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The Role of Reading Anxiety among Struggling Readers in Fourth and Fifth Grade

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Abstract

Cognitive predictors of reading are well known, but less is understood about the roles of “noncognitive” factors, including emotional variables such as anxiety. While *math* anxiety has been a focus of study, its analogue in the reading literature is understudied. We assessed struggling fourth and fifth graders ($n = 272$) on reading anxiety in the context of general anxiety, cognitive predictors (working memory, verbal knowledge), and demographics. Regressions tested for unique contributions to three reading outcomes: word reading accuracy, oral reading fluency, and reading comprehension. Reading anxiety and general anxiety correlated moderately ($r = .63$) but were differentially related to reading. Reading anxiety predicted comprehension when all other predictors were considered, and predicted oral reading fluency until word reading accuracy was added to the model. Results offer a more nuanced understanding of the nature of reading anxiety, and its implications for struggling readers.

Identifying intervention targets for struggling readers is important because reading is strongly linked to children’s later achievement, retention, and future earning potential (Duncan et al., 2007). Late elementary school (i.e. fourth and fifth grade) is an especially critical developmental stage for reading, as students are expected to have mastered lower level skills and are reading to learn subject content (Chall, 1996; Chall & Jacobs, 1983). Most reading development research has examined the contributions of cognitive processes such as working memory (WM; Cain et al., 2004; Carretti et al., 2009), as well as language factors such as phonemic awareness (Vellutino et al., 2004), the latter of which typically form the foundation of early prediction models.

However, reading is complex and not all struggling readers respond to typical language-based intervention (Fletcher & Vaughn, 2009; Torgesen, 2000). So-called “noncognitive” factors (to distinguish them from performance measures), including self-regulation, motivation, self-efficacy, and emotional variables such as anxiety, may account for variability in reading above and beyond cognitive and language-based factors (Carroll & Fox, 2016; Denton et al., 2020; Grills et al., 2012, 2013; Ialongo et al., 1994; Toste et al., 2020). The focus of the current work is on anxiety, and particularly reading anxiety, as

its role in reading is understudied relative to other noncognitive factors. Within academic contexts, it is important to consider the extent to which domain-specific anxiety converges or diverges with general, trait-level anxiety. This distinction has been investigated quite thoroughly in the math domain over the past decades (Ashcraft & Moore, 2009; Hembree, 1990; Wigfield & Meece, 1988), but analogous relationships in the reading domain are not well understood. Therefore, the purpose of the current study was to investigate the roles of reading anxiety versus general anxiety in the context of well-known reading predictors.

Anxiety and reading achievement

Anxiety has been negatively linked to achievement (Bryan et al., 2004; Carey et al., 2017; Grills et al., 2012; Pekrun et al., 2017). For example, a child may become distracted by anxious thoughts (e.g. “I’m worried about failing this class”) or physiological symptoms of anxiety (e.g. increased heart rate), which may interfere with his/her ability to concentrate and problem solve (Grills et al., 2013; Ialongo et al., 1994). This relationship is consistent with Attentional Control Theory (Eysenck & Derakshan, 2011), which posits that anxiety inhibits performance by reducing the individual’s capacity to process information in order to complete new or difficult tasks. Despite the theoretical link between anxiety and achievement, only a handful of studies have examined this relationship, and these have been with samples of early elementary school students. For instance, Ialongo et al. (1994) found that a group of first graders who reported high levels of anxiety at the beginning of the year were more likely to be in the lowest quartile for reading at the end of the year. A set of studies from Grills et al. (2012, 2013, 2014) examined different types of anxiety (i.e. separation anxiety, harm avoidance) and how they differentially relate to various reading outcomes (e.g. word reading, fluency) in first graders. One cross-sectional study (Grills et al., 2012) found that reading fluency was positively related to harm avoidance, while neither type of anxiety predicted word reading. These studies did not find a strong direct relationship between general anxiety and reading achievement; even the largest effects were small (e.g. $r = 0.20$, for the relationship between harm avoidance and both basic skills and passage comprehension) (Grills et al., 2013). Additionally, a longitudinal study from Grills et al. (2014) found that general anxiety levels at the beginning of first grade were not associated with intervention response among struggling readers at the end of the year.

It is possible that a measure of reading-specific anxiety would have demonstrated stronger and more consistent relationships to reading across these studies. Although the Grills et al. (2014) study examined the relationship between anxiety and reading among struggling readers, most studies have used samples of students with a wide range of reading skills, and none of these studies utilized a reading-specific anxiety measure. We found only two studies that utilized a reading-specific anxiety measure (Katzir et al., 2018; Ramirez et al., 2019). Katzir et al. (2018) found that WM, phonological awareness, and rapid automatized naming were significantly related to reading anxiety indirectly via word reading and reading fluency. However, this study was conducted with Hebrew-speaking second graders who were not selected for reading difficulties. Recently, Ramirez et al. (2019) found support for the relationship between reading anxiety and reading among first and second graders; however, this sample was not selected for reading difficulties and reading was only indexed with a

measure of word reading accuracy. Moreover, these studies did not also measure general trait-level anxiety.

Taken together, existing theory supports a link between anxiety and reading, but emerging evidence suggests that domain-specific anxiety measures may demonstrate stronger contributions to reading skills. However, the construct of reading anxiety and the extent to which it is distinguishable from general trait-level anxiety is understudied. Additionally, more work is needed to clarify these relationships among struggling readers at the late elementary school level and for different types of reading outcomes. From a theoretical perspective, Attentional Control Theory suggests that anxiety may be particularly deleterious for timed compared to untimed tasks; while some available evidence supports this relationship (Grills et al., 2012), more work is needed. Moreover, existing studies do not also consider reading comprehension, a complex skill requiring cognitive resources and information processing, which may be compromised by anxiety (Eysenck & Derakshan, 2011).

Findings in the math literature support the argument that measures of domain-specific anxiety have stronger relations to achievement than general anxiety measures. For example, general anxiety has not demonstrated strong relationships to math performance (Hembree, 1990), but math-specific anxiety has been linked to lower course grades in math, poorer knowledge of math concepts, and lower math fluency (Ashcraft, 2002; Ashcraft & Krause, 2007; Donolato et al., 2020; Sorvo et al., 2017). Although math anxiety is moderately correlated with trait-level general anxiety, these are distinct constructs (Hembree, 1990). A stronger knowledge of the role of math anxiety in math achievement has led to evaluations of interventions that integrate math anxiety-reducing components (Brunyé et al., 2013; Arch & Craske, 2006; Tang et al., 2007). Therefore, a better understanding of these analogous relationships within the reading domain may have the potential to inform intervention efforts.

Cognitive predictors of reading

Prior studies considering the relationship between anxiety and reading have not consistently controlled for well-known reading predictors. Thus, in order to develop a stringent test of the unique contribution of reading anxiety to reading outcomes, it is important that predictive models include well-known predictors of reading. For example, WM has demonstrated moderate relations to phonological processing, word reading, fluency, and comprehension (Cain et al., 2004; Carretti et al., 2009). Verbal knowledge is another important predictor of reading, particularly comprehension (Denton et al., 2011). The role of untimed word reading accuracy, a strong predictor of fluency and comprehension (Gough & Tunmer, 1986), can also be considered in predictive models of fluency and comprehension to provide a particularly rigorous test for the role of reading anxiety.

Current study

The studies described above have demonstrated that anxiety has theoretical and empirical relations to reading outcomes; however, the nature of the relationship between reading

specific anxiety and reading achievement is unclear, particularly among struggling readers and for a range of reading outcomes. It is also important to evaluate the convergence and divergence between reading anxiety and general trait-level anxiety. WM and verbal knowledge have known relations to reading and will thus further contextualize the role of reading specific anxiety. If reading anxiety demonstrates a unique contribution to reading outcomes above these important predictors, then this may be a viable target for intervention if integrated into typical language-based approaches. Moreover, this study focuses on late elementary school students because these factors may be particularly important at this age level, since students are expected to have shifted from “learning to read” to “reading to learn.”

Although there is limited research examining the relationship between reading anxiety and reading achievement, we expected that reading anxiety would be differentially related to different types of reading skills (i.e. word reading accuracy, oral reading fluency, reading comprehension). For instance, in line with Attentional Control Theory, reading anxiety would be expected to lead to greater interference when the reading task is complex and cognitively demanding (i.e. reading comprehension), or when the task is less complex but performed under timed conditions (i.e. oral reading fluency). It was also expected that reading anxiety would be moderately related to trait-level general anxiety, but that only reading anxiety would demonstrate unique contributions to reading outcomes.

Methods

Overview

We drew a sample of 272 fourth and fifth grade students from a larger reading intervention study ($N = 280$). The intervention study identified struggling readers through a measure of silent reading comprehension (described below). Students were randomized to the intervention or to a business-as-usual treatment condition; however, the current study only uses data from the initial (pre-test) time point; more information about the intervention project and procedures can be found in Vaughn et al. (2019). Moreover, despite overlap in participants from the intervention study, the combination of variables utilized and the research questions addressed are unique to the present study. All procedures were approved by the Institutional Review Boards of the institutions of the investigators.

Participants

School sites—Participants were drawn from a total of nine schools and three school districts in the southern United States. There was variability across the three districts with regard to race/ethnicity and socioeconomic status; specifically, one school district served predominantly Caucasian students and had a low proportion of students with low SES, whereas the other two districts served larger portions of African American and Hispanic students and also had higher proportions of students with low SES. However, we note that the sample as a whole generally reflected the range of ethnic and economic diversity of public school students served across this region of the country. Across all school districts and schools in the current sample, there were 66 classrooms represented.

Selection of struggling readers—The Test of Silent Reading Efficiency and Comprehension (TOSREC; Wagner et al., 2010) was used to identify struggling readers. This screening measure was administered to all fourth and fifth grade students ($n = 2,570$) at participating schools. Students were identified as struggling if they scored at or below a standard score of 85. There were 674 students eligible for randomization into treatment or business-as-usual groups for the intervention study; however, due to limited resources, only 280 students were drawn at random from this pool of eligible participants. Eight of these 280 students did not complete all measures examined in the present study, resulting in a total of 272 struggling readers in the current study.

Student participants—Demographic information regarding the current study's final sample is reported in Table 1.

Measures

Trained examiners, who included research staff, undergraduates, and graduate students, administered all assessments. Training for examiners involved approximately 20 h of instruction on test administration and practice administration with feedback. Before being cleared to test in the schools (with onsite supervision), each examiner was evaluated by the project assessment coordinator.

Demographic information—Student demographic information was provided by the schools and included age, gender, free or reduced lunch status, special education eligibility, and race/ethnicity.

Reading—The Woodcock Johnson-III Letter-Word Identification subtest was used to measure word reading (Woodcock et al., 2001). Test re-test reliability for children aged 8–13 years is approximately .85 (Woodcock et al., 2001). In our sample, the internal consistency reliability coefficient for Letter-Word Identification was .90. The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Oral Reading Fluency (ORF; Good & Kaminski, 2002) was used to measure fluency. Test-retest reliability coefficients for this measure range from .92 to .97, and alternate form reliability ranges from .89 to .94 in elementary aged students (Tindal et al., 1983). For reading comprehension, the Gates-MacGinitie Test of Reading Comprehension (GMTR; MacGinitie et al., 2000) was administered in a timed, group setting. Alternate form reliability for the GMTR ranges from .80 to .87 (MacGinitie et al., 2000). In our sample, internal consistency reliability for the GMTR was .84. For descriptive purposes, we also report scores for silent reading efficiency, which was measured with the Test of Silent Reading Efficiency and Comprehension (TOSREC; Wagner et al., 2010), since this measure was used to identify participants as struggling readers. Reliability coefficients for the TOSREC with other reading measures such as the WJ-III exceed .70 (Wagner et al., 2010). Age-based standard scores were used for all reading measures.

Verbal knowledge—Verbal knowledge was assessed with the Kaufman Brief Intelligence Test-2, Verbal Knowledge (KBIT-2; Kaufman & Kaufman, 2004). The Verbal Knowledge subtest is an individually administered, untimed measure of receptive vocabulary. The Verbal Knowledge score was prorated for the verbal domain, and age-based standard scores were

used. Test-retest reliability estimates range from .88 to .93 across four age groups for the verbal scale (Kaufman & Kaufman, 2004), and in our sample internal consistency reliability coefficient was 0.86.

Working memory—WM was assessed with the Working Memory Test Battery for Children-Listening Recall (Pickering & Gathercole, 2001). The test has six items at span levels 1–6. At each level, the child must pass four items in order to progress to the next span level. The test is terminated when the child fails three consecutive items within a level. For each span, the child listens to a series of short sentences, and determines whether each sentence is true or false, and then recalls the final word of each sentence. The mean test-retest reliability coefficient for this measure is .61 (Pickering & Gathercole, 2001). In our sample, the internal consistency reliability coefficient was 0.86.

Anxiety—For general anxiety, the Beck Youth Inventory-Anxiety Inventory (BYI) was used (Beck et al., 2005). This measure consists of 20 items assessing general anxiety levels (i.e. “I worry about the future”), which are rated by students on a 4-point Likert scale, with higher scores reflecting higher anxiety levels (scores range from 0–60). The internal consistency reliability coefficient for the current sample is 0.89. For reading anxiety, the Reading Anxiety Questionnaire (RAQ) was used (Grills, unpublished). This measure consists of 6 items that assess anxiety about reading, which are rated by students on a 4-point Likert scale, with higher scores reflecting higher levels of reading anxiety (scores range from 0–18). The internal consistency reliability coefficient is 0.77 for the present sample. Raw scores for both anxiety measures were used.

Data analysis

All data analysis was conducted in SAS. Before running primary analyses, the relationships between demographics and reading outcomes were examined to determine their potential as covariates. One-way ANOVAs revealed significant differences in word reading [$F(4, 251) = 3.12, p = .016$] and comprehension [$F(4, 251) = 4.68, p = .001$] based on racial background and so race was maintained as a covariate in subsequent analyses. Free/reduced lunch status, a proxy for economic disadvantage, was related to word reading [$F(4, 231) = 2.93, p = .022$], so this was maintained as a covariate. Special education eligibility status was related to word reading [$F(1, 258) = 29.13, p < .001$], reading fluency [$F(1, 258) = 15.28, p < .001$], and reading comprehension [$F(1, 258) = 8.23, p = .005$], so this too was included as a covariate. Finally, age correlated with word reading skill $r = -0.28 (p < .001)$, so age was also included as a covariate. Neither limited English proficiency (LEP) status nor gender was related to reading achievement, so these were not included as covariates. Thus, in all subsequent analyses, we included race/ethnicity, free/reduced lunch status, special education eligibility status, and age as covariates. Demographic covariates (with the exception of age) were dummy coded. Given that this study focuses on struggling readers, the current sample had a restricted range of reading scores on the TOSREC (the selection measure, which was not used as an outcome in this study). Although reduced variability could negatively impact correlations and predictive relations, the ranges of scores across the other reading outcomes were only somewhat restricted and had normal distributions (see Table 2).

Regression diagnostics demonstrated adequate normality, linearity, homogeneity of variance, independence, and lack of collinearity among predictors. Hypotheses were assessed through three regression models, one for each reading outcome (word reading, fluency, comprehension).

As noted, students came from 66 classrooms, nine schools, and three districts. Although we did not have a basis to form hypotheses about specific teacher or classroom characteristics that might influence the relation of reading anxiety to reading (and the fact that data was obtained early in the school year minimized instructional differences on this relation), accounting for such clustering results in more accurate standard errors (Snijders & Bosker, 2011), and reflects the sample ascertainment, if such clustering effects are non-trivial (Hox & Roberts, 2011). We conducted multilevel models where we had sufficient level 2 units (i.e. teachers/classrooms), using proc mixed within SAS (SAS Institute Inc., 2015). In our sample, the intraclass correlations (ICCs) for our reading outcomes were .14 (word reading), .21 (fluency), and .21 (comprehension); e.g. classroom nesting accounts for 14% of the variation in word reading scores. Although the multilevel models are reported below, we noted that the substantive results were highly similar regarding the reading anxiety and reading relations whether the analyses were run in multilevel format or with traditional ordinary least-squares regressions. We followed the literature in computing parameters and effect sizes from multilevel models (Olejnik & Algina, 2003; Peugh, 2010; Selya et al., 2012; Tippey & Longnecker, 2016), which included computing squared semi-partial coefficients to examine unique effects of all predictors and covariates. The collective impact of all variables for each outcome was also examined through pseudo- R^2 . A critical p -value of .05 was used in the analyses.

Results

Preliminary results of Table 2 show correlations among all predictor and outcome variables, as well as descriptive statistics. Correlations between reading anxiety and all reading variables were negative and significant (as expected), ranging from $r = -0.17$ to $r = -.25$. Reading anxiety correlated with general anxiety ($r = 0.63$, $p < .001$), but multicollinearity was not an issue (tolerance of 0.55 for reading anxiety and 0.60 for general anxiety). Moreover, general anxiety was unrelated to comprehension and word reading, but did have a weak negative correlation with fluency ($r = -0.14$, $p = .019$).

Results from the three regression models using proc mixed are shown in Table 3. For word reading accuracy, results demonstrated significant effects of age ($p < .001$), special education eligibility ($p < .001$), and verbal knowledge ($p = .001$). Neither reading anxiety ($p = .074$) nor general anxiety ($p = .429$) made significant contributions to word reading accuracy. The pseudo- R^2 for the model was 41.7%. The conditional ICC was 0.12.

For oral reading fluency, the role of reading anxiety was first considered with all demographic covariates and verbal knowledge, but without consideration of word reading accuracy. These results demonstrated a significant effect of reading anxiety ($p = .004$), with a squared semi-partial correlation of 2.4%. However, with the addition of word reading accuracy, the contribution of reading anxiety was no longer significant ($p = .064$). In the

final model, results demonstrated significant effects of age ($p < .001$) and single word reading ($p < .001$). Notably, single word reading had a large unique effect as indicated by a squared semi-partial correlation of 28.4%. General anxiety did not make a significant contribution to oral reading fluency ($p = .902$). The pseudo- R^2 in the final model was 52.8%. The conditional ICC in the final model was .05.

For reading comprehension, results demonstrated significant effects of reading anxiety ($p = .002$), as well as race (specifically being Black, $p < .001$, or Hispanic, $p = .015$, relative to Caucasian), vocabulary ($p = .002$), and single word reading ($p < .001$). Squared semi-partial correlations for these variables were relatively small and ranged from 2–3%, with reading anxiety accounting for 2.3% of unique variance in comprehension. The pseudo- R^2 for the full model was 39.1%. The conditional ICC was .08.

Discussion

Understanding predictors of reading in late elementary school is important since students are expected to have mastered basic skills in order to “read to learn.” While cognitive predictors of reading are well known, the roles of “noncognitive” variables such as reading anxiety are less clear, although analogous work has demonstrated relations of math anxiety to math achievement. The purpose of the current study was to evaluate the role of reading anxiety across different types of reading outcomes in the context of general anxiety and well-known predictors of reading.

Reading anxiety and general anxiety: Overlapping or distinct constructs?

One aim of this study was to examine whether reading anxiety and general anxiety were separate or overlapping constructs. We found that reading anxiety and general anxiety were moderately related but not collinear, and differentially related to reading outcomes. Although general anxiety demonstrated a significant but weak bivariate relationship with fluency, it did not predict any reading outcomes in the context of the other predictors. On one hand, these findings provide important evidence that general anxiety and reading anxiety are distinct rather than completely overlapping constructs. This suggests that in considering anxiety for school children, it is important to understand its potential sources, and that reading, for some children, may be one such source, highlighting the need for specific measurement of reading anxiety when warranted. On the other hand, the relationship we found between reading anxiety and general anxiety ($r = .63$) was stronger than that of math anxiety and general anxiety ($r = .35$; e.g. the meta-analysis of Hembree, 1990). The closer relationship for reading could potentially reflect the emphasis on reading in elementary school, and this may be even stronger at the youngest elementary ages. One potential implication of this finding is that interventions with school children that target anxiety, a common childhood condition affecting 7% of children aged 3–17 (Ghandour et al., 2019), may have some indirect effects on reading anxiety and therefore reading achievement, more so than any such effects on math anxiety and math outcomes. Further study is needed to replicate and extend the current findings to other contexts, in particular comparing struggling versus non-struggling readers, and in tracking this relationship across development.

The role of reading anxiety in word reading accuracy and oral reading fluency

We found that reading anxiety did not contribute to untimed word reading accuracy when also considering the effects of important covariates such as verbal knowledge. While one prior study found that reading anxiety predicted word reading accuracy (Ramirez et al., 2019), this study was conducted with younger students and did not control for important reading predictors such as verbal knowledge. In contrast, we found mixed evidence for the role of reading anxiety in oral reading fluency such that it demonstrated a unique contribution in the context of WM, verbal knowledge, and demographics, but did not remain significant within a very stringent model that included word reading accuracy. Thus, our findings provide novel, yet preliminary, support for our hypothesis that reading anxiety may compromise timely information processing needed for efficient reading fluency, but not for untimed single word reading, consistent with Attentional Control Theory (Eysenck & Derakshan, 2011). In understanding this distinction, it is important to note that both our timed and untimed word reading tests required the student to read single words aloud; thus, our finding for oral reading fluency cannot be solely attributed to the oral reading component of the measure. However, we again note that even where reading anxiety demonstrated a significant contribution, its unique effect was small (2.4%), though this is not insignificant from a practical perspective, particularly since we employed strong predictors of reading in the model.

The role of reading anxiety in reading comprehension

Notably, though prior work has examined reading anxiety in relation to word reading or reading fluency (Katzir et al., 2018; Ramirez et al., 2019), our study is the first to demonstrate a unique contribution of reading anxiety to reading comprehension. This supports our hypothesis that reading anxiety should be most deleterious for reading tasks that require high levels of cognitive resources, which is also consistent with Attentional Control Theory. For instance, during reading comprehension tests, successful performance requires students to maintain their focus on the content of the text for a longer period of time than single word reading tests, and to maintain a mental representation of the text as they go back and forth between answering questions and reading the text. Heightened levels of reading anxiety may interfere with these demands, leading to poorer performance. Thus, the results of this study suggest that it is reasonable to inquire about reading anxiety in the context of low reading comprehension, or to inquire about reading comprehension in the context of a presenting problem associated with anxiety.

Despite these novel results, the effects sizes here were also relatively small, with reading anxiety accounting for 2.3% of the unique variance in comprehension (notably though, the effect size for single word reading in this model was only 3%). This means that further investigation is needed to understand the situations (or students for whom) this effect might be moderated, before including reading anxiety as an intervention target. However, we would also note that the effect sizes referenced above occurred in the context of well-known and robust reading predictors. For example, language-related predictors (word reading and verbal knowledge) make particularly strong contributions to comprehension at this age level (Gough & Tunmer, 1986). Thus, the size of the effect alone (which does not consider shared variance among predictors) does not render it unimportant given this very stringent test.

Importantly, it is notable that in the math anxiety literature, reported unique effect sizes are only somewhat larger; for example, Hoffman (2010) reported a squared semi-partial correlation of 5% for math anxiety predicting math problem solving accuracy. Moreover, while that study employed a domain general predictor of math (working memory), it did not also include math-specific covariates, as we did for reading in our study through the inclusion of word reading.

Limitations and future directions

A few limitations temper our conclusions. First, it is possible our findings would have been different if our sample included both typical and struggling readers; for instance, it is thought that moderate levels of anxiety may, at times, lead to improved performance (Sung et al., 2016), and this pattern may have emerged among typical or higher achieving readers. However, since reading achievement exists on a continuum rather than dichotomous categories (Branum-Martin et al., 2013; Schatschneider et al., 2016), it is possible that the mechanism through which reading anxiety impacts reading skill is the same across the spectrum of reading ability. Moreover, the practical implications of our findings are most critical for struggling readers, and our sample allows us to draw conclusions about the nature of reading anxiety for this population. Additionally, we note that our sample was racially and ethnically diverse, which reflected the region of the country in which the study occurred. Though we did not have a theoretical basis to indicate different relationships among the variables of interest for different racial/ethnic groups, future work with students from different demographic backgrounds and different grade levels than the current sample will be important in order to increase confidence in the results of the current study.

A second limitation is the cross-sectional nature of the study. In order to understand the interplay between reading anxiety and reading achievement, these constructs should be studied over time, and at different developmental stages. In order to expand upon our findings, longitudinal work is needed in order to understand the causal nature of the reading anxiety-reading comprehension relationship among late elementary struggling readers, since it is possible that low levels of reading comprehension lead to higher reading anxiety, or that this relationship is bidirectional. The mechanism through which reading anxiety is related to comprehension (possibly through diminished WM capacity) could also be examined mechanistically in an intervention context. However, the present study does provide information regarding both the separability of general versus reading anxiety, and how they differentially relate to different reading outcomes, particularly fluency and comprehension.

Although we employed multilevel models in our analyses, our purpose in doing so was to account for clustering effects of students within classrooms and to obtain more accurate standard errors of the fixed effects, rather than addressing specific multilevel hypotheses. Future work should consider whether teacher or classroom-level characteristics influence the relationship between reading anxiety and reading outcomes; for instance, it is possible that some teachers may be more sensitive to their students' anxiety in general and possibly to their reading anxiety in particular, and may foster a more comfortable environment which buffers the effects of reading anxiety on performance.

Future studies should also employ more comprehensive assessment of reading anxiety. In the present study, we measured students' perceptions of their own anxiety about reading. However, it is possible that students at this age level may not be accurate reporters of their own psychological distress, and consideration of teacher and parental report may provide a richer indication of their reading anxiety. Moreover, future studies should obtain physiological markers of anxiety (i.e. heart rate) during reading tasks, which could be used in conjunction with subjective measures. Similarly, future work aimed at disentangling domain-specific anxiety from trait-level general anxiety should clarify the extent to which reading anxiety is dimensional in the same way general anxiety is (i.e. physiological, cognitive, and behavioral subcomponents), and how different subcomponents of reading anxiety may relate to achievement.

Summary

The current study adds to existing work examining potential “noncognitive” intervention targets for struggling readers in late elementary school by exploring the role of reading anxiety across various reading skills, in the context of general anxiety and well-known reading predictors. Our results demonstrate that reading anxiety is moderately correlated with, yet distinct from, general trait-level anxiety. Reading anxiety demonstrated a unique contribution to reading comprehension in the context of WM, verbal knowledge, and word reading accuracy, supporting Attentional Control Theory. Findings were mixed with regard to the role of reading anxiety in oral reading fluency, such that reading anxiety made a significant contribution until word reading accuracy was considered. Taken together, these results provide preliminary, yet novel, support for the role of reading anxiety in reading. Further study is needed before reading anxiety is considered as an intervention target; specifically, follow-up studies should consider these relationships at different stages of development, and should comprehensively evaluate this construct by obtaining ratings from multiple informants, as well as physiological markers of reading anxiety.

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Table 1.Demographic information ($N = 272$).

Variable	
Age	
<i>M</i>	10.3
<i>SD</i>	0.7
% Boys	52.5
% Economically Disadvantaged*	75.6
% Limited English Proficient	19.3
% Eligible for Special Education	14.1
Race/Ethnicity	
% African American	43.8
% Caucasian	17.1
% Hispanic	31.4
% American Indian/Alaskan Native	2.7
% Asian	2.7
% Other	2.3

* Defined by eligibility for free or reduced lunch.

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Table 2.Correlations between all predictor and outcome variables and descriptive statistics ($N = 272$).

Variable	1.	2.	3.	4.	5.	6.	<i>M</i>	<i>SD</i>
1. Verbal Knowledge	–						88.45	14.05
2. Working Memory	0.20 ^{**}	–					11.36	3.49
3. Reading Anxiety	–0.21 ^{**}	–0.21 ^{**}	–				7.23	4.30
4. General Anxiety	–0.03	–0.15 [*]	0.63 ^{**}	–			51.14	11.21
5. Word Reading	0.32 ^{**}	0.11	–0.17 [*]	–0.07	–		94.79	10.55
6. Fluency	0.21 ^{**}	0.15 [*]	–0.24 ^{**}	–0.14 [*]	0.62 ^{**}	–	88.28	28.55
7. Comprehension	0.36 ^{**}	0.20 ^{**}	–0.25 ^{**}	–0.08	0.38 ^{**}	0.47 ^{**}	89.49	10.23

*
 $p < .05$.**
 $p < .01$.

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Table 3.

Summary of regression analyses for variables predicting word reading, fluency, and comprehension.

	Word reading accuracy		Oral reading fluency		Reading comprehension	
	<i>B</i> (SE)	<i>Semipartial</i> ω^2	<i>B</i> (SE)	<i>Semipartial</i> ω^2	<i>B</i> (SE)	<i>Semipartial</i> ω^2
Intercept	121.08** (11.33)		-177.03** (30.14)		51.86** (12.67)	
Reading Anxiety	-0.30 (0.17)	0.006	-0.73 (0.39)	0.005	-0.51* (0.16)	0.023
General Anxiety	0.05 (0.06)	-0.001	-0.02 (0.14)	-0.002	0.11 (0.06)	0.006
Word Reading Accuracy			1.67** (0.14)	0.284	0.20** (0.06)	0.030
Verbal Knowledge	0.14* (0.04)	0.027	0.04 (0.10)	-0.002	0.14** (0.04)	0.025
Working Memory	0.04 (0.16)	-0.003	-0.02 (0.38)	-0.002	0.26 (0.16)	0.005
Age	-3.55** (0.93)	0.038	11.07** (2.12)	0.052	0.60 (0.89)	-0.001
Race/ethnicity (Black vs. Caucasian)	-1.35 (1.79)	-0.005	-0.91 (4.01)	-0.002	-5.88** (1.69)	0.029
Race/ethnicity (Hispanic vs. Caucasian)	-0.31 (1.78)	-0.005	-4.17 (4.06)	-0.002	-4.16* (1.69)	0.029
Race/ethnicity (Other vs. Caucasian)	0.75 (2.61)	-0.005	1.89 (5.92)	-0.002	-1.03 (2.47)	0.029
SES (Economically disadvantaged vs. Not economically disadvantaged)	-2.33 (1.33)	0.006	-3.78 (3.08)	0.001	-0.59 (1.28)	-0.002
SPED (Eligible vs. Not eligible)	-7.62** (1.66)	0.056	-5.60 (3.97)	0.002	-1.99 (1.66)	0.001

Note:

* $p < .05$.** $p < .001$.

SES: Socioeconomic status.

SPED: Special education.