learn rapidly, solve complex problems, and generate creative responses (Calabrese et al., 2024; Gagné, 2020). However, asynchrony between cognitive, emotional, and physical development can lead to internal conflicts and difficulties in forming relationships with peers (Wiley, 2021; Yiğit & Doğan, 2024). When the educational environment does not adequately respond to their needs, the difficulties associated with their development may be exacerbated, leading some students to suppress their creativity and potential in order to fit in and avoid standing out among their peers (Robinson, 2008). These situations can

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result in unrealistic expectations that affect their self-esteem and social relationships, highlighting the need for early identification and differentiated pedagogical strategies (Cross & Coleman, 2014; National Association for Gifted Children, 2019; Pérez & Freitas, 2016).

Dyslexia is a neurobiologically based specific learning disorder that affects between 5% and 13% of the population (Krafnick & Evans, 2019; Peterson & Pennington, 2012). It is characterized by persistent difficulties in acquiring reading and writing skills that cannot be attributed to low intelligence, inadequate instruction, or limited educational opportunities; these difficulties usually manifest from childhood, resulting in literacy performance below expected levels (Arnett et al., 2017; Krafnick & Evans, 2019; Peterson & Pennington, 2012). It is a highly heritable disorder, primarily linked to a phonological deficit that affects auditory sequencing and discrimination, as well as the association between sounds and visual symbols (Snowling et al., 2020; Vellutino et al., 2004). These deficits impact the relationship between spelling and phonology, the learning of new words, and short-term verbal memory, resulting in difficulties with decoding and spelling fluency (Snowling et al., 2020; Snowling et al., 2019). In addition, some individuals exhibit difficulties beyond the phonological domain, such as problems with letter-position encoding, leading to errors in words that require high precision (e.g., pirates/parties and smile/slime) (Kohnen et al., 2012). In most cases, these difficulties lead to experiences of frustration, reduced academic self-esteem, and lower motivation toward reading and writing tasks (Eissa, 2010; Goldston et al., 2007).

Twice-exceptionality, combining intellectual giftedness and dyslexia, remains a little-known phenomenon, despite its relevance for understanding and adequately supporting these students. The coexistence of both conditions may cause one to mask the other, thereby complicating identification and the provision of appropriate support (Assouline et al., 2010; Maddocks, 2018; Nicpon et al., 2011). Estimating the prevalence of twice-exceptionality remains complex due to identification challenges, masking effects, and variability in diagnostic criteria (Kranz et al., 2024).

To better understand the cognitive mechanisms underlying this dual condition, it is essential to consider established cognitive models of dyslexia. From a theoretical perspective, dyslexia can be explained by the phonological deficit hypothesis, which attributes reading and spelling difficulties to impairments in phonological processing, including phonological awareness, rapid automatized naming, and verbal short-term memory (van Viersen et al., 2015; Vellutino et al., 2004). However, other theoretical models, such as the multiple-deficit model, conceptualize dyslexia as the result of interactions between multiple cognitive risk and protective factors that jointly influence literacy development (Pennington et al., 2012; van Viersen et al., 2015).

Within this theoretical framework, 2e reflects the coexistence of dyslexia-related cognitive weaknesses and giftedness-related cognitive strengths (van Viersen et al., 2019). These strengths, particularly in language, reasoning, and working memory, may act as protective factors that support compensatory mechanisms, allowing G-D students to partially mitigate the impact of phonological deficits without eliminating the underlying impairment (Kranz et al., 2024; Maddocks, 2020; van Viersen et al., 2019; van Viersen et al., 2016). As a result, their literacy profiles typically reflect the interaction between persistent decoding difficulties and strengths in higher-order language and cognitive abilities (Kranz et al., 2024; van Viersen et al., 2016).

Studies examining the cognitive and literacy characteristics of G-D students consistently describe a mixed profile combining areas of strength and weakness. V. W. Berninger and Abbott (2013) found that children with high verbal reasoning exhibit linguistic strengths in morphological, phonological, and orthographic encoding, as well as verbal working memory, alongside difficulties in attentional monitoring and inhibition. Similarly,

van Viersen et al. (2016) observed strong performance in vocabulary, grammar, and memory, but low performance in reading, spelling, and rapid naming, suggesting the use of semantic and syntactic skills to compensate for the deficits associated with dyslexia. For this reason, some of these students do not exhibit academic underachievement until they reach secondary education, when academic demands increase (Barbier et al., 2019).

Despite these advances in characterizing the cognitive and literacy profile of G-D students, the literature still shows important gaps, particularly regarding how these profiles may vary according to gender. In the general population, the scientific literature has documented gender differences in linguistic and visuospatial skills. Generally, girls show slight advantages in reading, spelling, and grammar, whereas boys tend to perform better in visuospatial tasks and quantitative reasoning (Reilly et al., 2016, 2019). According to Reilly (2020), these differences, moderate in reading and more pronounced in writing, do not reflect intellectual inequalities but rather different ways of expressing cognitive abilities. These gender-related cognitive patterns may also vary depending on the linguistic context. In a transparent language such as Spanish, where grapheme–phoneme correspondence is almost perfect, findings by Kirchner-Nebot and Amador-Campos (1999) show that gender differences are not so much explained by reading ability itself, but by the way reading and writing tasks are approached. Girls tend to use predominantly verbal strategies, whereas boys combine verbal and perceptual strategies, reflecting different cognitive profiles in reading activities. Although both groups demonstrate similar levels of accuracy and speed, girls excel in accurate reading of invented words or pseudowords, while boys show greater cognitive independence in perceptual reorganization (Kirchner-Nebot & Amador-Campos, 1999).

When considering students with intellectual giftedness, the literature shows no significant differences between boys and girls in terms of general intelligence (Halpern, 2012; Reilly, 2020). However, differentiated trends are observed: girls tend to show more balanced development and excel in verbal and social skills, whereas boys typically stand out in logical and visuospatial reasoning (Freeman, 2004; Heller & Hany, 2004; Silverman, 1993; Trillo, 2012). Some authors suggest that these differences may be influenced by educational practices and sociocultural factors that shape how intellectual giftedness is expressed and supported in boys and girls (Kerr et al., 2012; Yiğit & Doğan, 2024). For example, gender stereotypes and differential expectations from teachers and families may lead boys to receive greater encouragement in areas such as mathematics, science, and engineering, while girls are more often encouraged toward verbal, social, and language-related domains (Kerr et al., 2012). These differences in expectations and opportunities may contribute to the development of distinct cognitive profiles despite similar overall intellectual ability.

Regarding students with dyslexia, research also shows gender differences in prevalence, neuroanatomical aspects, and reading and writing performance. Several large-scale population studies have reported a higher prevalence in males, estimated to be two to three times more common than in females (Flannery et al., 2000; Katusic et al., 2006; Liederman et al., 2005; Rutter et al., 2004). In writing, boys with dyslexia exhibit greater difficulties in fluency and written expression, whereas girls tend to show relative advantages in these skills (V. Berninger et al., 1996; V. W. Berninger et al., 2008; Lefly & Pennington, 1991). In reading, girls with dyslexia stand out for more accurate performance in pseudoword reading and for strengths in verbal and linguistic processing, with verbal skills emerging as the main predictor of reading success. In contrast, boys, especially those with good performance, tend to combine verbal strategies with perceptual and visuospatial resources, relying on visual memory and nonverbal reasoning (Arnett et al., 2017; Krafnick & Evans, 2019).

However, although gender-related differences have been documented in intellectual giftedness and dyslexia when considered separately, little is known about how gender influences the development of literacy-related skills in 2e students. This issue is particularly relevant within the multiple-deficit model, which proposes that literacy development results from the interaction between cognitive risk and protective factors, including language abilities, working memory, and reasoning, which may support compensatory mechanisms (van Viersen et al., 2019; van Viersen et al., 2016). Given that gender differences have been documented in several of these cognitive domains, it is possible that boys and girls with G-D develop different compensatory mechanisms, which may influence how their reading and writing profiles are expressed. This lack of knowledge limits both the theoretical understanding of twice-exceptionality and the development of educational strategies tailored to its specific characteristics.

Therefore, the present study aims to examine gender differences in literacy-related skills among students G-D. Specifically, the study addresses the following research questions:

1. Are there gender differences in writing-related skills among students G-D?
2. Are there gender differences in reading-related skills among students G-D?

Based on the theoretical framework and previously documented gender differences, it is hypothesized that male and female students with G-D exhibit distinct patterns of performance across specific reading and writing-related skills.

2. Materials and Methods

2.1. Participants

To compose the sample, students were classified as intellectually gifted if they obtained a score of 130 or higher on the General Ability Index (GAI) derived from the Wechsler Intelligence Scale for Children (Wechsler, 2014). This index is regarded by some authors as the most appropriate measure of intelligence in double-exceptionality cases because these students often show strengths in verbal comprehension and fluid reasoning, while lower scores in processing speed and working memory tend to reduce their Full-Scale IQ (FSIQ), underestimating their true cognitive potential. Unlike the FSIQ, the GAI excludes working memory and processing speed, making it a more accurate alternative in such cases (Assouline et al., 2010; Maddocks, 2020; Toffalini et al., 2017).

On the other hand, the diagnosis of dyslexia was determined according to the criteria of the DSM-5 (American Psychiatric Association, 2013) and DSM-5-TR (American Psychiatric Association, 2022) by a single professional: a doctor in psychology who specialized in child and adolescent neuropsychology, and is fully accredited for this type of assessment with extensive experience in the field. All evaluations were conducted between 2017 and 2025 at the Centro Psicológico y Educativo Huerta del Rey (Valladolid, Spain), a specialized center providing an environment specifically adapted for this purpose. All students were native Spanish speakers and came from various regions of the country, mostly from middle-to-high socioeconomic backgrounds. In all cases, prior authorization was obtained from the families. Finally, after reviewing the cases and according to the criteria described, the final sample consisted of 39 students (21 boys and 18 girls) enrolled in grades 3 through 6 of primary education in the Spanish educational system, aged 8 to 12 years.

2.2. Instruments

Wechsler Intelligence Scale for Children (Wechsler, 2014):

- Intellectual level: The required indices were extracted from the subtests of the test to calculate the GAI, which provides an assessment of intellectual ability while minimizing the influence of working memory and processing speed. This measure is

recommended for evaluating students with a learning disorder. The reliability coefficient reported in the manual is above 0.92.

- Processing speed: This primary index of the test reflects the speed and efficiency in handling simple visual information, selective attention, and the ability to discriminate relevant stimuli, indicating mental agility and the capacity to process information quickly and accurately. The reliability coefficient reported in the manual is 0.88.

PROESC: Writing Processes Assessment Battery (Cuetos et al., 2004). The reliability coefficient reported in the manual for all tests is 0.82:

- Syllable dictation: Assesses the student's ability to correctly write syllables that are orally dictated. It consists of 25 syllables dictated twice clearly and slowly, which the student must write on a sheet to evaluate phonological knowledge and accuracy in grapheme–phoneme correspondence.
- Word dictation: Involves the dictation of two lists of 25 words each. First, List A is dictated, consisting of words with arbitrary spelling, with the score reflecting performance in this category. Then, List B is dictated, containing words that follow standard orthographic rules, used to calculate the score for rule-based spelling.
- Pseudoword dictation: Consists of 25 invented words that subjects must write correctly. A total score is obtained from the full list, while the last 15 words, which follow orthographic rules, are used to calculate a specific score in this category.
- Story writing: Evaluates writing ability through the creation of a story. Students can choose any story, whether familiar or less known, as long as it fits in a designated space and includes a title. The evaluation focuses on content, coherence, and style.
- Composition writing: Involves writing a composition about a freely chosen animal. The text must be clear, complete, and fit within a designated space. Assessment focuses on content and presentation.
- Total PROESC score: Refers to the overall score obtained across all the tests in the battery, providing a general measure of writing performance and an overall view of the student's writing competence.

PROLEC-R: Reading Processes Assessment Battery—Revised (Cuetos et al., 2014):

- Letter name or sound: Assesses the student's ability to recognize and name letters of the alphabet or produce their corresponding sounds. It measures basic phonological and alphabetic knowledge, which is fundamental for learning to read, as it allows identification of the relationship between letters and sounds. Reliability coefficient reported in the manual: 0.91.
- Same–Different test: Evaluates the student's ability to visually discriminate letters or words that are the same or different from each other. It measures perceptual accuracy and visual attention, essential skills for correctly recognizing letters and words during reading. Reliability coefficient: 0.76.
- Word reading: Assesses the student's ability to recognize and read words accurately and fluently. It measures the level of lexical decoding development and allows evaluation of reading automatization, which is fundamental for effective reading comprehension. Reliability coefficient: 0.95.
- Pseudoword reading: Evaluates the student's ability to apply grapheme–phoneme conversion rules when reading invented or meaningless words. It measures phonological processing and decoding skills, allowing assessment of mastery of basic reading mechanisms beyond visual recognition of familiar words. Reliability coefficient: 0.86.
- Grammatical structures: Assesses comprehension of sentences with different syntactic structures. It measures the student's ability to correctly interpret the meaning of

sentences based on word order and function, evaluating grammatical comprehension and linguistic development. Reliability coefficient: 0.88.

- Punctuation marks: Evaluates the student's ability to recognize and properly use punctuation marks during reading. It measures reading comprehension and prosodic intonation, assessing how the child interprets pauses and text structure based on graphical signs. Reliability coefficient: 0.89.
- Sentence comprehension: Assesses the student's ability to understand the meaning of read sentences. It measures syntactic and semantic comprehension, evaluating how the child integrates information to correctly interpret sentence content. Reliability coefficient: 0.85.
- Text comprehension: Evaluates the student's ability to understand and extract the overall meaning of different types of texts. It measures deep reading comprehension, assessing the ability to identify main ideas, make inferences, and answer questions about the content. Reliability coefficient: 0.87.
- Oral comprehension: Assesses the student's ability to understand and process verbally presented information. It measures auditory comprehension and oral language development, evaluating the ability to retain, interpret, and respond appropriately to what is heard. Reliability coefficient: 0.81.

2.3. Data Analysis

Statistical analysis was conducted using SPSS version 25 and G-Power version 3.1. The analytical procedure comprised an initial descriptive phase followed by an inferential phase, aimed at exploring statistically significant differences and relationships between the two groups (Table 1).

Table 1. Descriptive Analysis: Sample Size, Sex Proportion, Grade Level, and IQ Score by Group.

			Grade Level				IQ	
Group	**n**	**Proportion**	**3rd**	**4th**	**5th**	**6th**	**M**	**SD**
Girls (F)	18	46.2%	5	5	4	4	137.94	7.90
Boys (M)	21	53.8%	5	5	6	5	136.67	7.06
Total	39	100%	10	10	10	9	137.26	7.39

Note. M = mean; SD = standard deviation.

Next, the assumption of normality was assessed to determine the most appropriate statistical test for comparing boys and girls. For variables with a normal distribution, the parametric independent samples Student's *t* test (P) was applied. In cases where the normality assumption was not met, the nonparametric Mann–Whitney U test (NP) was used, suitable for comparing two independent groups when the data do not follow a normal distribution (Gerald & Patson, 2021; McKnight & Najab, 2022).

Effect size was also calculated to estimate the magnitude of the observed differences between boys and girls, complementing the information provided by statistical significance. Cohen's d, a widely used indicator, was employed for this purpose, allowing quantification of effect magnitude and proving especially useful in small to moderate sample sizes (Cohen, 1988). For comparisons using nonparametric tests, effect size was estimated using the rank-biserial correlation coefficient, appropriate for this type of analysis (Wendt, 1972). Additionally, statistical power (1-β) was estimated, indicating the probability of detecting a real effect based on sample size and the established significance level.

Given the number of literacy-related variables analyzed and the relatively small sample size, no formal correction for multiple comparisons (e.g., Bonferroni adjustment)

was applied. Such corrections, while reducing the risk of Type I errors, can substantially decrease statistical power and increase the risk of Type II errors, particularly in studies involving rare populations and limited sample sizes (Midway et al., 2020). Therefore, effect sizes and statistical power were considered alongside *p*-values to support a more comprehensive interpretation of the results.

3. Results

Analysis of the sample by sex and grade level revealed a balanced distribution between the two groups. Boys accounted for 53.8% of the sample and girls accounted for 46.2%. The chi-square test showed no statistically significant differences in grade distribution by sex, $\chi^2(3) = 0.28$, $p = 0.96$, indicating that the representation of both groups is homogeneous across the different grade levels. These results allow us to consider that the variable grade level is balanced between girls and boys, ruling out possible biases associated with this factor.

Tables 2 and 3 present the corresponding results, highlighting both statistically significant findings and the magnitude of observed effects. Table 2 summarizes the descriptive statistics and group comparisons for processing speed and writing-related scores assessed with the PROESC battery, including test type, *p*-values, effect sizes, and statistical power. Table 3 presents the corresponding descriptive statistics and group comparisons for reading-related scores assessed with the PROLEC-R battery, including measures of decoding, grammatical processing, and reading comprehension. It is important to clarify that non-significant differences refer to the absence of statistically significant group differences at the established alpha level and should not be interpreted as complete equivalence between gender groups.

To examine possible differences between girls and boys in the assessed skills, the results obtained from the various applied tests were analyzed. The data indicate that in processing speed, there are no significant differences between the two groups.

Table 2. Test Scores and Comparison Results Between Girls and Boys: Processing Speed and PROESC Values.

	GGirls			Boys				Girls-Boys		
	n	**M**	**SD**	**n**	**M**	**SD**	**T.T**	***p*-Value**	**Effect Size**	**1-β**
Processing speed	18	111.17	12.08	21	109.29	13.55	NP	0.507		
PROESC Total	18	116.89	21.81	21	114.33	13.35	P	0.657		
Syllable dictation	18	21.78	2.05	21	23.10	0.77	NP	0.026 *	0.405	1.000
Word dictation (arbitrary)	18	16.94	6.25	21	17.76	3.95	P	0.623		
Word dictation (rule-based)	18	18.78	4.49	21	19.81	3.08	P	0.186		
Pseudoword dictation Total	18	19.67	2.33	21	19.19	2.75	P	0.567		
Pseudoword dictation Rule-based	18	11.00	1.75	21	10.10	2.34	P	0.186		
Story writing	18	5.67	2.35	21	3.67	2.01	P	0.007 **	0.921	0.921
Composition writing	18	4.06	2.04	21	3.71	1.82	P	0.584		

Note. M = mean; SD = standard deviation; 1-β = statistical power; T.T = Test Type; P = parametric; NP = nonparametric; * $p < 0.05$; ** $p < 0.01$.

In the analysis of the writing tests, no significant differences were observed between girls and boys in the total PROESC score. However, when examining specific subtests, some notable differences were identified. In the syllable dictation test, boys obtained significantly higher scores than girls ($p < 0.05$), whereas in the story writing task, girls

obtained significantly higher scores ($p = 0.01$). In the remaining dictation tests (words with arbitrary spelling, rule-based spelling, total pseudowords, and pseudowords following orthographic rules) as well as in the composition writing task, no significant differences were found between the two groups.

Table 3. Test Scores and Comparison Results Between Girls and Boys: PROLEC-R Values.

	Girls			Boys				Girls-Boys		
	n	**M**	**SD**	**n**	**M**	**SD**	**T.T**	***p*-Value**	**Effect Size**	**1-β**
Letter naming	18	148.33	29.70	21	160.10	42.77	P	0.333		
Same–Different	18	23.28	11.33	21	25.14	8.21	P	0.556		
Word reading	18	123.17	43.79	21	121.71	37.36	P	0.912		
Pseudoword reading	18	57.00	18.28	21	52.90	16.25	NP	0.163		
Grammatical structures	18	14.56	2.46	21	13.86	1.65	NP	0.044 *	0.368	0.250
Punctuation marks	18	25.39	7.92	21	21.19	4.75	P	0.048 *	0.656	0.652
Sentence comprehension	18	15.67	0.49	21	15.52	0.68	NP	0.527		
Text comprehension	18	14.44	1.42	21	14.05	2.16	NP	0.884		
Oral comprehension	18	6.00	1.28	21	6.0	1.70	NP	0.897		

Note. M = mean; SD = standard deviation; 1-β = statistical power; T.T = Test Type; P = parametric; NP = nonparametric; * $p < 0.05$.

Regarding the reading tests, girls and boys showed similar scores in most subtests without significant differences (letter naming, same–different test, word reading, pseudoword reading, sentence comprehension, text comprehension, and oral comprehension). However, significant differences were found, with higher scores in the case of girls, in grammatical structures ($p < 0.05$) and punctuation marks ($p < 0.05$).

4. Discussion

The results show that significant differences between boys and girls are scarce, creating a more homogeneous profile than that described in the literature, where girls have traditionally been reported to outperform boys in literacy among students with dyslexia (Arnett et al., 2017; V. Berninger et al., 1996; V. W. Berninger et al., 2008; Lefly & Pennington, 1991). In some variables, boys even obtained higher scores, further nuancing this traditional view. Specifically, the results of this analysis showed that boys outperformed girls in syllable dictation, while girls obtained higher scores in story writing and in reading tasks involving grammatical structures and punctuation marks. Overall, the results indicate that similarities far outweigh differences, a finding that may be linked to the G–D profile, characterized by the coexistence of strengths and weaknesses. This profile appears to modify the disparities traditionally described by gender and highlights the influence of the individual cognitive profile.

When analyzing writing-related variables, it is observed that boys obtain higher scores in syllable dictation, with significant differences ($p < 0.05$), as well as in word dictation, whereas girls show better results in pseudoword dictation. These differences could be explained by the predominant, or even compensatory, use of different writing strategies among G–D students. The literature indicates that boys with dyslexia tend to combine verbal strategies with perceptual and visuospatial resources, relying on both visual memory and nonverbal reasoning (Arnett et al., 2017; Kirchner-Nebot & Amador-Campos, 1999; Krafnick & Evans, 2019). In line with these findings, the results suggest that in syllable dictation and known word dictation, boys more frequently use the lexical procedure, which involves retrieving the complete form of a word from memory, not by constructing

its sounds, but by recalling it as it appears visually. This process, mainly supported by visual memory, which is responsible for storing the appearance of familiar words, could explain their superior performance in these tasks. In contrast, in pseudoword dictation, girls showed superior performance, likely due to their strengths in verbal and linguistic processing (V. Berninger et al., 1996; V. W. Berninger et al., 2008; Lefly & Pennington, 1991; Reilly, 2020), since this task requires almost exclusive use of the phonological procedure, which involves maintaining and manipulating sounds in verbal memory to transform them into graphemes. The results suggest that girls use their linguistic and verbal resources more efficiently in tasks requiring detailed phonological analysis, in contrast to the more visual and visuospatial strategies predominant in boys.

In the previously described dictation tasks, performance is considerably simplified because they involve reproductive writing, which does not require the activation of higher-order planning processes or autonomous selection of syntactic structures. In these activities, the starting point consists of the words dictated by the examiner, so only orthographic retrieval processes and motor processes are involved. In contrast, creative writing tasks, such as composing a story or a composition, require the engagement of complex processes of planning, syntactic selection, and discourse integration, substantially increasing their level of difficulty. In these variables, girls obtain higher scores, with significant differences compared to boys ($p < 0.01$) in story writing. A possible explanation for this advantage is that boys with dyslexia often present greater difficulties in writing fluency and expression, whereas girls with dyslexia tend to show greater strengths in verbal and linguistic processing, as well as in verbal memory, resources that support idea construction and written expression (V. Berninger et al., 1996; V. W. Berninger et al., 2008; Lefly & Pennington, 1991).

The results of the reading variables again show that boys obtain higher scores in the less complex tasks, specifically the two tests aimed at letter identification, letter naming or sound and same–different test. In tasks that assess lexical processes, such as word and pseudoword reading, the same pattern observed in the writing tests emerges. Boys show greater difficulties when reading pseudowords compared to real words, suggesting that they primarily use the lexical route in reading, rather than grapheme–phoneme conversion, relying more on visual memory due to weaknesses in verbal memory (Arnett et al., 2017; V. Berninger et al., 1996; V. W. Berninger et al., 2008; Krafnick & Evans, 2019; Lefly & Pennington, 1991). The largest differences are observed in tests that evaluate grammatical processes, where girls achieve significantly higher scores than boys, both in grammatical structures ($p < 0.05$) and punctuation marks ($p < 0.05$). These results may reflect the predominant, or even compensatory, use of different reading strategies among G–D students. These findings are consistent with previous studies in other populations, which show that, in the general population, girls obtain moderate advantages in reading and grammar (Hyde & Linn, 1988; Reilly et al., 2016, 2019).

The absence of statistically significant differences in most reading and writing variables, as well as the higher scores obtained by boys in some of them, is striking compared to what has been described in the general population, where girls have been documented to show moderate advantages in reading and more pronounced advantages in writing (Hyde & Linn, 1988; Reilly, 2020; Reilly et al., 2016, 2019). Similarly, previous studies involving students with dyslexia have reported greater writing difficulties in boys, whereas girls tend to demonstrate more accurate performance and relative strengths in verbal and linguistic processing (V. Berninger et al., 1996; V. W. Berninger et al., 2008; Lefly & Pennington, 1991). Among the variables in which no statistically significant gender differences were observed, two are particularly noteworthy in relation to prior findings. First, although girls obtained slightly higher scores on the total PROESC measure, this difference did not reach statistical significance. Second, both groups obtained comparable scores on semantic processing mea-

sures assessed by the PROLEC-R, including sentence comprehension, text comprehension, and oral comprehension.

From this perspective, the interpretation of the data aligns with previous studies describing mixed and compensatory profiles in this population (Barbier et al., 2019; V. W. Berninger & Abbott, 2013; van Viersen et al., 2015; van Viersen et al., 2016). Characteristic traits of this twice-exceptional profile, such as the coexistence of a larger vocabulary, better comprehension, and strengths in semantic and syntactic skills, alongside lower performance in phonological and orthographic skills (Kranz et al., 2024; Maddocks, 2020; van Viersen et al., 2016), may help explain the observed gender differences in this population. Specifically, it is reasonable to assume that girls compensate through more efficient linguistic resources, while boys more frequently rely on perceptual or visuospatial strategies, so that both groups show relatively similar performance using different strategies, although significant differences persist when each variable is analyzed independently.

These results can be more fully understood within established cognitive models of dyslexia and compensation. The phonological deficit hypothesis proposes that reading difficulties primarily arise from impairments in phonological processing, including phonological awareness and verbal short-term memory (van Viersen et al., 2015; Vellutino et al., 2004). However, the multiple-deficit model conceptualizes dyslexia as the result of interactions between multiple cognitive risk and protective factors that jointly influence literacy development (Pennington et al., 2012; van Viersen et al., 2015). Within this framework, intellectual giftedness provides cognitive strengths that may function as protective factors supporting compensatory mechanisms (Kranz et al., 2024; Maddocks, 2020; van Viersen et al., 2019). These compensatory processes may manifest differently depending on the individual cognitive profile and the specific configuration of cognitive strengths and weaknesses (Pennington et al., 2012; van Viersen et al., 2019; van Viersen et al., 2015). Importantly, research has consistently shown gender-related differences in cognitive profiles, with males demonstrating relative advantages in visuospatial and perceptual processing and females showing relative strengths in verbal and linguistic domains (Halpern, 2012; Reilly, 2020). Given that compensatory mechanisms rely on the recruitment of cognitive strengths, these gender-related differences may influence how boys and girls with G-D compensate for literacy difficulties. This interpretation aligns with developmental models of twice-exceptionality, which emphasize the dynamic interaction between cognitive strengths and weaknesses in shaping literacy outcomes (Kranz et al., 2024; Maddocks, 2020; van Viersen et al., 2019).

In this context, the present study provides valuable new evidence by examining this phenomenon in Spanish, a language characterized by a high degree of orthographic transparency, where reading can rely heavily on consistent grapheme–phoneme conversion processes (Ferreres & López, 2014). This linguistic characteristic may shape the development of reading and writing strategies and compensatory mechanisms in students with dyslexia, potentially resulting in cognitive and literacy profiles that differ from those observed in languages with more opaque orthographic systems.

The identification of these differential patterns has practical implications, as it paves the way for tailoring educational strategies to the cognitive profile of each student, thereby optimizing the compensatory mechanisms inherent to this twice-exceptional population. Moreover, these results underscore the need to avoid oversimplified attributions that may lead to overestimating or underestimating specific difficulties based on gender, risking misidentification or the promotion of inadequate educational responses. A detailed understanding of how this twice-exceptional profile influences boys' and girls' reading and writing processes contributes to improving early detection and designing specialized support that more accurately addresses their characteristics. Integrating this knowledge into

teaching practice and evaluation systems enables progress toward an educational model that is more sensitive to cognitive diversity, where the needs of twice-exceptional students can be recognized and addressed with rigor and equity.

Study Limitations and Future Research Directions

This study presents certain limitations that should be considered when interpreting the results. First, the sample size, although comparable to other studies on twice-exceptional populations, remains small, limiting the generalizability of the findings. The low prevalence of the G–D profile and the inherent difficulty of its identification make it challenging to assemble larger and more representative samples, especially when the goal is to compare performance by gender. Additionally, the sample consists exclusively of students evaluated at a single specialized center and mostly from a middle-to-high socioeconomic background. While this limits comparisons across different socioeconomic contexts, it can also be considered a strength, as it reduces the potential influence of economic differences on the outcomes, ensuring that the results reflect cognitive and gender-related factors rather than variations in access to educational resources or support. Another limitation relates to the linguistic context of the study. All participants were native Spanish speakers, and Spanish is characterized by a highly transparent orthographic system with consistent grapheme–phoneme correspondences. Consequently, the cognitive profiles and compensatory strategies observed in this study may differ from those found in languages with more opaque orthographies, such as English, and caution is therefore warranted when generalizing these findings to other linguistic contexts. Additionally, although statistical power was estimated for all analyses, the relatively small sample size may have reduced the ability to detect existing differences between groups, increasing the risk of Type II errors (false negatives). Consequently, some gender-related differences in literacy-related skills may not have reached statistical significance despite potentially meaningful effect sizes, and non-significant findings should be interpreted with caution.

Based on these limitations, several avenues can be identified to advance the understanding of gender differences in this twice-exceptional population. One approach involves conducting studies with larger and more balanced samples to increase statistical power and enable more in-depth analyses. Longitudinal studies would also be valuable to examine developmental trajectories from childhood to adulthood, allowing researchers to assess how reading and writing strategies evolve over time and whether gender differences emerge, intensify, or diminish in response to increasing academic or occupational demands. Similarly, expanding research to languages other than Spanish would help determine whether observed differences persist in languages with different orthographic systems and linguistic characteristics. Another important avenue involves incorporating emotional, motivational, and contextual variables, such as self-efficacy, interest in reading, perception of teacher support, or family educational style, to provide a broader and more comprehensive profile of factors influencing literacy performance in G–D students. Finally, a relatively unexplored but relevant area is the development of intervention programs specifically tailored to this twice-exceptional population, analyzing their effectiveness by gender. Designing, implementing, and evaluating school or neuroeducational support programs would help identify which strategies are most beneficial for enhancing cognitive strengths and compensating for the specific weaknesses of each student.

5. Conclusions

This study provides relevant empirical evidence on gender differences in reading and writing variables among students with G-D, an area that remains notably underexplored in the scientific literature. In relation to the research questions, the findings indicate that

gender differences in literacy-related skills among students with G-D are limited and highly specific rather than generalized. Regarding writing-related skills, significant gender differences were observed in syllable dictation, where boys obtained higher scores, and in story writing, where girls outperformed boys, while no differences were found in other writing measures. Regarding reading-related skills, girls demonstrated significantly higher scores in syntactic processing tasks, specifically grammatical structures and punctuation marks, whereas no significant gender differences were observed in most other reading-related variables. Therefore, the hypothesis that boys and girls with G-D could exhibit distinct patterns of performance across literacy-related measures is partially supported, as differences emerged in specific domains but not across the full range of assessed skills.

In response to this gap, the findings presented here contribute to expanding knowledge and refining assumptions derived from research conducted in general populations or among students with either dyslexia or intellectual giftedness considered in isolation, but rarely in the combined presence of both conditions. The study employed appropriate statistical procedures, including both parametric and non-parametric analyses, complemented by effect size and power estimates, which strengthen the robustness of these findings. This approach allowed the identification of significant differences between boys and girls, while also confirming the absence of relevant discrepancies in most of the assessed variables, providing a solid and precise interpretation of the data.

Overall, the findings suggest that, although specific gender-related differences emerged, the general pattern reflects a high degree of similarity between boys and girls with G-D. This convergence indicates that the interaction between intellectual giftedness and dyslexia may attenuate the gender differences typically observed in other populations. Rather than reflecting broad disparities in literacy-related scores, the identified differences appear to be domain-specific and potentially linked to the differential use of compensatory mechanisms. These findings underscore the importance of adopting identification and assessment approaches that are sensitive to the G-D profile, avoiding assumptions based on traditional gender patterns that may not apply to this population. They also highlight the need to design educational interventions that are more equitable, precise, and aligned with student diversity. Finally, these conclusions open new avenues for future research exploring the developmental evolution of these patterns and their relationship with qualitative cognitive and contextual variables.

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Institutional Review Board Statement: The present study is a retrospective observational study based exclusively on fully anonymized data obtained from the assessments conducted as part of routine professional practice by a licensed psychologist at the request of the participants' parents, with their informed consent, and with the approval to use the data for research purposes. Since no additional assessments, interventions, or contact with the minors were conducted in the context of this study and all data provided were fully anonymized, ensuring that no participant could be identified directly or indirectly by the authors, we believe that, based on national regulations and institutional guidelines in Spain, this study does not require approval by an Institutional Review Board or Research Ethics Committee.

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