Top Lang Disorders
Vol. 43, No. 3, pp. 251–275

Relations Between Pragmatic Language and Literacy-Related Skills in Omani Elementary Students

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In this study of more than 1,000 typical and at-risk elementary Arabic-speaking students in Oman, we explore relationships between pragmatic (and other) language skills, literacy, cognition, and behavior and the degree to which demography impacts performance on associated tasks. We found, in most cases, that females performed better than males, students' performance improved between Grades 2 and 4 but declined in Grade 5, and at-risk students performed as well as their nonreferred peers except on a working memory task. Pragmatic competence was the best predictor of literacy proficiency, and vice versa, for both groups when controlling for other variables. Findings are discussed in the context of Omani education and the limited attention given to pragmatics in research on connections between language and literacy. **Key words:** *at-risk*, *elementary-aged*, *literacy*, *Oman*, *pragmatics*

PRAGMATIC COMPETENCE is predicated on the social behaviors, cognitive processes, and semantic and syntactic aspects of linguistic functioning critical to success in all languages (Lightbown & Spada, 2013). Pragmatics is the use of language in varied social contexts to understand and exploit the implicit and explicit meanings of communicative acts (Green et al., 2014; O'Neill, 2014). It refers to an integrative constellation of skills, including (a) the ability to initiate, maintain (through turn taking), shift, terminate, and repair communication with others using discourse structures to regulate these actions; (b) the use and interpretation of a variety of communicative intentions and pragmatic functions appropriately in context; (c) the presupposing of shared understandings between oneself and one's communicative partner(s), given each person's unique perspective, a set of interactional maxims, and circumstances in which these maxims or rules may or may not be adhered; and (d) the understanding and use of nonliteral and figurative language (including humor) used to transmit cultural values in a society (Demchick & Day, 2016; Farnsworth, 2018; Lightbown & Spada, 2013; Mackie & Law, 2014; O'Neill, 2014; Troia, 2011, 2021; Wiener & Schneider, 2002).

Pragmatic abilities are crucial for the success and growth of oral language. There is evidence from many studies that show

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This research was supported by a grant from His Majesty's Research Trust Fund (HMRTF), the Sultanate of Oman, under Grant No. SR/EDU/PSYC/12/01.

All other authors and planners have disclosed no potential relevant financial relationships or otherwise. Author disclosures can be found at http://links.lww.com/TLD/A107.

Supplemental digital content is available for this article. Direct URL citation appears in the printed text and is provided in the HTML and PDF versions of this article on the journal's website (www.topicsinlanguagedisorders.com).

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DOI: 10.1097/TLD.0000000000000319

children with spoken language impairments frequently exhibit serious weaknesses in their pragmatic language skills (e.g., Horowitz et al., 2006; Liiva & Cleave, 2005; Nippold, 2007; Timler, 2008). Pragmatic skills also are postulated to contribute to written language development and success. Presupposition, for instance, is presumed crucial for the entire writing process, from revising and editing to satisfy the needs of an audience to drafting a text while taking a reader's potential experiences, knowledge, motives, and values into account (e.g., Kim & Schatschneider, 2017). For reading, too, presupposition is important, as the reader must infer why an author has presented particular information in some precise and purposeful manner at a given point in the text (e.g., Kim, 2015, 2016). Understanding this authorial stance allows the reader to view the information with the weight the author likely intended and as a result adjust prior knowledge activation, inferencing, comprehension monitoring, reading speed, and similar strategies. Effective discourse regulation, another aspect of pragmatics, is requisite to effectively use genre structure and subject knowledge for meaningful communication of ideas in writing or interpretation of ideas through reading (e.g., Chapman, 1999). Similarly, the use of figurative language is seen to be crucial for success in reading and writing because roughly two thirds of English is nonliteral (Arnold & Hornett, 1990) and almost one in 10 reading texts used in elementary classrooms contains idiomatic expressions (Lazar et al., 1989). Figurative language is used frequently in some genres, such as poetry, where imagery, symbolism, and analogy are used to assist writers in creating texts that communicate complex relationships between ideas, people, and things through imaginative language play.

Students with reading and/or writing difficulties, like their peers with spoken language impairments, experience significant challenges with pragmatics. It should be noted that the majority of the literature in this field does not clearly distinguish between children with dyslexia or dysgraphia, disorders that primarily affect written language development and performance in the absence of broad oral language difficulties, and those with oral language disabilities that also affect written language comprehension and expression. At any rate, students who struggle with literacy appear to have poor discourse regulation skills in that they do not successfully initiate and maintain conversations and they lack sufficient organization in their discourse (e.g., Lam & Ho, 2014; Riddick et al., 1997) and use a more limited array of communicative intentions and functions (e.g., Lapadat, 1991). In addition, they perform more poorly on theory of mind tasks thought to be related to pragmatic abilities, most ostensibly presupposition (e.g., Caillies & Soum-Bissaoui, 2008; Cardillo et al., 2018; Carruthers & Smith, 1996; Eyuboglu et al., 2018; Martin & McDonald, 2003; McTear & Conti-Ramsden, 1991; Norbury, 2005). Students with written language problems also have difficulty with comprehension of figurative language forms such as metaphors (Kasirer & Mashal, 2017; Wiejak, 2014), though this may be attributable to weaker vocabulary knowledge (Cardillo et al., 2018).

Research shows that students with language deficits appear less capable of effective discourse regulation while writing or reading, which provides evidence that pragmatic difficulties negatively influence text comprehension and output by children with spoken or written language impairments. With respect to writing, they have trouble with (a) topic organization and maintenance (e.g., Botting, 2002; Norbury & Bishop, 2003), (b) grammatical cohesion and clausal structures characteristic of the genre (e.g., Lapadat, 1991), (c) lexical cohesion created through use of synonyms, antonyms, hyponyms, and so forth, and (d) strategies to avoid reader confusion such as simplifying complex information, repeating important points, and elaborating on potentially controversial or unfamiliar content (e.g., Adams & Bishop, 1989). With respect to reading, children with an oral or written language disorder show underdeveloped genre and topic knowledge

(beyond the difficulties the student might have with decoding and word recognition; e.g., Best et al., 2008; Rupley & Wilson, 1996) and limited awareness and use of strategies associated with effective discourse regulation. These include summarizing the gist of a section of text, identifying the theme of a text, making text-to-self, text-to-text, and text-to-world connections, and rereading or momentarily skipping difficult content (e.g., Cain & Oakhill, 2007; Gersten et al., 2001).

SULTANATE OF OMAN EDUCATIONAL CONTEXT

Oman has a centralized education system and therefore variability among schools in terms of resource allocation is minimal. Oman has made strides in expanding access to education since 1970 by providing more than 1,000 tuition-free government-affiliated schools for its citizens. The total duration of general education in Oman is 12 years, divided into two stages: primary education, which lasts for 10 years and comprises two key stages; and secondary education that lasts for 2 years. Key Stage 1 of primary education covers Grades 1–4, whereas Key Stage 2 covers Grades 5–10. Available research evidence on the achievement of Omani students indicates there is a persistent gender achievement gap favoring females for students at different phases of general education (Akiba & Liang, 2013). Omani female students generally outperform male students on international assessments such as the Trends in International Mathematics and Science Study (Akiba & Liang, 2013).

Inclusive education for students with disabilities became part of official Omani educational policy in 2007 when it was formally incorporated into the education system. The Ministry of Education and the Ministry of Social Development have continued their efforts to overcome specific barriers to inclusive education, including negative attitudes toward inclusivity, misconceptions about the impact of students with disabilities on typically developing peers in the same class, inadequate resources that impede school preparation for inclusive education, and lack of teachers' self-efficacy for inclusive practices (Emam & Hendawy Al-Mahdy, 2022). The 2040 Oman National Strategy for Education includes two recommendations: (1) "the Ministry of Education in collaboration with the Ministries of Health and Social Development is responsible for developing a national scheme for the education of students with disabilities"; and (2) "the state is responsible for providing facilities, support services, necessary special programs, and human resources to create an ideal educational setting to enable the education of individuals with disabilities."

The Ministry of Education has established a support program for students with learning disabilities (LDs) in elementary schools. A resource room is set up in each school and is staffed by a specialized teacher who is responsible for coordinating the support provided to students inside and outside the classroom. The LD teachers receive in-service training through an endorsement program on diagnosis, instruction, and remediation for students with disabilities in schools. This program is a result of collaboration between the Ministry of Education and Sultan Qaboos University, the premiere higher education institution in Oman.

Arabic language, spoken throughout Oman, abounds with the use of figurative language and sarcasm. The use of figurative expressions can be similar in both Arabic and English. For example, the metaphor expressed in "A flood of students poured in following an announcement of need for blood donors" and the metonymy of "keep your eyes open" for staying alert are used similarly in both languages. Of course, there are figurative expressions unique to Arabic language and culture. For instance, the metaphor in the sentence "He is water dried grass" (هذا الشخص مية من تحت تبن) means "he is a snake in the grass." The idiom expressed by "I thought he was like Moses, but he turned out to be like Pharoah" (اللي حسبته موسى طلع فرعون) is used when one is

deceived in their impression of another person (i.e., "I thought he was a good person, but he turned out to be otherwise"). Of course, all other aspects of pragmatic functioning (discourse regulation, presupposition, and varied communicative intents and pragmatic functions) are evident in Arabic. For instance, the use of diminutives in Arabic can serve to express a pejorative attitude, show affection and endearment, hedge an utterance, minimize imposition, and display modesty (e.g., Badarneh, 2010). Pragmatic skills have been found to be impaired in Arabic-speaking children with language learning difficulties (e.g., Alduais et al., 2022; Qasem et al., 2022) and amenable to intervention in this population (e.g., Al-Shakhs et al., 2020; El-Zayat, 2023) using role-play activities, modeling, imitation, and reinforcement, as well as structured parent–child interactions.

THE CURRENT STUDY

The precise nature of the relationships between cognitive, linguistic, and literacy skills in children with and without pragmatic and/or literacy problems is unclear, despite the abundance of evidence suggesting a link between pragmatic language and literacy skills and that children who struggle in one area frequently exhibit difficulties in the other. Research that examines the relationship between pragmatic competence and structural language competence (i.e., competence with the form—syntax, morphology, and phonology—and content—semantics—of language), as well as the impact that these relationships have on literacy and reading and writing skills, is particularly needed. Of course, both language and literacy are influenced by and exert an influence on cognitive abilities such as executive functioning, attention, memory, and reasoning (e.g., Peng & Kievit, 2020; Quinn & Wagner, 2018) and these variables typically have not been studied along with language and literacy in the extant research focused on pragmatics. The current study investigates performance differences and relationships between tasks that assess pragmatics, structural oral language, literacy (both reading and writing), cognition (specifically, attention, verbal working memory, reasoning, and visual-motor integration), and behavior in elementary-aged children who are considered at low risk or at risk for academic learning difficulties. The specific research questions we examine include the following: (1) How do the student demographic characteristics of gender, grade, and risk status affect performance on measures of language (pragmatics and structural language), literacy, cognition, and behavior? (2) To what degree are these measures of language, literacy, cognition, and behavior related for the entire sample (elementary-aged students considered at low risk and at risk)? (3) For the entire sample (elementary-aged students considered at low risk and at risk), how well do pragmatic skills predict structural oral language and literacy performance, controlling for demographics, cognitive abilities, and behavior, and vice versa? (4) For the subset of students who are at risk for learning difficulties, are the same predictors identified for Research Question 3 equally relevant?

METHODS

Participants

The 1,185 Arabic-speaking students in the convenience sample, approximately 53% of whom were female, were enrolled in second- through fifth-grade classes in 62 different schools representing all 11 geographic regions of Oman, with most coming from schools in the more heavily populated northern portion of the country (see Table 1). Each school had at least three classroom teachers who evaluated the students, with a total of 267 teachers across Oman providing their students' data. About two thirds of the child participants were in Grades 2 and 3, and nearly 48% were identified as at risk for LDs. In Oman, students are considered at risk if they (a) possess normal intellectual functioning based on general cognitive ability measures, (b) demonstrate below

Table 1. Participant characteristics

Variable	*n*	%	Age (Years)	
			M	*SD*
Gender				
Female	627	52.9	8.7	1.3
Male	558	47.1	8.6	1.2
Grade				
2	420	35.4	7.5	0.6
3	370	31.2	8.5	0.6
4	259	21.9	9.6	0.6
5	136	11.5	10.5	0.8
At risk				
No	613	51.7	8.8	1.2
Yes	572	48.3	8.4	1.1
Region				
Northwest Oman	221	18.7	8.6	1.1
Northeast Oman	282	23.8	8.7	1.2
North Central Oman	434	36.6	7.9	0.8
Central Oman	88	7.4	8.8	1.0
South Oman	160	13.5	8.8	1.3

average performance on school-administered, teacher-designed academic tests, and (c) exhibit problems in one or more areas evaluated through teacher ratings using the Learning Disabilities Diagnostic Inventory (LDDI). However, risk status does not equate to having a verified LD because there is no formal process developed for identifying LD in Oman, including ruling out poor academic performance due to inadequate instruction. In addition, clinical testing performed by developmental psychologists or other nonschool professionals (e.g., to assess cognitive ability) is divorced from educational decision-making.

Procedures

The study activities were approved by the University Humanities Research Ethics Committee and the Ministry of Education Technical Office. Informed written consent was obtained from teachers and the parents of students who were included in the study. Participating teachers were informed of the general purposes of the research project and asked to use the rating scales to judge each child's performance on each item as accurately as possible. The teachers completed all rating scales and administered the direct child assessments (visual-motor and working memory tests [WMTs], see later) to their students following training to do so. The visual-motor test was administered to groups in one session, whereas the WMT was administered individually in another session.

All instruments used in this study were translated to Arabic using the committee approach, which better accommodates large cultural and linguistic differences between the source and target languages, with back-translation. The committee approach employs parallel translation, where several translators independently translate items (Harkness, 2003), following which a meeting is held to review, adjust, and finalize translation efforts through collaborative consensus among committee members, including the translators. Nearly all the rating scales completed by classroom teachers demonstrated unidimensional data structures (see notes for Table 2), and every instrument displayed strong internal consistency reliability, with Cronbach alphas greater than .80 (see Table 2). In addition, prior work has

Table 2. Descriptive statistics for study measures by group and simple univariate parametric tests

		Statistics					
Variable	**Group**	***M***	***SD***	***F***	***df***	***MSE***	**Cronbach α**
ROS item average[a]							.99
	Females	2.87	1.18	41.69**	1, 1,179	1.33	
	Males	2.44	1.12				
	No risk	2.68	1.20	0.08	1, 1,179	1.38	
	At risk	2.66	1.14				
	Second graders	2.55	1.17	3.06*	3, 1,177	1.37	
	Third graders	2.71	1.12				
	Fourth graders	2.82	1.26				
	Fifth graders	2.64	1.13				
WLOS item average[a]							.99
	Females	2.88	1.11	65.34**	1, 1,173	1.17	
	Males	2.37	1.05				
	No risk	2.62	1.15	0.54	1, 1,173	1.23	
	At risk	2.67	1.07				
	Second graders	2.55	1.10	3.27*	3, 1,171	1.23	
	Third graders	2.69	1.04				
	Fourth graders	2.79	1.21				
	Fifth graders	2.52	1.11				
WMT Total							.84
	Females	4.98	3.27	0.19	1, 1,161	11.24	
	Males	5.06	3.45				
	No risk	6.07	3.48	140.83**	1, 1,161	10.03	
	At risk	3.86	2.78				
	Second graders	5.06	3.27	13.97**	3, 1,159	10.87	
	Third graders	4.42	3.30				
	Fourth graders	5.00	3.56				
	Fifth graders	6.63	2.81				
FRTVMI Total							.91
	Females	31.41	8.91	43.03**	1, 1,167	83.16	
	Males	27.90	9.35				
	No risk	29.46	9.36	1.33	1, 1,167	86.13	
	At risk	30.09	9.19				
	Second graders	27.32	9.64	29.57**	3, 1,165	80.27	
	Third graders	29.85	8.64				
	Fourth Graders	34.01	8.98				
	Fifth graders	29.10	7.41				
LDDI Listening item average[a]							.96
	Females	6.32	1.89	17.91**	1, 1,182	3.50	
	Males	5.86	1.85				
	No risk	6.10	1.95	0.00	1, 1,182	3.55	
	At risk	6.10	1.81				
	Second graders	5.93	1.92	4.29*	3, 1,180	3.52	
	Third graders	6.18	1.83				
	Fourth graders	6.39	1.80				
	Fifth graders	5.84	1.98				
LDDI Speaking item average[a]							.97
	Females	5.95	2.04	15.49**	1, 1,182	3.95	
	Males	5.49	1.93				
	No risk	5.73	2.07	0.00	1, 1,182	4.00	
	At risk	5.73	1.92				
	Second graders	5.59	1.99	5.47**	3, 1,180	3.96	
	Third graders	5.72	1.92				
	Fourth graders	6.14	1.95				
	Fifth graders	5.43	2.23				

(*continues*)

Table 2. Descriptive statistics for study measures by group and simple univariate parametric tests (*Continued*)

		Statistics					
Variable	**Group**	***M***	***SD***	***F***	***df***	***MSE***	**Cronbach α**
LDDI Reasoning item average[a]							.98
	Females	5.45	2.26	22.84**	1, 1,182	4.98	
	Males	4.83	2.20				
	No risk	5.17	2.28	0.03	1, 1,182	5.07	
	At risk	5.15	2.22				
	Second graders	4.96	2.19	2.61	3, 1,180	5.05	
	Third graders	5.30	2.20				
	Fourth graders	5.38	2.30				
	Fifth graders	5.01	2.44				
CTRS ADHD Index/Hyperactivity item average[b]							.91
	Females	0.55	0.46	71.53**	1, 1,183	0.26	
	Males	0.80	0.56				
	No risk	0.66	0.51	0.17	1, 1,183	0.27	
	At risk	0.67	0.54				
	Second graders	0.65	0.51	1.20	3, 1,181	0.27	
	Third graders	0.70	0.54				
	Fourth graders	0.68	0.55				
	Fifth graders	0.61	0.46				
PLOS Short item average[a]							.97
	Females	3.07	1.01	14.30**	1, 1,183	0.94	
	Males	2.85	0.92				
	No risk	2.95	0.99	0.25	1, 1,183	0.95	
	At risk	2.98	0.96				
	Second graders	2.87	0.97	4.69*	3, 1,181	0.94	
	Third graders	3.01	0.92				
	Fourth graders	3.12	1.02				
	Fifth graders	2.83	1.02				

Note. ADHD = attention-deficit/hyperactivity disorder; CTRS = Connors' Teacher Rating Scale; FRTVMI = Full Range Test of Visual Motor Integration; LDDI = Learning Disabilities Diagnostic Inventory; PLOS = Pragmatic Language Observation Scale; ROS = Reading Observation Scale; WLOS = Written Language Observation Scale; WMT = Working Memory Test.

[a]Scales were found to exhibit unidimensional characteristics except the WLOS, which had two highly related ($r = .82$) factors that we decided to combine because the second factor was not clearly distinguishable from the first and only explained an additional 4.2% of total variance whereas the first factor explained 74.5% of variance.

[b]We used the designated subscales from the CTRS in our analyses, except that we (a) excluded the five items associated with the Cognitive Problems/Inattention subscale and the five items associated with the Oppositional Conduct subscale due to low internal consistency reliability and (b) combined the ADHD Index and Hyperactivity subscales into a single mean score because their association approached unity ($r = .87$).

*$p \leq .05$. **$p \leq .001$.

established the reliability and validity of the following translated measures used in this study: LDDI (Al-Mamari et al., 2015; Emam & Kazem, 2015), Connors' Teacher Rating Scale (CTRS; Al-Mamari et al., 2015), and Full Range Test of Visual Motor Integration (FRTVMI; Emam et al., 2021). We used raw scores in all data analyses rather than derived scores primarily because the normative data upon which any derived scores are based do not represent the population from which our sample was drawn.

Data collection in the spring semester was preceded by training in which the participating teachers recruited for the study were familiarized with the items on the instruments described later by the second author or one of 35 teacher trainers associated with the

research study, who themselves received a full day of training on the goals of the research study, instrument administration, and data entry. All the teachers who collected student data had taught students during the school semester prior to data collection, so they possessed good knowledge of their students' communication and literacy abilities to complete all the rating scales. Administration of the direct assessment items to students covering visual-motor integration and working memory was practiced under supervision, with feedback until teachers demonstrated 100% adherence to standardization procedures.

Instruments: Language

The Pragmatic Language Observation Scale (PLOS; Newcomer & Hammill, 2009) is used to screen for students who display pragmatic weaknesses in school and to assess the communication skills of students with or suspected of having specific language impairment in natural settings. It uses teachers' ratings on 30 items to judge students' classroom oral language behaviors. Most items are considered related to pragmatic skills (e.g., shares information, sticks to the topic when speaking, adjusts language to different social situations), though other items assess semantic (e.g., retrieves words quickly), syntactic (e.g., uses acceptable grammar), and phonological (e.g., has intelligible speech) skills. The PLOS is appropriate for use with children between 8 and 17 years of age and is completed in 5–10 min. Professionals knowledgeable about the student rate the 30 communication behaviors on a 5-point Likert-type scale (i.e., 1 and 2 = below average, 3 = average, 4 and 5 = above average). For this study, we desired a measure focused solely on the construct of pragmatics; thus, we closely examined the items to determine whether they matched the four areas related to pragmatic language functioning—communicative intentions, presuppositional abilities, discourse regulation skills, and figurative/nonliteral language comprehension and use (see Troia, 2021). Four items were considered indicative of communicative intentions (5, 14, 15, and 28), five items were considered representative of presupposition (9, 17, 19, 20, and 24), three items were associated with discourse regulation (4, 8, and 25), and, finally, three items were indicative of figurative language (11, 26, and 29). Thus, we used 15 of the original 30 items to develop an abbreviated and focused version of the PLOS. All analyses reported in this article are based on this abbreviated version.

The LDDI (Hammill & Bryant, 1998) is a multicomponent instrument appropriate for students between 8 and 17 years of age, with six independent scales for Reading (e.g., cannot sound out words), Writing (e.g., writes slowly), Mathematics (e.g., counts on fingers), Reasoning (e.g., takes too long to solve relatively simple problems), Speaking (e.g., uses incomplete, fragmented sentences), and Listening (e.g., misunderstands spoken directions). Each scale has 15 items that employ a 1 (frequently) to 9 (rarely) rating scale and requires 5–10 min to complete. For this study, we used only the Listening, Speaking, and Reasoning scales because (a) our focus excluded mathematics performance and (b) the Reading Observation Scale (ROS) and the Written Language Observation Scale (WLOS) displayed slightly better reliability. Importantly, the Speaking scale does not include any items that overtly index pragmatic abilities and the Listening scale only includes one such item ("Has difficulty with nonliteral language such as metaphors").

Instruments: Literacy

The ROS (Weiderholt et al., 2009) is a 25-item rating scale that can be used to assess reading behaviors of students aged 8;0 through 17;11 and is completed by teachers in 5–10 min. The scale statements describe specific reading behaviors typically observed in instructional contexts (e.g., reads orally with appropriate intonation and affect, retells read material correctly); each statement is rated by teachers on the same 5-point scale as the PLOS.

The WLOS (Hammill & Larson, 2009) is a 25-item rating scale that is used to assess written language behaviors displayed by students

aged 9;0 to 17;11. Its items are completed in 5–10 min and describe specific writing behaviors exhibited in instructional settings (e.g., writes well-organized paragraphs, uses acceptable grammar). Each statement is rated by teachers on the same 5-point scale as the PLOS and the ROS.

Instruments: Cognition

The FRTVMI (Hammill et al., 2006) evaluates the coordination of visual perception and fine motor movements in children aged 5;0 to 10;11 and comprises 18 geometric figures administered in a booklet, with six figures in boxes on each page. The figures are copied by the child directly beneath the sample provided in the test booklet. Administration usually takes 10–30 min, and scoring takes another 15 min. The score is the total number of designs correctly copied, given a list of detailed criteria for each figure.

The WMT, a test of listening memory span, has four practice trials, followed by 12 test items for which students are presented with two, then three, then four, and finally five sets of yes/no questions to which they respond in serial order and then are asked to recall the last words in each question set in presentation order. Testing is discontinued after three consecutive errors (i.e., one or more missed word recalls for a set). The score is the total number of words recalled in correct sequence.

The LDDI Reasoning scale was also used to evaluate cognition in our sample. As noted earlier, this scale has 15 items that employ a 1 (frequently) to 9 (rarely) rating scale and requires 5–10 min to complete. Items include "is inconsistent in thinking and makes illogical arguments" and "does not see cause–effect relationships."

Instruments: Behavior

The Conners' Teacher Rating Scale–Revised Short Form (CTRS; Conners, 1997) is used to assess the presence of attention-deficit/hyperactivity disorder (ADHD) in children and adolescents between 3 and 17 years of age. The 28-item version of the CTRS can be completed in 5–10 min and assesses behavior using four subscales (Oppositional Conduct, Cognitive Problems/Inattention, Hyperactivity, and an ADHD Index). The items on the ADHD Index subscale are drawn from the other three subscales and provide a sensitive indicator of ADHD symptoms. Teachers rate how often a child exhibits the behavior indexed by each item using a scale of 0 (not at all) to 3 (frequently). For this study, we used only the ADHD Index and Hyperactivity subscales because the others displayed inadequate reliability and we were solely interested in ADHD symptoms and not conduct problems. As noted in Table 2, the ADHD Index and Hyperactivity subscale scores were averaged to form a composite because 76% of variance between them was shared.

RESULTS

All data were found to exhibit normal distributional characteristics. Heterogeneity of variance between groups was observed for some variables and, in these cases, robust parametric comparisons using Brown–Forsythe univariate analyses of variance (ANOVAs) were employed. Because the results of robust testing were no different from those using conventional mean comparisons, we report results from conventional univariate ANOVAs for all variables. For ordinary least-squares regression analyses, multivariate normality was confirmed using Mahalanobis distances following removal of three outlier cases, and the relationships between all variables were determined to be linear based on plots of standardized residuals against predicted values and curve estimation testing. In addition, multicollinearity was found to be within acceptable limits (i.e., variance inflation factors <5, tolerances >0.200, and condition indexes <30). The SPSS data file (with outliers removed) used to produce these results is available as Supplemental Digital Content (available at: http://links.lww.com/TLD/A106).

Research Question 1: How do gender, grade, and risk status affect performance on measures?

As seen in Table 2, female students significantly outperformed male students on all measures except working memory. The largest gender difference was observed on the CTRS ADHD Index/Hyperactivity composite, with an effects size of $d = -0.49$, followed by the difference on the WLOS, with an effect size of $d = 0.47$. Students referred as at risk for LD performed significantly lower than their peers deemed at low risk based on teacher judgment on the working memory task only, with an effect size of $d = -0.70$. Significant differences attributable to grade level were observed on all measures except the CTRS ADHD Index/Hyperactivity composite and the LDDI Reasoning scale. Generally, scores across all measures rose between Grades 2 and 4 and then precipitously dropped at Grade 5, except for the WMT. The largest differences across grades were seen on the FRTVMI and the WMT tasks, with effect sizes of $d = 0.72$ for both (second vs. fourth graders for the FRTVMI and third vs. fifth graders for the WMT).

Significant two-way interactions were found for the ROS [risk status by grade, $F(3, 1{,}165) = 3.86$, $MSE = 1.31$, $p = .009$], the WLOS [risk status by grade, $F(3, 1{,}159) = 3.02$, $MSE = 1.15$, $p = .029$], and the FRTVMI [risk status by grade, $F(3, 1{,}153) = 2.95$, $MSE = 76.81$, $p = .032$]. For the ROS, at-risk students did not differ significantly in their teacher-reported reading skills across grades, but for low-risk students, (a) fourth graders displayed significantly better reading than fifth graders and (b) third and fourth graders displayed significantly better reading than second graders (see Figure 1). Likewise, for the WLOS, at-risk students were equivalent across grades, but low-risk fourth graders displayed significantly better writing skills than low-risk students in Grades 2 and 5 (see Figure 2). On the FRTVMI, at-risk fourth graders performed significantly better than students in all three other grades. For low-risk

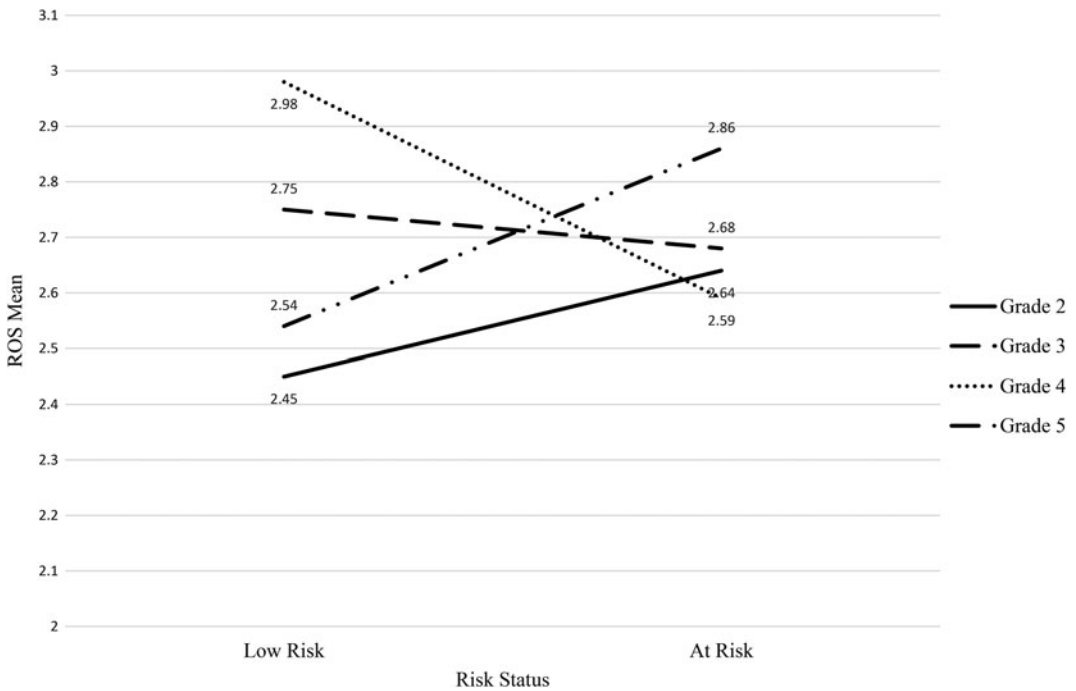

Figure 1. Risk status by grade interaction for the ROS. ROS = Reading Observation Scale.

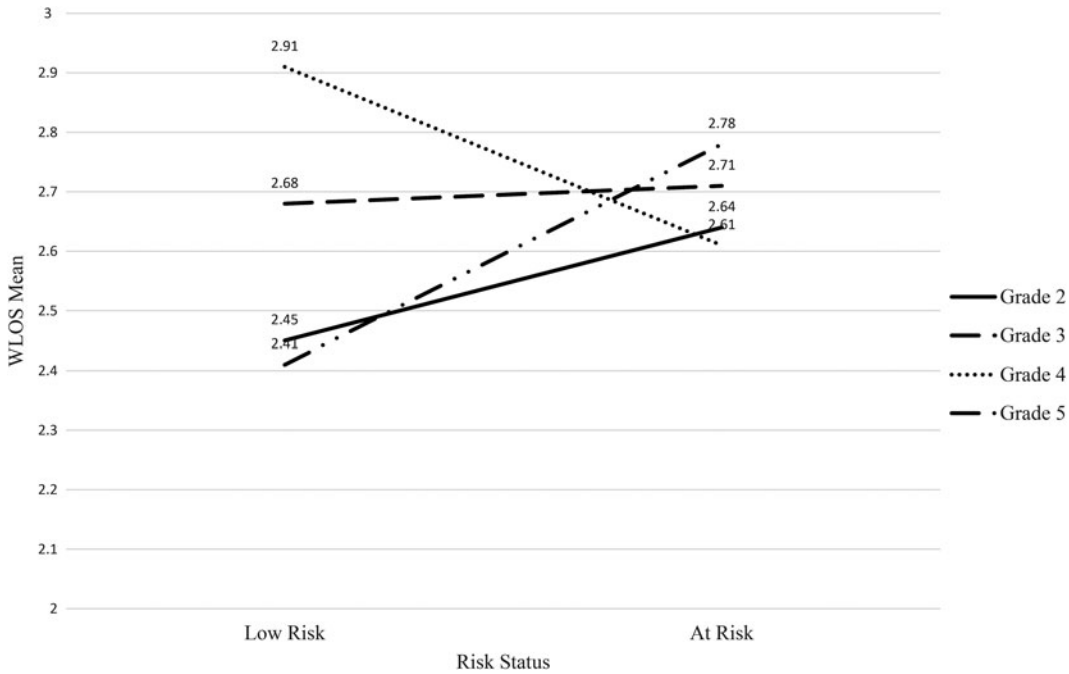

Figure 2. Risk status by grade interaction for the WLOS. WLOS = Written Language Observation Scale.

students, not only did fourth graders perform better than students in all three other grades but also students in Grades 3–5 scored higher than second graders (see Figure 3).

Significant three-way interactions were found for the WLOS [risk status by grade by gender, $F(3, 1{,}159) = 2.65$, $MSE = 1.15$, $p = .047$] and CTRS ADHD Index/Hyperactivity composite [risk status by grade by gender, $F(3, 1{,}169) = 4.77$, $MSE = 0.26$, $p = .003$]. As seen in Figure 4, among low-risk girls, those in Grades 3 and 4 significantly outperformed their second- and fifth-grade counterparts on the WLOS, whereas at-risk girls did not differ across grades in their teacher-reported writing skills. For low-risk boys, fourth graders performed significantly better than fifth graders on the WLOS, whereas at-risk boys did not differ across grades on the WLOS. On the CTRS (see Figure 5), low-risk second- and fourth-grade boys significantly outperformed (i.e., scored lower than) third-grade low-risk boys, whereas at-risk boys in the second grade performed better on the CTRS than fourth grade at-risk boys. Girls did not exhibit significant differences across grades on the CTRS, regardless of risk status.

Research Question 2: How are measures of language, literacy, cognition, and behavior related in the entire sample?

Table 3 shows the zero-order and first-order (controlling for child's age, which is important, given that raw scores from the measures were used rather than age-adjusted derived scores) correlations between the measures we employed in this study. Except for the WMT total score, which was not significantly correlated with any other variable, all correlations between measures were significant with a probability of .01 or less with and without age held constant and in expected directions. Most notable was the very strong ($r = .91$) correlation between scores on the ROS and the WLOS. Because these variables shared nearly 83% of variance, we created a composite observed literacy rating from the sum of the average teacher ratings for each scale. Likewise, the LDDI Listening and Speaking ratings were strongly correlated ($r = .89$ or

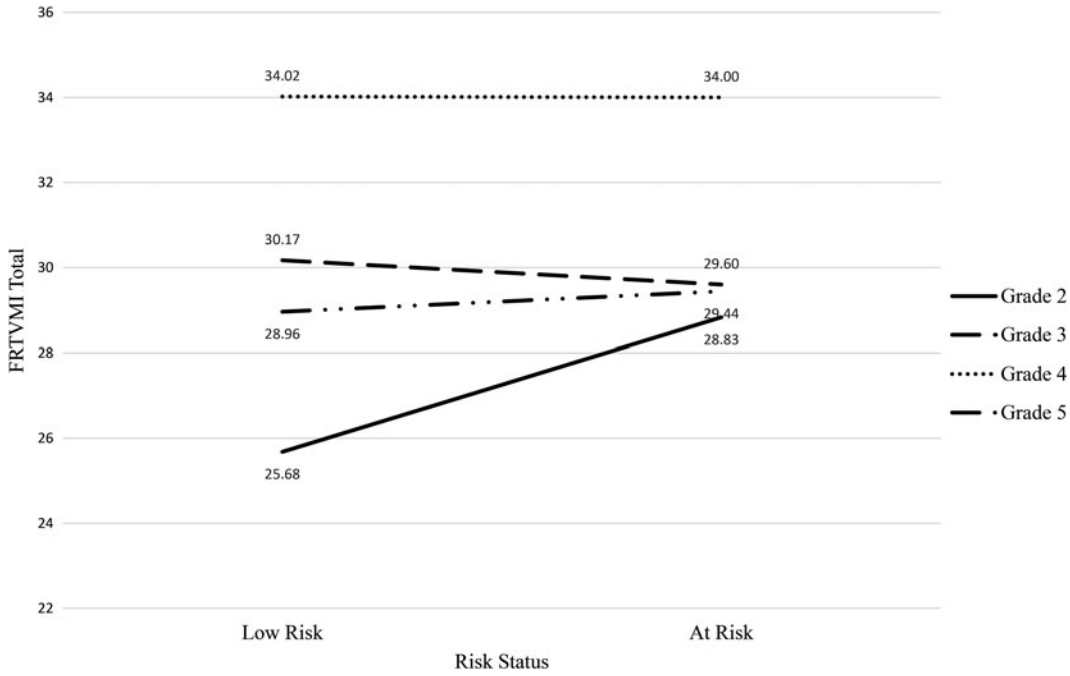

Figure 3. Risk status by grade interaction for the FRTVMI. FRTVMI = Full Range Test of Visual Motor Integration.

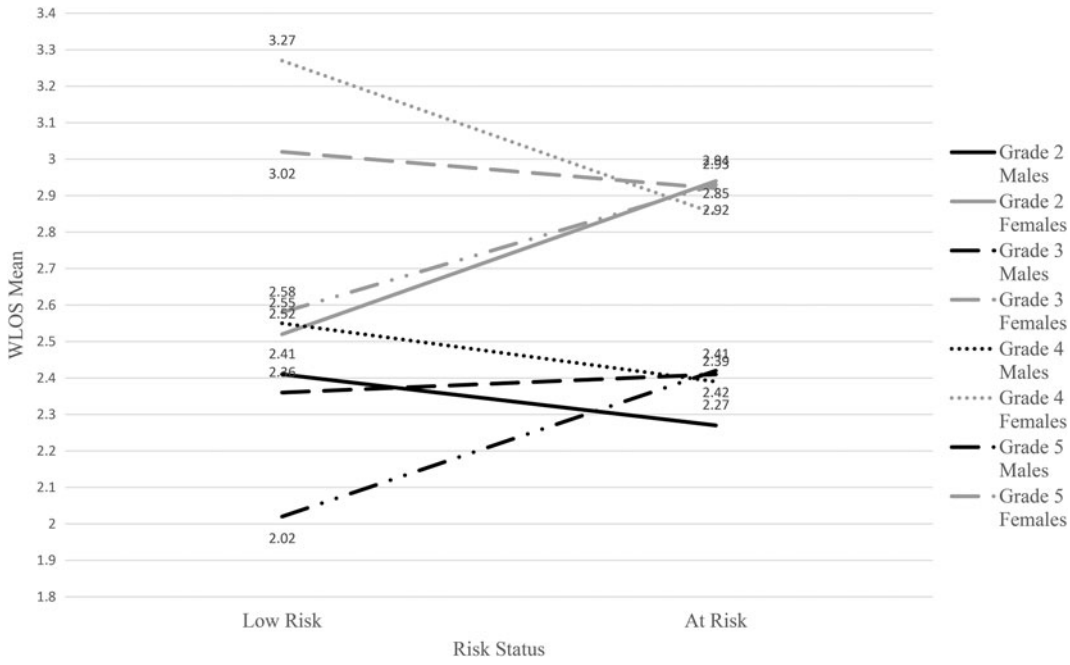

Figure 4. Risk status by grade by gender interaction for the WLOS. WLOS = Written Language Observation Scale.

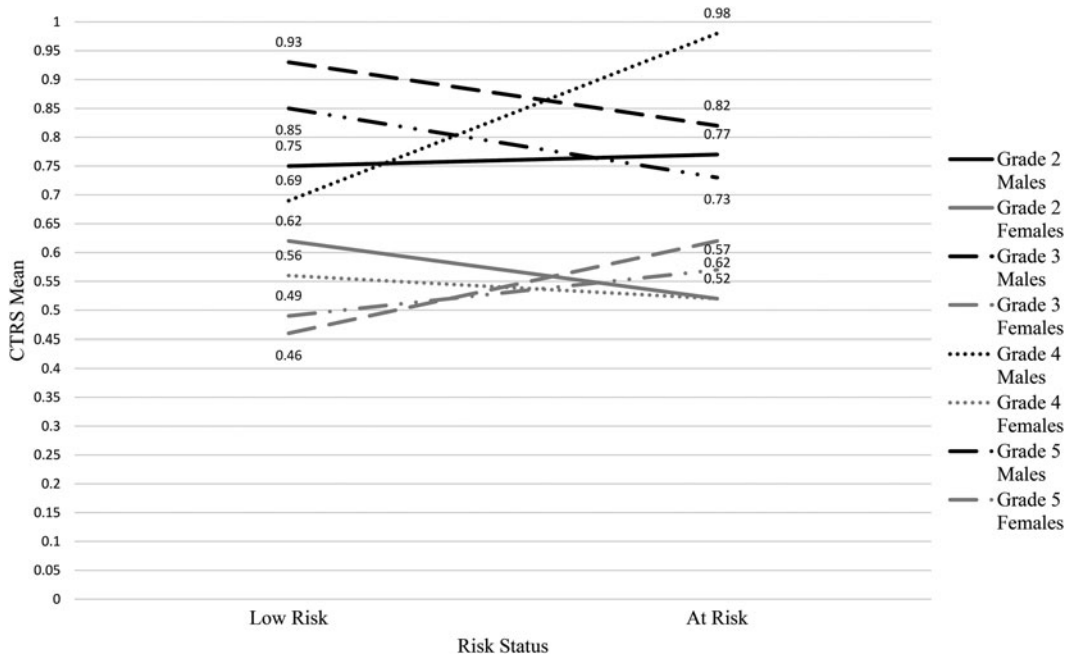

Figure 5. Risk status by grade by gender interaction for the CTRS. CTRS = Connors' Teacher Rating Scale.

.90) and thus we created a composite spoken language rating using the sum of the average teacher ratings for each scale. These composite variables were used in subsequent analyses.

Although scores on the WMT were not associated with any other measure, working memory deficits often are observed in children with language and literacy problems (e.g., Henry & Botting, 2017; Hutchinson et al., 2012; Peng et al., 2018; Swanson et al., 2009). As reported earlier, students in our sample who were considered at risk for LD performed significantly more poorly on the WMT than children who were considered at low risk even while rated performance in oral language (including pragmatics), literacy, reasoning, and behavior did not differ on the basis of risk status in this sample. To further explore the relationship between working memory and risk for LD based on referral, we identified the WMT score at the lowest quartile at each grade level (because there were some significant differences on the WMT due to grade) and calculated associated sensitivity (correctly included or identified) and specificity (correctly excluded or not identified) using the WMT as the reference standard for teacher referral of at-risk students. The mean WMT total scores at the 25th percentile for second through fifth graders were 3, 2, 2, and 4, respectively. Using these values, in the second grade, there were 153 students at or below the cut score of 3, and 106 of them were referred; conversely, there were 265 students above the cut score for the second grade and 110 of them were referred for LD risk. This resulted in 69% sensitivity and 59% specificity for LD risk status. In the third grade, there were 131 students at or below the cut score of 2, and 104 of them were referred; conversely, there were 232 students above the cut score for the third grade and 100 were referred. This resulted in 79% sensitivity and 57% specificity for LD risk status. In the fourth grade, 78 students attained a score of 2 or less on the WMT, and of these, 43 were classified as at risk based on referral; 179 fourth graders were above the cut score and 61 of them were referred. This resulted in 55% sensitivity and 66% specificity for LD risk status. Finally, in Grade 5, there were 32

Table 3. Zero-order correlations (below diagonal) and first-order correlations (above diagonal, with age held constant) between study measures

Measure	1	2	3	4	5	6	7	8	9
1. ROS	–	.91**	.04	.29**	.76**	.79**	.81**	−.55**	.84**
2. WLOS	.91**	–	.02	.32**	.74**	.75**	.77**	−.58**	.81**
3. WM	.05	.02	–	.00	.02	.03	.04	−.01	.04
4. FRTVMI	.30**	.33**	.01	–	.31**	.30**	.27**	−.23**	.26**
5. LDDI Listen	.76**	.74**	.02	.31**	–	.90**	.78**	−.49**	.73**
6. LDDI Speak	.79**	.75**	.03	.31**	.89**	–	.81**	−.49**	.76**
7. LDDI Reason	.81**	.78**	.04	.28**	.78**	.81**	–	−.53**	.75**
8. CTRS ADHD/ Hyper	−.54**	−.57**	−.01	−.23**	−.48**	−.48**	−.52**	–	−.46**
9. PLOS Short	.84**	.81**	.04	.28**	.72**	.76**	.75**	−.44**	–

Note. ADHD = attention-deficit/hyperactivity disorder; CTRS = Connors' Teacher Rating Scale; FRTVMI = Full Range Test of Visual Motor Integration; LDDI = Learning Disabilities Diagnostic Inventory; PLOS = Pragmatic Language Observation Scale; ROS = Reading Observation Scale; WLOS = Written Language Observation Scale; WM = working memory; WMT = Working Memory Test.

**$p \leq .01$.

students at or below the cut score of 4, and 12 were classified as at risk for LD; conversely, 93 students were above this cut score and 19 of these fifth graders were referred for LD risk. For the fifth grade, the LD risk status sensitivity was 38% and the specificity was 80%.

Research Question 3: Predictors of oral language, literacy, and pragmatics

To determine the extent to which teacher-rated pragmatic skills predicted oral language and literacy, and vice versa, we conducted several serial linear regression analyses. In all analyses, gender, grade, and LD status were entered in the first block to control for these demographic variables. In the second block, we entered scores from the CTRS ADHD Index/Hyperactivity composite, LDDI Reasoning scale, and the FRTVMI (scores from the WMT were omitted because they were unrelated to scores on other measures) to control for these cognitive variables. Finally, the predictor variables of greatest interest were entered in the third block. Analyses were run using stepwise entry for each block of variables to yield the most parsimonious regression equation. The results of these analyses are presented in Table 4.

In every case, gender, LDDI reasoning, and CTRS attentional/hyperactive behaviors remained significant predictors of the criterion of interest (whether spoken language, observed literacy, or PLOS scores) when all other predictors were entered. The FRTVMI also remained a significant predictor for observed literacy and spoken language ratings, though not for teacher-rated pragmatic skills. Pragmatics, spoken language, and literacy were consistently predictive of each other and contributed unique variance beyond that from student demographics, teacher-rated reasoning ability, teacher-rated ADHD-related behaviors, and directly assessed visual-motor integration skills. Demographic variables contributed anywhere between about 1% and 4% of variance to a criterion variable, and reasoning ability plus ADHD-related behavior plus visual-motor integration contributed an additional 57% (for pragmatic competence) to 68% (for spoken language ratings) of variance. Spoken language and pragmatics together contributed 11.5% unique variance to observed literacy ratings, whereas literacy and pragmatics together contributed 5% unique variance to spoken language ratings. Spoken language and observed literacy contributed nearly 16% unique variance to pragmatics. We used squared part correlations to evaluate the relative importance of each significant predictor, beyond demographic characteristics, in the full model for each criterion variable. For observed literacy ratings, pragmatics was the best predictor, followed by reasoning, ADHD-related behavior, spoken language, and FRTVMI score, in that order. For spoken language ratings, reasoning was the best predictor, followed by pragmatics, literacy, visual-motor integration, and ADHD-related behavior. For pragmatics, observed literacy rating was most predictive, followed by spoken language, reasoning, and, finally, ADHD-related behavior ratings.

Research Question 4: Predictors of oral language, literacy, and pragmatics in at-risk students

We performed the same analyses as described in the previous section but restricted the sample to those students whose WMT score was at or below the 25th percentile for their grade ($n = 396$, or 34.1% of the participants for whom we had WMT data). As noted previously, this criterion was associated with a raw score on the WMT of 3, 2, 2, and 4 for Grades 2, 3, 4, and 5, respectively. We used the WMT because risk status for LD based on teacher referral alone was not a reliable indicator of performance on most study measures. The results are briefly summarized here. When predicting observed literacy ratings, the final model, which was significant [$F(8, 378) = 215.69, MSE = 0.82, p < .001$], explained a total of 82% of variance, with demographics explaining 5.8% unique variance, performance on cognitive and behavioral measures explaining 62.2% unique variance, and structural oral language plus pragmatics explaining 14% unique variance.

Table 4. Regression analyses outcomes for multiple criterion variables

Criterion Variable: Observed Literacy Rating															
	Block 1					Block 2					Block 3				
Predictor Variable	***B***	***SE B***	***β***	***t***	***p***	***B***	***SE B***	***β***	***t***	***p***	***B***	***SE B***	***β***	***t***	***p***
Gender	.900	.130	.201	6.929	<.001	.241	.075	.054	3.220	.001	.307	.059	.069	5.246	<.001
Grade	.079	.064	.036	1.227	.220	.009	.036	.004	0.243	.808	.008	.028	.004	0.279	.780
Risk status	−.005	.131	−.001	−0.040	.968	.018	.073	.004	0.254	.799	−.019	.057	−.004	−0.342	.732
FRTVMI						.019	.004	.078	4.515	<.001	.008	.003	.034	2.457	.014
LDDI						.690	.019	.698	36.208	<.001	.249	.024	.252	10.415	<.001
Reasoning															
CTRS						−.733	.083	−.170	−8.792	<.001	−.527	.066	−.123	−8.011	<.001
Composite															
Spoken language rating											.094	.014	.159	6.495	<.001
PLOS Short											1.052	.048	.462	22.105	<.001
R^2					.043					.705					.821
Adj. R^2					.041					.704					.819
ΔR^2					.043					.662					.115
F					17.20**					856.81**					367.23**
df					3, 1,147					3, 1,144					2, 1,142

(*continues*)

Table 4. Regression analyses outcomes for multiple criterion variables (*Continued*)

Criterion Variable: Spoken Language Rating														
	Block 1					Block 2					Block 3				
Predictor Variable	***B***	***SE B***	β	***t***	***p***	***B***	***SE B***	β	***t***	***p***	***B***	***SE B***	β	***t***	***p***
Gender	.862	.223	.114	3.857	<.001	−.198	.129	−.026	−1.539	.524	−.255	.119	−.034	−2.145	.032
Grade	.104	.111	.028	0.940	.347	−.033	.062	−.009	−0.533	.482	−.040	.057	−.011	−0.692	.489
Risk status	.025	.225	.003	0.109	.913	.043	.125	.006	0.344	.872	.011	.114	.001	0.099	.921
FRTVMI						.039	.007	.096	5.520	<.001	.027	.007	.067	4.129	<.001
LDDI Reasoning						1.258	.033	.751	38.403	<.001	.761	.045	.454	16.902	<.001
CTRS Composite						−.069	.143	−.096	−4.879	<.001	−.319	.136	−.044	−2.346	.019
Observed literacy rating											.380	.059	.224	6.495	<.001
PLOS Short											.765	.112	.198	6.812	<.001
R^2					.014					.697					.747
Adj. R^2					.012					.695					.745
ΔR^2					.014					.683					.050
F					5.54**					858.51**					112.78**
df					3, 1,147					3, 1,144					2, 1,142

(*continues*)

Table 4. Regression analyses outcomes for multiple criterion variables (*Continued*)

Criterion Variable: PLOS Short															
	Block 1					Block 2					Block 3				
Predictor Variable	***B***	***SE B***	β	***t***	***p***	***B***	***SE B***	β	***t***	***p***	***B***	***SE B***	β	***t***	***p***
Gender	.195	.058	.099	3.365	<.001	−.045	.039	−.023	−1.154	.249	−.104	.031	−.053	−3.378	<.001
Grade	.033	.029	.034	1.147	.252	.004	.019	.004	0.201	.840	.003	.015	.003	0.203	.839
Risk status	.026	.058	.013	0.450	.653	.028	.038	.014	0.734	.463	.025	.030	.013	0.839	.402
FRTVMI						.007	.002	.063	3.065	.002	−.001	.002	−.007	−0.419	.676
LDDI Reasoning						.307	.010	.708	30.939	<.001	.047	.013	.107	3.600	<.001
CTRS Composite						−.133	.043	−.070	−3.066	.002	.111	.035	.059	3.175	.002
Spoken language rating											.051	.007	.197	6.812	<.001
Observed literacy rating											.285	.013	.648	22.105	<.001
R^2					.012					.585					.748
Adj. R^2					.009					.583					.747
ΔR^2					.012					.573					.163
F					4.57*					527.23**					370.57**
df					3, 1,147					3, 1,144					2, 1,142

Note. CTRS = Connors' Teacher Rating Scale; FRTVMI = Full Range Test of Visual Motor Integration; LDDI = Learning Disabilities Diagnostic Inventory; PLOS = Pragmatic Language Observation Scale.
*$p < .01$. **$p < .001$.

The significant predictors were identical to those found using the original sample: pragmatics ($\beta = .467$), reasoning ($\beta = .239$), structural oral language ($\beta = .186$), ADHD-related behavior ($\beta = -.106$), and gender ($\beta = .085$). When predicting spoken language ratings, the final model was significant [$F(8, 378) = 112.04$, $MSE = 3.97$, $p < .001$] and explained 70.3% total variance. Demographics explained 1.4% (not significant), cognitive and behavioral measures 62.2%, and observed literacy ratings and pragmatics 6.8% unique variance. The significant predictors were slightly different from those of the original sample: reasoning ($\beta = .377$), observed literacy ratings ($\beta = .307$), pragmatics ($\beta = .167$), gender ($\beta = -.063$), and visual-motor integration ($\beta = .063$). Finally, with pragmatic competence as the criterion, all variables entered explained a total of 73.1% of variance and the model was significant [$F(8, 378) = 128.54$, $MSE = 0.25$, $p < .001$]. The only two significant predictors were observed literacy ratings ($\beta = .698$) and spoken language ratings ($\beta = .152$).

DISCUSSION

Our goals in this study essentially were to (1) delineate the effects of select demographic characteristics on cognitive, structural language, pragmatic, behavioral, and literacy measures in elementary-aged students considered at low risk or at risk for LD and (2) identify the degree to which pragmatic skills predict and are predicted by the other measures in the whole sample of students and in those specifically at risk for LD. For our first research question dealing with the effects of student demographics on measures, we found that, for most tasks, (1) females performed better than males (in line with findings reported by other scholars such as Conlon et al., 2019; Kauschke et al., 2016; Reilly et al., 2019; Troia et al., 2019); (2) students' performance improved between Grades 2 and 4 (as would be expected especially for measures using raw scores) but then declined in Grade 5; and (3) contrary to expectations, students considered at risk based on teacher referral performed just as well as their low-risk peers except on the task evaluating verbal working memory. However, the effects of sociodemographics on performance were more nuanced for some measures. For instance, on teacher judgments of reading proficiency, at-risk students were rated equivalently across grades whereas low-risk third and fourth graders were rated somewhat or significantly better than their second- and fifth-grade counterparts. Similarly, on teacher judgments of writing proficiency, at-risk boys and girls were rated equivalently across grades, but while low-risk girls in the third and fourth grades were judged to be better writers than those in Grades 2 and 5, low-risk boys in only the fourth grade were judged to be better writers than their fifth-grade counterparts. Thus, on these literacy measures, the rated performance of at-risk students was flat across grades for both boys and girls, but the rated performance of students considered at low risk for LD had a more pronounced curvilinear manifestation across grades, especially for girls. In Omani schools, children in Grades 1–4 are educated together in mixed-sex classrooms, but beginning in Grade 5, children are segregated by sex into different classrooms. We suspect this influenced teacher ratings of the fifth graders in our sample and may help explain the drop in ratings seen at that grade, though the precise mechanism by which this may have occurred is unclear and warrants further investigation. Perhaps, teacher demands for literacy performance were substantially greater in the fifth grade for typical students, or perhaps with the absence of the opposite sex in the same classrooms, teachers' judgments of literacy proficiency were less moderated for unreferred (i.e., at low-risk) students. Also, there might be a "leapfrog" effect in the academic demands placed upon students in the fifth-grade curriculum compared with that in earlier grades, in part, due to the complexities of the morphological, syntactic, and semantic aspects of standard Arabic language that

become more of a focus in late elementary school.

The general lack of differences between referred (at-risk) and unreferred (low-risk) students in how teachers rated their performance in oral language (including pragmatics), literacy, reasoning, and behavior (i.e., attention and hyperactivity) is puzzling. Considering that referred students purportedly had to demonstrate below average performance on teacher-constructed academic tests (Omani schools have limited access to norm-referenced assessments) and problems in one or more areas evaluated through teacher ratings using the LDDI, one would anticipate differences on at least some of the literacy and language measures. Although we elected not to use the Reading, Writing, and Mathematics subscales from the LDDI, a check for significant differences between students considered at risk (i.e., referred) versus low risk (i.e., unreferred) on average ratings for each of these scales revealed no such differences. Thus, we are confident that referred and unreferred students were not rated significantly differently by teachers in any domain of language or literacy and performed similarly on the visual-motor integration test.

Where these students did differ was on the verbal working memory task, but the overlap between those referred for LD risk and those who scored at or below the sample-based 25th percentile for the WMT ranged between 38% in Grade 5 and 79% in Grade 3. Consequently, referral status did not correspond well with performance on an objective cognitive measure that assesses working memory, an aspect of cognition implicated in many language and literacy disorders (e.g., Daneman & Merikle, 1996; Peng et al., 2018). It is unclear why this discordance existed and why notable teacher rating differences between at-risk and low-risk students were not observed, but it is likely that Omani teachers are not well positioned to make accurate judgments regarding students' language, literacy, and behavioral abilities. Widespread formal education is a relatively recent policy prescription for the Omani population, having been instituted in the last half century, and teaching has transformed from an open access job to which anyone could apply to a more professionalized occupation requiring preservice preparation through colleges and universities, though professional induction and ongoing professional development are still weak (Al Barwani, 2016; Ministry of Education & World Bank, 2012). Consequently, teachers in Oman may lack sufficient knowledge regarding appropriate developmental expectations to distinguish at-risk students from peers because of the relative newness of the profession and limited opportunities for continuous learning. Prior research with Omani teachers has found that they fail to accurately identify the key characteristics of students with ADHD, emotional and behavioral difficulties, and LDs (Al-Mamari et al., 2015; Emam & Kazem, 2015). It also should be noted that some students who are referred for LD in Oman receive reading tutoring using rather arbitrary local decision-making by the school staff (we were unable to track such decisions for the participants in this study); this additional support may mask performance differences between those who are referred and those who are not.

For our second research question focusing on the correlations between measures, we found all measures to be significantly correlated with each other, except for working memory task performance, regardless of whether student age was held constant. In fact, some measures were so strongly correlated (i.e., scores on the ROS and the WLOS, scores on the LDDI Listening and Speaking scales), we created composite variables to avoid collinearity problems with subsequent analyses. It is not surprising to find significant correlations between language, literacy, behavior, and most cognitive measures because of shared task processing demands, use of related funds of knowledge, and so forth. Other authors have observed significant relationships between measures associated with these broad constructs (e.g., Berninger

et al., 2017; Chow & Wehby, 2018; Kim et al., 2013).

For our third and fourth research questions dealing with predictive relationships between variables, we found that, when controlling for student demographic variables (including risk status) and cognitive plus behavioral abilities, pragmatics was the best predictor of teacher-rated literacy proficiency, and vice versa. For spoken language, reasoning was the best predictor, followed by pragmatics and then literacy skills. In just those students who scored at or below the 25th percentile on the WMT (and thus could be considered at risk, though not necessarily referred for possible LD), the findings were mostly the same, with pragmatics and literacy being the best predictors of each other, though for spoken language, reasoning remained the best predictor and literacy skills and pragmatics switched their relative importance. In all these analyses, cognitive and behavioral measures entered second in the serial regression explained the majority of variance (57%–68%), with smaller but still significant amounts of variance explained by the language and literacy measures entered last (5%–16%), and the weakest contributions made by the demographic variables entered first (1%–6%). Of course, given the potential for inadequate reliability of the Omani teachers' ratings, these findings should be viewed as suggestive and tentative until more rigorous research has been conducted. Nevertheless, the observed relationships between pragmatics and literacy (and structural spoken language skills) in children with and without risk for LD reinforces and expands prior work that has identified connections between these areas of development (e.g., Cardillo et al., 2018; Lam & Ho, 2014; O'Neill, 2014). Perhaps, most noteworthy is the finding that pragmatic and written language skills were more strongly connected with each other than were other aspects of linguistic, cognitive, and behavioral functioning. This suggests researchers (and practitioners) should devote greater attention to the influence of language use for social purposes when examining school achievement; the presumed effects of pragmatics on reading comprehension and written expression described earlier may be even more relevant than typically assumed considering the limited consideration given to social language use in literacy assessment, development, and intervention research. In the context of Oman and standard Arabic written language, the connections between pragmatics, structural language, and literacy become even more central, because written Arabic abounds with diverse socially derived expressions and vocabulary that differ to some extent from everyday spoken Arabic and among the varied local and regional dialects of Arabic within Oman.

Limitations and future research

Our current investigation has some limitations that warrant discussion. First, teachers' evaluations of students' competencies served as the foundation for our study, except for working memory and visual motor integration, which were examined using objective tests. Although using teacher reports to identify students who are at risk is generally reliable and valid (e.g., Rimfeld et al., 2019; Slattery et al., 2022), relying on this sole evaluation approach is likely problematic. To improve screening and assessment processes and to provide more reliable data, it would be beneficial to integrate objective testing of the observed constructs (e.g., pragmatic language, attention, literacy) and/or conduct follow-up teacher interviews. Likewise, because of the large geographic area (i.e., across the country of Oman) for data collection in this study, it was not possible to examine and ensure interobserver reliability. We attempted to improve the quality of the data by providing training workshops for teams representing different regions of Oman, which led the data collection in their regions and trained the classroom teachers who rated/tested students. Second, because standardized norm-referenced or criterion-referenced tests are not available in Oman, the referrals of the at-risk study participants

were based on diagnostic academic evaluations in reading and writing that are generally created by specialist teachers; thus, the referred students may not have been, in fact, at risk. Third, our findings should be viewed as preliminary and await replication with more varied samples of students and teachers. Future research may prioritize testing referred and nonreferred diverse groups of students on pragmatic language, written language, and oral language and investigating how their performance is associated with other cognitive and behavioral variables.

Clinical implications

The current study has several implications for teachers and other school professionals in Oman. It is noteworthy to mention that in Oman, there are school psychologists who conduct assessment of students' educational abilities, but there are few speech–language pathologists and special educators to provide intervention services to students with disabilities. General educators in Oman are not exposed to field experiences during their teacher education programs that could adequately prepare them for addressing the needs of neurodiverse students. Teachers in Oman do obtain some in-service professional development on inclusive education, though it is not extensive enough to enable them to face the challenges associated with teaching students with disabilities. On the basis of our study findings, we recommend that general educators in Oman obtain intensive training on assessment of students' language and literacy skills, particularly in early grades, as early diagnosis and early intervention could lead to improved student learning outcomes. Teacher education programs in Oman need to include one or two core courses on diverse learners to better equip teacher candidates with the necessary knowledge, skills, and dispositions associated with teaching students with disabilities, particularly students with LDs who are overrepresented in schools in Oman. Finally, because pragmatic language abilities and literacy appear to be strongly interrelated, both should be considered when evaluating at-risk students and designing interventions for those who eventually are identified with a disability.

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