Feature Article

Cognitive Profiles of Gifted Discrepant Readers in Primary Education

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Abstract

Gifted students with relative reading difficulties often struggle with the discrepancy between their high intelligence and lower-than-expected word-reading level (i.e., discrepant readers). This discrepancy may be a burden and poses specific educational challenges to individual students. To understand their challenges and the nature of their discrepancy, this study examined the cognitive profiles of gifted discrepant readers ($n = 50$) compared with gifted (nondiscrepant) readers ($n = 30$). A case series analysis mapping weaknesses and strengths on risk factors for dyslexia (phonemic awareness [PA], rapid automatized naming [RAN], and verbal short term memory [VSTM]) showed that both groups displayed largely similar cognitive profiles. A discrepant reading profile seemed to result from the absence of strengths on underlying skills (PA, RAN, VSTM). Hierarchical multiple regression indicated that group (discrepant readers vs. gifted readers) did not moderate the relationship between cognitive factors and word-level reading outcomes. Based on these findings, it is proposed that educational support for gifted discrepant readers might comprise gifted- and needs-based education that focuses on (building) strengths.

Keywords

multiple regression, case series analysis, reading difficulties, cognitive profile, giftedness, discrepant readers

Gifted students are often seen as students with outstanding intellectual and creative abilities (Stephens & Karnes, 2000) who show superior achievement in most educational domains compared with their peers (Worrell et al., 2019). However, giftedness does not necessarily imply that a student will excel in all domains. After all, the correlation between intelligence and academic performance is at best moderate (e.g., Peng et al., 2019, 2022). For example, when both giftedness and a learning disability occur within an individual (i.e., twice-exceptionality [TE]; Assouline et al., 2010; Foley-Nicpon et al., 2011; Gierczyk & Hornby, 2021; Maddocks, 2020) there may be a substantial discrepancy between their high intelligence and achievement in one or more academic areas, for example in reading. Several studies have addressed whether criteria for a dyslexia diagnosis (i.e., severe and persistent word-level reading and/or spelling difficulties) should be adapted to include TE children (e.g., Berninger & Abbott, 2013; Gilman et al., 2013; van Viersen et al., 2015, 2016) given that they might compensate or mask their learning difficulties (Assouline et al., 2010; Berninger & Abbott, 2013; Brody & Mills, 1997; Maddocks, 2018, 2020; Silverman, 2009). However, recent findings show that evidence for compensation of deficits and subsequent masking of word-level reading difficulties is very limited (Bazen et al., 2020; van Viersen et al., 2015, 2017, 2019). Hence, there is no empirical support for changing diagnostic criteria or requirements for referral to services for TE children. However, gifted primary school students without a dyslexia diagnosis but with relatively low reading skills compared with their high intelligence (i.e., discrepant readers, see also "borderline dyslexic children" in van Viersen et al., 2015, using similar criteria) are also hindered by this discrepancy and need appropriate educational support (Cheek et al., 2023; Elbro, 2010). This study aims to provide insights into the specific problems experienced by gifted discrepant readers through assessing their cognitive profiles and compare these to the profiles of gifted nondiscrepant readers (i.e., with above average reading levels). These insights might be used for optimization of educational support for gifted discrepant readers.

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Giftedness

In recent decades, the concept of giftedness has undergone major changes and there is no consensus regarding an overall definition of giftedness (Mönks & Katzko, 2005; Smedsrud, 2020; Worrell et al., 2019). A more narrow definition of giftedness entails academic or intellectual giftedness, which is indicated by an IQ score of at least 130 on a standardized intelligence test (McClain & Pfeiffer, 2012; Winner, 1997). Yet, giftedness can also be considered as multidimensional, where cognitive ability is complemented by, for example, creativity and task commitment or motivation (Gierczyk & Hornby, 2021; Heller et al., 2005; Hornstra et al., 2020; Renzulli & Reis, 2018; Sternberg & Davidson, 2005; Worrell et al., 2019). However, cognitive ability remains the overarching aspect in models and theories on giftedness (Heller et al., 2005; Renzulli & Reis, 2018; Smedsrud, 2020; Sternberg & Davidson, 2005; Subotnik et al., 2011; Worrell et al., 2019). Therefore, and also given that word-level reading is a basic academic skill, in this study the more narrow definition of academic giftedness is used.

Twice-Exceptionality

Reis et al. (2014) define TE children as students who have the potential for high achievement or creative productivity in one or more domains and who show one or more disabilities, which may include, among others, learning disabilities (e.g., dyslexia), physical disabilities (e.g., ASD), or health impairments (e.g., ADHD). When examining twice-exceptionality from a need-based perspective (i.e., focused on educational or psychological interventions), it can be argued that TE individuals exhibit specific strengths alongside clear weaknesses, both at the behavioral and cognitive level (Burger-Veltmeijer et al., 2011, 2014, 2016; Burger-Veltmeijer & Minnaert, 2023).

Regarding their cognitive characteristics, TE students have both strengths related to their high intelligence (see Alloway & Elsworth, 2012; Beckmann & Minnaert, 2018; Berninger & Abbott, 2013; Johnson et al., 2003; Ruban & Reis, 2005; Snowling, 2001; van Viersen et al., 2016, for overviews) *and* weaknesses related to their learning disability (Assouline et al., 2010; Brody & Mills, 1997; Foley-Nicpon et al., 2011). Focusing on literacy, a large body of literature has demonstrated that the main underlying deficits associated with word-level reading difficulties are phonemic awareness (PA; i.e., detection and manipulation of speech sounds in spoken words); rapid automatized naming (RAN; i.e., rapid retrieval of phonological-orthographic information from long-term memory), and verbal short-term memory (VSTM; i.e., transient retention of phonological representations; see, for example, de Jong & van der Leij, 2003; Melby-Lervåg et al., 2012; Tambyraja et al., 2023; Tilanus et al., 2013; Vellutino et al., 2004). As in averagely intelligent children with dyslexia, gifted children with dyslexia show weaknesses in PA and RAN (van Viersen et al., 2015, 2016, 2019). In contrast, it appears that VSTM is not a common weakness in gifted children with literacy difficulties (van Viersen et al., 2015, 2019). Overall, these weaknesses, combined with intelligence-related strengths, cause TE students to have specific educational needs, tapping into both special needs and gifted education (see Gierczyk & Hornby, 2021, for an overview).

Gifted Discrepant Readers

The characteristics described above may give rise to assumptions of possible compensation by TE children, both for those with diagnosed reading disabilities and relative reading difficulties. However, there is currently very limited empirical evidence that points toward compensation. For example, van Viersen et al. (2015) found no evidence for compensation of dyslexia-related weaknesses by intelligence-related strengths in either gifted children with dyslexia or gifted discrepant readers (here called "borderline dyslexic children"), as often proposed by TE theory (e.g., Brody & Mills, 1997; Foley-Nicpon et al., 2011). In short, variation in word-reading levels resulted from increasingly less severe and fewer combinations of underlying deficits and was not due to strengths functioning as protective factors. Specific claims of gifted discrepant readers compensating and unjustly missing a diagnosis were thus not supported.

The average performance level of a discrepant reader may not be considered as objectively low performance. However, given that their average reading level is two standard deviations below their high IQ, they may experience difficulties and negative consequences as a result of this large discrepancy, as their reading levels are not in line with what is expected from them in education (Cheek et al., 2023). Elbro (2010) clearly distinguishes between poor reading as a disability, which focuses on weak skills or poor performance, and poor reading as a handicap, which focuses on the *consequences* of poor(er) performance. Hence, based on their intelligence and possibly high expectations from parents, teachers (Davidson, 2012), and themselves (Grugan et al., 2021), gifted discrepant readers, in particular, may experience frustration (Beckmann & Minnaert, 2018; Brody & Mills, 1997; Cheek et al., 2023; King, 2005). These students are generally not referred for assessment or special services. Consequently, they often do not receive the educational support that they need to reach their full potential (Bazen et al., 2020; Fuchs & Fuchs, 2006), neither regarding their reading difficulties nor regarding their high abilities (Stephens & Karnes, 2000). Moreover, lack of educational support may lead to higher levels of anxiety (fear of failure), frustration, and possible self-esteem issues (Beckmann & Minnaert, 2018; King, 2005; Reis & Colbert, 2004; Silverman, 2009), as well as negative feelings about school and decreased overall well-being. As a result, a (solvable) difficulty may turn into a considerable burden (Elbro, 2010).

Table 1. Descriptive Statistics of the Subgroups.

	Gifted discrepant readers		Gifted readers	
	50 (32%)		30 (50%)	
n (% girls)	*M*	*SD*	*M*	*SD*
Age in months	115.42	17.48	117.97	16.94
Nonword-reading fluency[a]	10.60	1.14	14.93	1.96
PA[a]	10.54	1.78	11.60	1.68
RAN[a]	12.76	2.45	14.73	1.95
VSTM[a]	11.74	3.53	13.23	3.29

Note. PA = phonemic awareness; RAN = rapid automatized naming; VSTM = verbal short-term memory.
[a]Standard scores ($M = 10$, $SD = 3$).

The Present Study

In this study, we aimed to investigate (a) the extent to which weaknesses and strengths on specific risk factors for word-level reading difficulties are represented in the cognitive profiles of gifted discrepant readers, and (b) whether being a discrepant reader moderates the relationship between known risk factors for word-level reading difficulties and reading outcomes. To gain detailed insight, we used a combination of person-centered and variable-centered approaches to our data. Accordingly, we hypothesized that the cognitive profiles of gifted discrepant readers are characterized by mostly single underlying deficits in PA or RAN, but not in VSTM. Whether *strengths* on risk factors might occur was explored. Furthermore, we hypothesized that the relation between PA, RAN, and VSTM and reading outcomes would be different for gifted discrepant readers, as indicated by a significant moderation effect, such that effects in this group are stronger than in a gifted comparison group of nondiscrepant readers (i.e., with above average word-reading levels).

Method

Participants

This study was conducted at a Dutch primary school for gifted education with a total of 156 gifted students (age range 6–13 years). One of the criteria for admission to the school was an attested IQ-score of 130 or higher. IQ had to be independently assessed by a certified (educational) psychologist through a standardized, validated, and individually administered intelligence test (e.g., WISC; Wechsler, 1991, 2009, 2014). All students thus had an IQ-score of 130 or higher. Parents of all children were invited to participate and informed consent was provided for 90 students (57.7% response rate). Ethical approval was provided by the ethical committee of Fontys Committee on Research Ethics for the Domain of Human and Social Sciences. The sample was divided into two subgroups based on their performance on a standardized nonword-reading fluency test (see Instruments section). In line with van Viersen et al. (2015), gifted discrepant readers had to show a significant discrepancy between IQ and word-level reading of at least two *SD*. Given their IQs of ≥ 130 (gifted range), this corresponds to standard scores on a word-reading test ≥8 and ≤12 (average range). Gifted children with standard scores < 8 were excluded, as their reading difficulties would be absolute (indicating low performance) instead of relative. Gifted students with reading levels that are more in line with their IQ (i.e., gifted readers) had to show standard scores on word-level reading >12 (above average performance). In total, nine students were excluded due to a standard score on reading below 8. In addition, one student with a dyslexia diagnosis was excluded. Accordingly, the final sample consisted of 80 students (38.75% girls) from Grades 2 to 6 ($M_{age} = 9.70$; $SD_{age} = 1.42$, range 6–13 years). Background information on the sample is provided in Table 1.

A sensitivity analysis was conducted using the G*Power software (Faul et al., 2007) to assess the adequacy of this sample size for testing the proposed effects. The results showed a Cohen's f^2 of .10 (rule of thumb: .02 = small, .15 is medium, .35 is large; Cohen, 1988), with a power of .80. This indicates that we have enough power to detect large, medium, and even medium-small effects within the current sample.

Instruments

Word-Level Reading. Word-level reading skills were measured using the *Klepel* (van den Bos et al., 1999), a nonword-reading fluency test. Students had 2 minutes to read aloud a list of pseudowords of increasing difficulty (one to four syllables) as quickly and accurately as possible. The number of correctly read pseudowords (max 116) was the raw score used in the analyses. Norm-referenced standard scores per semester were used for group selection (see above). The reliability of the *Klepel* varies per age from .89 to .94 (van der Kleij et al., 2018).

Risk Factors. To measure the risk factors of dyslexia four subtests from the DST-NL (Dyslexia Screening Test–Dutch

Version) test battery were used. Subtests measuring PA, RAN, and VSTM were selected because a large body of literature indicates that these are the primary predictors of reading difficulties (see, for example, de Jong & van der Leij, 2003; Melby-Lervåg et al., 2012; Tambyraja et al., 2023; Tilanus et al., 2013; Vellutino et al., 2004). The complete DST-NL has satisfactory test–retest reliability and interrater reliability between .94 and .98 (Kort et al., 2005). Reliability of individual subtests is given below.

PA was measured using two subtests. *Klanksplitsing* [phoneme separation] was used to measure phoneme deletion. Students had to produce a word while deleting a phoneme in a given target word (e.g., schelp "shell" without /p/ is schel). The maximum score on this task was 12. *Letter verwisseling* [spoonerism] was used to measure phoneme transposition. Students had to swap the onset phonemes of two words. The words with the exchanged phonemes had to be produced correctly (e.g., transposing onset phonemes of John Lennon to Lohn Jennon). The maximum score on this task was 11. Raw scores, based on the number of correctly produced words, were used in the analyses. For both tests, there was no cutoff point. All students completed the entire tasks, with a total score of 11 or 12 achievable. Test–retest reliabilities were .52 for *Klanksplitsing* and .60 for *Letter verwisseling*.

RAN was measured using the *Letters Benoemen* [letter naming] subtest. The students had to name 50 letters (i.e., j, m, h, o, v, e, k, b, s, i, d, a, z, t, w, f, c, p, u, n, x, r, g), organized in five rows of 10 letters, as quickly and accurately as possible. The time to read all the letters was measured and errors were tracked. For the analyses, the number of items named per second was used as the raw score. The test–retest reliability of this subtest is .84.

VSTM was measured using the *Cijferreeksen Achterwaarts* [digit span backward] subtest. Students had to recall eight increasingly difficult series of digits backwards. The test was terminated when the student misnamed two series consecutively. Raw scores were used in the analyses. The test–retest reliability of this subtest is .57.

Procedure

Data was collected during March and April 2019. Each student was tested in a one-on-one session by the first author. Testing was done in a silent room at school and took approximately 15 minutes per student. After an introduction, general information (e.g., name, gender, age) and verbal assent were asked before the start of the test session. All tests were explained verbally and practice items were presented during all tests to ensure understanding. Tests were administered in a fixed order (nonword-reading fluency test, RAN, VSTM, PA).

Analyses

First, a case series analysis was performed to gain insight into how weaknesses *and* strengths in known risk factors (PA, RAN, VSTM) for severe word-level reading difficulties are represented in the cognitive profiles of gifted discrepant readers and gifted readers. For weaknesses, the cutoff was set at 1 *SD* below the norm-based mean (i.e., standard score < 8; Snowling, 2000). For strengths, the cut-off was set at 1 *SD* above the norm-based mean (i.e., standard score > 12; for example, van Viersen et al., 2015; 2019). A case series analysis is an effective, person-centered approach to gaining detailed insight into patterns of variation between individuals in their skill and underlying profiles (see, for example, Layes et al., 2022; Nag & Snowling, 2012; Ramus et al., 2003; van Viersen et al., 2015, 2019, for similar studies in the context of literacy).

Second, a complementing variable-centered approach was taken to examine whether predictive relations between risk factors and nonword-reading fluency were different in both groups. Hence, a moderation analysis using *z*-scores was conducted using IBM SPSS Statistics (version 29.0; IBM Corp., 2022). A hierarchical multiple regression with nonword-reading fluency as the outcome was performed in two steps. In the first step, the main effects for age (covariate), PA, RAN, and VSTM, as well as reading group (moderator) were entered. Subsequently, interaction effects between the predictors and reading group were added. For each model, standardized regression coefficients (β) were reported, with .10 to .29 considered a small effect, .30 to .49 medium, and ≥.50 a large effect (Cohen, 1988; Fey et al., 2022). R^2 is reported as an indicator of general model fit, with <.02 explaining a negligible amount of explained variance, .02 to .13 a small amount, .13 to .26 a moderate amount, and >.26 a substantial amount (Cohen, 1988). The combination of a significant beta for the interaction effect and significant change in R^2 after adding the interaction terms would indicate the presence of a moderation effect. All statistical analyses were conducted using a significance level of $\alpha = .05$.

Results

Data Screening

The data contained no missing values. An outlier analysis using *z*-scores (<–3.29 or >3.29) indicated that there were no univariate outliers. Assumptions of linearity, homoscedasticity, normality, independence of errors, and absence of multicollinearity were all met. Descriptives of the variables used in the moderation analysis are provided in Table 2.

Case Series Analysis

The case series analysis provides a detailed insight into heterogeneity within and between groups of gifted discrepant (Table 3) and gifted readers (Table 4) regarding their cognitive profiles and prevalence of strengths and weaknesses on known risk factors for word-level reading difficulties. Regarding weaknesses on risk factors, 14% of the gifted discrepant readers had a deficit in PA, 2% had a deficit in RAN, and 14% had a deficit in VSTM. For combinations of

Table 2. Descriptive Statistics of Z-Scores for Underlying Cognitive Skills and Word-Level Reading.

Variables	*M*	*SD*	Min.	Max.
Nonword-reading fluency	.00	1.00	–2.02	2.39
RAN	.00	.89	–2.15	2.79
VSTM	.00	1.00	–1.89	2.28
PA	.00	1.00	–2.64	.88

Note. Min. = minimum; Max. = maximum; PA= phonemic awareness; RAN= rapid automatized naming; VSTM = verbal short-term memory.

Table 3. Case-Series of Weaknesses/Strengths on Risk Factors for Gifted Discrepant Readers (n = 50).

	Risk factors (− vs. +)			NWR fluency		
Case no.	PA	RAN	VSTM	Klepel SS	# Weaknesses	# Strengths
06	+		+	8		2
83		+		8		1
54				8		
10	−	+		9	1	1
05		+		9		1
20	+			9		1
82			+	9		1
03	−	+	−	10	2	1
34		−	−	10	2	
04			−	10	1	
81	−			10	1	
02	+			10		1
65	−	+		10	1	1
24	−	+		10	1	1
60		+	−	10	1	1
88	−	+	+	10	1	2
44				10		
56			+	10		1
66			+	10		1
28				10		
08				10		
67		+	+	10		2
46		+		10		1
16	+			11		1
42		+	+	11		2
55			+	11		1
45				11		
79		+	−	11	1	1
19		+		11		1
23		+	−	11	1	1
33	+	+	+	11		3
68	+		+	11		2
49		+		11		1
90	+	+	+	11		3
73		+	+	11		2
84	+	+	+	11		3
70		+	+	11		2
07	+	+	+	12		3
40	−	+	+	12	1	2
76			+	12		1
38		+	−	12	1	1
87	+	+	+	12		3
63		+		12		1
21				12		
74	+	+	+	12		3
32				12		
35	+	+	+	12		3
58		+	+	12		2
25		+	+	12		2
26	+	+		12		2
Totals	7[a]/13[b]	1[a]/30[b]	7[a]/22[b]	10.60[c]	15	65
%	14%[a]/26%[b]	2%[a]/60%[b]	14%[a]/44%[b]		74%/22%/4%/0%[d]	20%/44%/22%/14%[e]

Note. – = Weakness (standard score < 8); + = Strength (standard score > 12); PA= phonemic awareness; RAN= rapid automatized naming; VSTM = verbal short term memory; NWR = nonword reading; # = Number of.
[a]Weaknesses. [b]Strengths. [c]Mean score. [d]0/1/2/3 weaknesses. [e]0/1/2/3 strengths.

Table 4. Case-Series of Weaknesses/Strengths on Risk Factors Among Gifted (Nondiscrepant) Readers(n = 30).

	Risk factors (− vs. +)			NWR fluency		
Case no.	PA	RAN	VSTM	Klepel SS	# Weaknesses	# Strengths
85		+	−	13	1	1
64	+	+		13		2
86	+	+	+	13		3
71	+	+	+	13		3
18		+		13		1
43	+	+	+	13		3
29		+	+	13		2
75	+	+		13		2
14		+	+	13		2
12		+	+	13		2
78		+	+	14		2
62	−	+	+	14	1	2
57		+	−	14	1	1
72	+	+	+	14		3
01	+	+	+	14		3
15		+	+	14		2
50	+		+	15		2
77	+	+	+	15		3
36		+	+	15		2
11	+	+	+	16		3
59		+	+	16		2
39		+	+	16		2
41	+	+	+	16		3
52		+		17		1
69	+	+	+	17		3
13		+		17		1
51		+	−	18	1	1
17	+	+	+	18		3
31	−	+	+	19	1	2
48	+	+	+	19		3
Total	2[a]/14[b]	0[a]/29[b]	3[a]/22[a]	14.93[c]	5	65
%	6.7%[a]/46.7%[b]	0%[a]/96.7%[b]	10%[a]/73.3%[b]		83.3%/16.7%/0%/0%[d]	0%/20%/43.3%/36.7%[e]

Note – = Weakness (standard score < 8); + = Strength (standard score > 12); PA= phonemic awareness; RAN= rapid automatized naming; VSTM = verbal short term memory; NWR = nonword reading; # = Number of.
[a]Weaknesses. [b]Strengths. [c]Mean score. [d]0/1/2/3 weaknesses. [e]0/1/2/3 strengths.

deficits, 74% of the gifted discrepant readers had no deficits on any of the risk factors, 22% had one deficit, and 4% had two deficits. None of these students had three deficits. The χ^2-difference test was used to compare percentages between the subgroups of gifted discrepant and gifted readers. Percentages for none of the deficits differed significantly, PA: $\chi^2(1, N = 80) = .99, p = .32$; RAN: $\chi^2(1, N = 80) = .60, p = .44$; VSTM: $\chi^2(1, N = 80) = 0.27, p = .60$. Likewise, the percentages for combinations of deficits were not significantly higher for gifted discrepant readers compared with gifted readers—no deficits: $\chi^2(1, N = 80) = .92, p = .34$; one deficit: $\chi^2(1, N = 80) = .33, p = .56$; two deficits: $\chi^2(1, N = 80) = 1.22, p = .27$.

Regarding strengths on risk factors, 26% of the gifted discrepant readers had a strength in PA, 60% had a strength in RAN, and 44% had a strength in VSTM. For combinations of strengths, 20% of the gifted discrepant readers had no strengths, 44% had one strength, 22% had two strengths, and 14% had three strengths. Statistical comparison of the percentages between both gifted groups showed that gifted readers significantly more often had a strength in RAN, $\chi^2(1, N = 80) = 12{,}89\ p < .001$, and/or VSTM, $\chi^2(1, N = 80) = 6.42, p = .01$, than gifted discrepant readers, but not in PA, $\chi^2(1, N = 80) = 3.55, p = .06$. Similarly, the percentages for combinations of strengths were significantly higher for gifted readers than for gifted discrepant readers—no strengths: $\chi^2(1, N = 80) = 6.77, p = .009$; one strength: $\chi^2(1, N = 80) = 4.69, p = .03$; two strengths: $\chi^2(1, N = 80) = 4.00, p = .05$; three strengths: $\chi^2(1, N = 80) = 5.43, p = .02$.

Table 5. Pearson Correlations for Covariate, Predictors, Moderator, and Outcome Included in the Regression.

Variables	1.	2.	3.	4.	5.	6.
1. Age	–					
2. Reading Group	−.07	–				
3. PA	.40**	−.25*	–			
4. RAN	.63**	−.31**	.33**	–		
5. VSTM	.28*	−.21	.44**	.40**	–	
6. Nonword-reading fluency	.63**	−.63**	.59**	.72**	.47**	-

Note. For Reading group, 0 = no Discrepant Profile; 1 = DR. PA= phonemic awareness; RAN= rapid automatized naming; VSTM = verbal short term memory.
*$p < .05$ **$p < .01$ (two-tailed).

Correlations

Bivariate correlations are reported in Table 5. Correlations between risk factors and nonword-reading fluency were moderate and positive for PA and VSTM, and strong and positive for RAN. This is consistent with higher scores on underlying cognitive skills being associated with better word-level reading skills. The correlations among the three risk factors were all small to moderate, .33 to .44. Age as a covariate showed significant and positive correlations with all predictors and the outcome, but not with the moderator (reading group), with small correlations for PA and VSTM and moderate correlations for RAN and nonword-reading fluency. Finally, reading group shows significant but small negative correlations with PA and RAN, but not with VSTM, indicating that gifted discrepant readers have lower scores than gifted readers on PA and RAN, but not on VSTM. The negative correlation with nonword-reading fluency is moderate, which accurately reflects group differences in reading based on the selection criteria.

Moderation Analysis

Model 1. The model including the main effects for the covariate, predictors, and moderator, was significant, $F(5, 74) = 84$, $p < .001$, $R^2 = .85$. Age as a covariate had a significant moderate positive effect on nonword-reading fluency. PA and RAN both had a small but significant positive effect on nonword-reading fluency, indicating that higher PA and RAN contributes to higher reading outcomes. The effect of reading group on nonword-reading fluency was also significant and was moderately negative, indicating that gifted discrepant readers had lower nonword-reading fluency outcomes than gifted readers. VSTM was not a unique predictor of nonword-reading fluency. Taken together, this model explained 85% of the variance in nonword-reading fluency.

Model 2. In the second model, several interaction effects between reading group and risk factors for word-level reading difficulties were added to the model as predictors. Model fit did not increase significantly, $F(3, 71) = 84$, $p < .33$, $\Delta R^2 = .007$. The results of Model 2 align with Model 1, with comparable and significant main effects for age as a covariate, PA and RAN, and reading group. None of the interaction effects were significant, indicating that reading group does not have moderating effect. Relations between predictors and nonword-reading fluency are thus comparable for gifted discrepant and gifted readers. Taken together, this model explained 84.7% of the variance in nonword-reading fluency. The estimates are reported in Table 6.

Discussion

This study aimed to gain a deeper understanding of the specific problems experienced by gifted discrepant readers (i.e., gifted students with relatively low word-level reading skills compared with their high IQ) in primary education by looking into their underlying cognitive profiles. More specifically, we investigated (a) the extent to which weaknesses and strengths on specific risk factors for word-level reading difficulties are represented in the cognitive profiles of gifted discrepant readers, and (b) whether being a discrepant reader moderates the relationship between known risk factors for word-level reading difficulties and reading outcomes. To gain detailed insight and evaluate our hypotheses, we used a combination of person-centered and variable-centered approaches to our data. Hypotheses were largely rejected, as differences between gifted discrepant and gifted readers were minimal, although relevant findings surfaced regarding the role of strengths in underlying cognitive skills.

Prevalence of Weaknesses and Strengths

Our hypothesis that the cognitive profile of gifted discrepant readers would be characterized by mostly single deficits in phonemic awareness (PA) or rapid automatized naming (RAN) was rejected. Overall, the cognitive profiles of gifted discrepant readers were similar to the profiles of gifted readers in terms of weaknesses on risk factors for dyslexia, both regarding severity and combinations of deficits. Yet, the hypothesized absence of a weakness in verbal short-term memory (VSTM) was confirmed.

Interestingly, also mapping strength on these risk factors in both groups in fact revealed relevant differences that

Table 6. Summary of Multiple Regression Analysis Including Interactions.

Variables	*B*	*SE*	β	95% CI	
				LB	UB
Model 1					
Constant	67.33	.87		65.59	69.06
Age	5.90	1.20	.30*	3.51	8.29
PA	4.92	1.19	.22*	2.55	7.28
RAN	5.58	1.24	.29*	3.11	8.06
VSTM	1.55	1.03	.08	−.49	3.60
ReadingGroup	−8.80	.96	−.45*	−10.71	−6.89
Model 2					
Constant	66.94	.94		65.07	68.81
Age	5.69	1.21	.29*	3.28	8.09
PA	4.96	1.23	.23*	2.50	7.41
RAN	5.72	1.25	.29*	3.21	8.21
VSTM	1.56	1.04	.08	−.51	3.64
ReadingGroup	−8.57	.99	−.44*	−10.54	−6.60
ReadingGroup × RAN	−1.48	.99	.14	−3.45	.40
ReadingGroup × VSTM	−.71	1.03	.48	−2,73	1.31
ReadingGroup × PA	.98	1.26	.44	−1.53	3.49

Note. CI = confidence interval; LB = lower bound; UB = upper bound; PA = phonemic awareness; RAN = rapid automatized naming; VSTM = verbal short term memory; Reading group, 0 = no Discrepant Profile; 1 = Discrepant Readers.
*$p < .05$.

might help explain differences in literacy outcomes. Gifted readers (i.e., with reading levels more in line with their high IQs) more frequently exhibited strengths (i.e., above average performance) in RAN and VSTM, as well as combinations of two and three strengths, compared with gifted discrepant readers. Poorer word-level reading skills in gifted discrepant readers thus seem not to result from (slight) weaknesses on risk factors, but rather from an absence of or less pronounced strengths on reading-related cognitive skills. Previous studies already found evidence for variation in impairment on risk factors for dyslexia influencing the degree of word-level reading difficulties (e.g., van Viersen et al., 2015). The findings in this study are in line with correlations between word-level reading and underlying skills (e.g., Araújo & Faísca, 2019; Stevenson et al., 2014). The stronger the underlying skills, the higher the word-level reading outcomes. Our study confirms and extends this through providing empirical data on two groups of gifted students that show relevant variation in their word-level reading outcomes and underling cognitive skills.

Previous studies have debated whether diagnostic and treatment criteria for dyslexia (i.e., severe and persistent word-level reading difficulties) should be adapted for gifted/twice-exceptional (TE) students (e.g., Berninger & Abbott, 2013; Gilman et al., 2013; van Viersen et al., 2015, 2016). The findings of this study further confirm that diagnostic criteria, as well as referral practices for specialized treatment, should not be adapted to also include gifted discrepant readers. Gifted students with dyslexia and gifted discrepant readers can be clearly distinguished from each other based on behavioral outcomes (i.e., word-level reading), which is further supported by performance on underlying risk factors (PA and RAN, but not VSTM). Furthermore, given these clear behavioral and cognitive differences, it is evident that both groups of gifted children have distinct educational needs and it is unlikely that gifted discrepant readers would benefit from specialized dyslexia treatment.

Relation Between Risk Factors and Reading Outcomes

Our hypothesis that the relation between PA, RAN, and VSTM and word-level reading outcomes would be different for gifted discrepant readers was rejected. There were no differential effects between gifted discrepant and gifted readers in the contribution of PA, RAN, and VSTM to word-level reading. In both groups, PA and RAN were found, while controlling for age. The contribution of PA and RAN to word-level reading is in line with previous studies on students with average intelligence (e.g., Araújo et al., 2015; Hogan et al., 2005; Knoop-van Campen et al., 2018). VSTM did not emerge as a unique predictor of word-level reading, which corroborates previous findings in gifted samples (e.g., van Viersen et al., 2015, 2016) as well as population samples (Moll et al., 2013). Against our expectations, the absence of a moderation effect of reading group indicated that the presence of a reading-IQ discrepancy did not seem to impact the strength of the relationship between underlying skills (PA, RAN, and VSTM) and word-level reading. This supports the notion that foundational skills are important for all students

to achieve efficient word-level reading (Foorman et al., 2016; Peltier et al., 2020) and that this holds across achievement and intelligence levels.

Limitations and Future Research

There are some limitations to this study. First, all students came from one school for gifted primary education. Although the sample size is comparable to other studies on gifted students with literacy difficulties, future research should replicate the findings and aim for larger and more diverse samples, preferably with students from different schools and regions.

Despite new insights into the cognitive profiles of gifted discrepant readers and increased understanding of the nature of their relative reading difficulties, we lack information about the degree to which students within the sample are actually hindered by the discrepancy between their intelligence and reading ability. Most importantly, gaining insight into the handicap that these students experience as a result of their discrepant profile might reveal other relevant factors of influence. Elbro (2010) has shown that adults with strong vocabulary are more likely to perceive a discrepancy because of a relative reading difficulty as a burden. Moreover, Bazen et al. (2023) have shown that the sources of *perceived* negative consequences of dyslexia may not be cognitive but environmental factors. These findings indicate that it is essential to also take socio-emotional, interpersonal, and educational factors into account when aiming for tailored support, also for gifted discrepant readers.

Finally, this study focused on the intellectual aspect of giftedness, neglecting other dimensions such as motivation and creativity (Gierczyk & Hornby, 2021; Heller et al., 2005; Hornstra et al., 2020; Renzulli & Reis, 2018; Sternberg & Davidson, 2005; Worrell et al., 2019). Future research that aims to determine which students with a discrepant profile actually experience hindrance and which do not should consider multiple aspects of giftedness, as this may be a relevant source of variation in experienced negative consequences and resilience.

Future research could also further explore protective factors and their impact on the literacy profiles of gifted discrepant readers. Following definitions from research on academic resilience, compensation might occur at an underlying level when students show better-than-expected performance on literacy skills that are more complex than where their main impairment lies (e.g., better text reading fluency and/or reading comprehension than expected based on impaired word-level reading skills; Appels et al., 2024; see also Slomowitz et al., 2021). This study primarily focused on identifying weaknesses and strengths on risk factors for impaired word-level reading. Adopting a broader scope and investigating a broader set of skills associated with higher-order literacy skills as potential protective factors can provide further insights into the cognitive profile of gifted discrepant readers and clarify their specific educational needs.

Theoretical Implications

This study contributes to the existing body of research on giftedness, literacy development/reading difficulties, and twice-exceptionality in several ways. First, the study addressed a unique and understudied population—gifted discrepant readers in primary education—by collecting relevant empirical data. Previous research about twice-exceptionality was mostly concentrated on gifted students with diagnosed (learning) disabilities (e.g., Assouline et al., 2010; Foley-Nicpon et al., 2011), whereas this study focused on a group of students that did not qualify for a diagnosis but still faces educational challenges and may experience difficulties related to their discrepant performance profile. Second, by assessing risk factors, reading difficulties for both weaknesses and strengths in gifted discrepant and gifted readers, this study challenges existing assumptions about both groups (e.g., regarding compensation and the relation between literacy and intelligence). This study clearly shows that the cognitive profiles of these two groups do not differ in terms of weaknesses, but in terms of strengths on underlying skills, further supporting that approaches focusing only on deficits provide an incomplete picture of children's skill profiles.

Practical Implications

The insights from this study also have some practical implications. When addressing gifted discrepant readers, a valuable strategy may be to shift focus from remediating deficits (which they do not seem to have much) toward fostering their strengths and aptitudes. In this study we found that poorer results in word-level reading for the gifted discrepant group did not seem to result from weaknesses on risk factors for dyslexia, but rather from an absence of, or less pronounced, strengths on underlying reading-related cognitive skills. Nurturing these and other relevant areas of proficiency provides a promising opportunity for strengths to emerge and allow them to act as buffering factors against the challenges posed by less proficient word-level reading. This is in line with the principles of the strength-based approach (Lopez & Louis, 2009) and studies from Baum et al. (2014) and Olenchak (2009). Probably, the same holds for gifted students as for average-ability students, that recourse to remediation or compensatory interventions is unnecessary for the gifted discrepant readers, given the absence of dyslexia or identifiable weaknesses associated with risk factors for dyslexia (PA, RAN, VSTM). This might seem obvious (there is no dyslexia present), but it is a general misconception that gifted students with average reading ability compensate and therefore miss the threshold for a dyslexia diagnosis. This misconception can, in turn, lead people to believe that gifted discrepant readers require educational services similar to those provided to children with dyslexia. Yet, this assumption is unfounded. First, the correlation between intelligence and academic performance is at best moderate

(e.g., Peng et al., 2019, 2022), which means it is not necessarily the case that a gifted student will excel in all domains. This implies that gifted students who do no excel in reading do not necessarily have dyslexia. Furthermore, there is no clear evidence that gifted students can compensate for in the case of absolute or relative word-level reading difficulties (e.g., van Viersen et al., 2015). Moreover, the current study demonstrates that focusing on weaknesses in gifted discrepant readers is actually futile, as most of these children do not show weaknesses in these areas, as do gifted readers. Instead, a constructive approach involves capitalizing on their strengths, such as during reading comprehension, which is the primary goal of reading and crucial for academic progress (Smith et al., 2021).

In order to find out which (broader) strengths a student has, needs-based assessment can be used, which focuses on identifying relevant risk and protective factors (including strengths and weaknesses) pertaining to both the individual students and their educational and home environments (Pameijer, 2006). While this may sound like more individualized assessment is required to ultimately meet the educational needs of students, that is not the case; in most educational contexts, teachers in general already compile an overview of each student's facilitating and hindering factors. Teachers often employ a student-centered approach, although in practice they may be focusing on remedying deficits. The key lies in shifting the focus toward enhancing strengths and creating protective factors. In addition, when the needs-based approach is applied effectively, discrepancies between intelligence and performance should also be more noticeable, thereby allowing for earlier recognition of gifted students with relative reading difficulties. Yet, recognizing these students is contingent upon the teacher having knowledge about giftedness and being aware that gifted students can exhibit discrepancies between their intelligence and achievement (Gierczyk & Hornby, 2021). Using needs-based assessment and strength-based education is in line with Gierczyk and Hornby (2021), who emphasize the importance of the focus on developing strengths as much as the remediation of difficulties (see also Baum et al., 2014; Olenchak, 2009). Importantly, by harnessing their strengths, the student's sense of competence is likely to grow, thereby increasing their motivation to read (Deci et al., 1991; Ryan & Deci, 2020), which should positively affect reading outcomes (Mol & Bus, 2011).

Limited research focuses on gifted children who do not meet diagnostic criteria but have a significant discrepancy between their intelligence and their reading achievement. Understanding these students is crucial, as they may lack needed educational support despite their potential. While this study examined gifted students with a reading discrepancy, similar challenges likely exist for gifted students with discrepancies in other academic areas (e.g., mathematics). More attention is needed for these students who fall between the cracks (i.e., do not receive the same attention as diagnosed students but also do not perform at the level expected based on their intelligence) to better support them and unlock their potential.

Conclusion

This study showed that the cognitive profiles of gifted primary school students with a discrepant reading profile are largely comparable to those of gifted students without a discrepant reading profile. Slight differences are found in terms of strengths, but not weaknesses on risk factors for dyslexia. Average word-reading levels of gifted discrepant readers seem to result from absence of pronounced strengths on underlying skills, instead of a presence of weaknesses. Having a discrepant profile did not affect the strength of the relation between risk factors of dyslexia and word-level reading outcomes. To meet the needs of gifted discrepant readers, needs-based education for gifted students, which focuses on strengths, could be a fruitful and positive starting point for tailored support.

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