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Reading Anxiety: An Early Affective Impediment to Children's Success in Reading

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ABSTRACT

Learning to read is a critical but often challenging academic task for young children. In the current study, we explore the relation between children's reading affect—particularly anxiety—and reading achievement in the early years of reading acquisition. We hypothesized that reading anxiety would relate to reading achievement across the school year and that boys and girls might show differential patterns in the relation between reading anxiety and achievement due to the common stereotype that boys underperform in reading. A sample of first and second grade students completed measures of reading anxiety, positive reading affect, math achievement, and reading achievement in the fall and spring. Results show that reading anxiety and reading achievement share a bi-directional relation in which fall reading anxiety predicts spring reading achievement and vice versa. Furthermore, the pattern of relation between reading anxiety and achievement differs by gender: boys appear more susceptible to the reciprocal damaging effects of reading anxiety on reading achievement across the school year. Finally, reading achievement shares a stronger relation with reading anxiety than with positive reading affect, perhaps because of the phenomenon in which negative relative to positive experiences have a greater psychological impact.

Educators and psychologists have long been interested in understanding the developmental factors that contribute to and impede children's reading proficiency. Yet while learning to read is acknowledged to be a developmentally difficult and complex task (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001), little attention has been paid to the role of *negative* affect on the development of reading proficiency. Indeed, the field of developmental science has investigated the processes and stages involved in reading independently from those involved in emotional development despite evidence showing that emotions are related to academic achievement (Mega, Ronconi, & De Beni, 2014; Pekrun, Goetz, Titz, & Perry, 2002). Furthermore, anxiety is reported as one of the most commonly experienced emotions in academic settings (Pekrun et al., 2002). Considering these findings, it is curious that the relation between young children's negative affect and the challenge presented by early reading experiences has yet to be explored. We address this limitation by examining the bi-directional relation between an

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acute fear related to situations that require the processing of textual information (i.e., reading anxiety) and children's growth in reading achievement across the school year.

The significance of early reading proficiency

Early reading proficiency is an essential component of academic success (Duncan et al., 2007; Juel, 1988). Successful young readers are more likely to be engaged in school (Guthrie & Wigfield, 2000; McGee, Prior, Williams, Smart, & Sanson, 2002), succeed in content domains (Laborde, 1990), graduate high school (Lloyd, 1978), and attend college (Zaff, Moore, Papillo, & Williams, 2003). In contrast, young students who struggle with learning to read are likely to struggle academically (Annie E. Casey Foundation, 2013; McGee et al., 2002). The negative impacts of low reading proficiency extend beyond academic settings. In fact, because reading is one of the earliest educational milestones, children who are identified as struggling readers are subject to a variety of interventions including remedial instruction, summer school, special education assessment, and grade level retention (Bowman-Perrott, Herrera, & Murry, 2010; Denton, Vaughn, & Fletcher, 2003). The recently created Common Core State Standards aim to further heighten the expectations for reading proficiency across the grades, beginning with kindergarten, to improve the reading abilities essential for students' academic and professional success (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). To meet these new standards, professional development for teachers predominantly focuses on teaching strategies to develop fluency and comprehension, which have been well researched and widely implemented. However, the research that undergirds these policies and practices largely omits the role of affect in children's reading success. We argue that the affective component of children's reading experiences, particularly negative affect about reading, is an important but unexplored determinant of reading acquisition and achievement. In particular, children whose earliest reading experiences are characterized by an acute fear around the process of reading may show reduced growth in reading achievement down the line.

The role of positive and negative reading affect

Students' *positive* affect, specifically attitudes, interest, and motivation for engaging in reading-related activities has garnered significant attention among scientists and educators (Heckhausen, 1991; Sainsbury & Schagen, 2004; Schunk, Meece, & Pintrich, 2012; Wigfield et al., 2008). In general, many children hold reading attitudes that are quite positive, but these positive attitudes decline with advancing grade level (McKenna, Conradi, Lawrence, Jang, & Meyer, 2012; Sainsbury & Schagen, 2004). Correlational research has found that positive reading attitudes do not predict students' letter-word identification in the lower elementary grades (i.e., year 1) but do predict students' reading comprehension in later grades (i.e., year 5; Chapman & Tunmer, 1995). Thus, it would appear that children's initial positive attitudes about reading gradually become more aligned with actual achievement as students advance through elementary school. Other work suggests that the relation between positive reading attitudes and achievement tends to decrease as students move through the grades (i.e., a correlation of $Z_r = 0.44$ for elementary students and $Z_r = 0.24$ for middle school students; Petscher, 2010). Thus,

positive affect and reading proficiency appear to be positively related at the student level, although findings are mixed regarding whether this relation grows stronger or weaker with age.

Negative reading affect may play a unique and perhaps larger role in the development of children's reading skills than does positive reading affect. After all, not all emotional experiences are created equal. Processes and experiences that are generally more negative in nature (e.g., negative emotions and unpleasant social interactions) have a greater psychological impact than those that are neutral or positive—what is referred to as a negativity bias (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Furthermore, positive and negative attitudes have been shown to exist largely independently of each other, such that an increase in one does not necessitate a decrease in the other (Diener, Larsen, Levine, & Emmons, 1985; Larsen, Diener, & Emmons, 1986). Hence, to explore the potential effect of *negative* reading attitudes, we focused on the relation between early reading anxiety and reading achievement in 1st and 2nd grades, which are formative years in children's reading acquisition.

Reading anxiety

Our literature review indicates that the association between early reading anxiety and early reading achievement has not been systematically studied. The few studies that are relevant to this question have focused on the comorbidity of internalizing and externalizing psychopathology and reading achievement (Casey, Levy, Brown, & Brooks-Gunn, 1992; Grills-Taquechel, Fletcher, Vaughn, Denton, & Taylor, 2013; Willcutt & Pennington, 2000), general trait anxiety or other clinical anxiety disorders as they relate to school achievement (Carroll, Maughan, Goodman, & Meltzer, 2005; Tysinger, Tysinger, & Diamanduros, 2010), intrinsic and extrinsic motivation to read (Becker, McElvany, & Kortenbruck, 2010; De Naeghel, Van Keer, Vansteenkiste, & Rosseel, 2012; McGeown, Norgate, & Warhurst, 2012;), or experimentally induced emotional states and their impact on reading strategy preference (Bohn-Gettler & Rapp, 2011). There is also a body of work examining negative attitudes around communicating in a foreign language (Saito, Garza, & Horwitz, 1999; Saito et al., 1999), but much of it is tangential to the topic of interest in the current study: children developing reading ability in a first language. Thus, most studies examining affect and reading have focused on anxiety only as a general construct in relation to fluency and comprehension, or have focused on the strategies employed when undergraduates, who are presumably competent readers, are induced into negative moods. Critically, the work reviewed here suggests that reading anxiety, while underexplored in the scientific literature for *early* reading acquisition, could be a unique affective obstacle in a child's early education.

We define reading anxiety as an acute fear or apprehension related to situations that require the processing of textual information. This broad definition captures the fact that children at different stages in development are made anxious by different processes and situations relevant to reading that center around evaluative reading measures (e.g., oral fluency and comprehension tasks) that tend to be conducted in the presence of peers and teachers. Indeed, early elementary school reading instruction typically involves reading out loud in front of peers and teachers (García & Cain, 2014; Ivey, 1999; Lindfors, 2002) making this sociocultural context a particularly salient factor in the development of reading anxiety. We argue that these socially evaluative reading scenarios contribute to

an aversion to academic related literacy tasks, which in turn can negatively affect reading achievement. Of course, the opposite might also be true. Children with early disfluent experiences around reading might come to perceive themselves as “bad at reading” and develop higher reading anxiety across the school year. The potential bi-directional relations between negative affect and reading development have yet to be explored.

A similar bi-directional relation has been argued for some time now within the related math anxiety literature (Jalongo & Hirsh, 2010; Jameson, 2013; Maloney, Converse, Gibbs, Levine, & Beilock, 2015; Vukovic, Kieffer, Bailey, & Harari, 2013). Math anxiety has consistently been shown to relate to math ability outcomes (Hembree, 1990). There is debate, however, about whether low math ability leads to math anxiety (i.e., *Reduced Competency* view; Maloney, Risko, Ansari, & Fugelsang, 2010) or whether math anxiety prevents engagement in math related learning and thus contributes to lower math achievement (i.e., a *Disruption Account*; Ashcraft & Faust, 1994; Faust, 1996; Park, Ramirez, & Beilock, 2014). Both accounts may be correct; previous research among adolescents (Meece, Wigfield, & Eccles, 1990) as well as first and second graders (Gunderson, Park, Maloney, Beilock, & Levine, 2018) demonstrates a bidirectional relation between math anxiety and math achievement (Ramirez, Shaw, & Maloney, 2018). This debate has led to important discussions around improving both education policy (Beilock & Maloney, 2015; Maloney et al., 2015) and educational interventions (Park et al., 2014; Walton, 2014) to address math anxiety. It is unfortunate that the possible bi-directional relation between reading anxiety and achievement is less well understood. In the current article, we explore the important relation of reading anxiety to children’s concurrent and subsequent reading achievement.

Another important issue that has been addressed in the math anxiety literature is the rate of math anxiety and its implications among females versus male students (Devine, Fawcett, Szűcs, & Dowker, 2012; Gunderson, Ramirez, Levine, & Beilock, 2012). In general, it has been argued that math anxiety can have particularly deleterious effects on girls, presumably because of the stereotype that girls are bad at math (Eccles, Jacobs, & Harold, 1990; Jacobs & Eccles, 1992; Midgley, Feldlaufer, & Eccles, 1989; Yee & Eccles, 1988). If this is the case, then the opposite might be true for reading anxiety: because boys are frequently stereotyped as being worse at reading than girls, they may show an enhanced vulnerability to the negative effects of reading anxiety (Cvencek, Greenwald, & Meltzoff, 2011; Gunderson et al., 2012; Lummis & Stevenson, 1990; Relich, 1996).

Indeed, the possible implications of boys’ reading stereotyping has received much less attention in the literature than the implications of girls’ mathematics stereotyping (Logan & Johnston, 2009; McKenna, Kear, & Ellsworth, 1995; Stoet & Geary, 2013). In a series of studies, Hartley and Sutton (2013) showed that as children progress through primary school, boys and girls report the stereotype that girls have superior scholastic abilities, and they believe that adults also subscribe to this stereotype. When this stereotype is made salient, boys’ performance on measures of math, reading, and writing suffers (Hartley & Sutton, 2013). These findings together suggest that despite being generally viewed as an advantaged group (Carli, 1999; Ridgeway, 2001), boys’ academic performance is not immune to the influence of negative affective factors that might impact reading proficiency. In the current study, we ask: How does reading anxiety relate to reading achievement across the school? We also ask: Does reading anxiety relate to achievement across the school year differentially depending on gender?

Current study

In the current study, we describe a new (and to our knowledge the very first) measure of reading anxiety for young children. Our measure of reading anxiety was developed to be appropriate for children in early elementary school. We chose to focus on this age range because children in first and second grade are just beginning to learn to read and are likely to find the process of learning to read to be challenging. In our investigation we address the following primary aims:

- (1) We provide descriptive data on children's self-reported reading anxiety among a sample of first and second grade children at the beginning and end of the school year.
- (2) In order to establish predictive, discriminant, and convergent validity, we also measure children's reading and math achievement at the beginning and end of the school year.
- (3) We leverage a cross-sectional, two-wave, longitudinal design to conduct a cross-lagged panel analysis in order to test the potential for reciprocal relations between reading anxiety and reading achievement.
- (4) Lastly, considering the widely accepted gender stereotype that boys are worse at reading than girls (Hartley & Sutton, 2013), we also examine whether our model differs by gender, perhaps with reading anxiety playing a larger role for boys than girls.

We also address a secondary question focused on the difference between positive and negative reading affects as it relates to achievement. Our review of the literature indicates that positive reading attitudes predict reading achievement--but is negative reading affect (i.e., reading anxiety) a better predictor of reading achievement than positive reading affect? To address this exploratory question, we also measured children's positive affect towards reading as a means of contrasting how positive versus negative attitudes differentially relate to reading achievement in the fall.

In sum, the present study aims to improve our understanding of the connections among reading anxiety, performance, and gender, providing valuable insight into the way reading proficiency develops in the elementary school years.

Method

Participants

This study was conducted as a part of a larger longitudinal project examining the development of children's academic attitudes and beliefs. The sample was recruited from 72 classrooms in 23 schools in the Chicago, northern Indiana, and the southern Wisconsin area. The sample only includes children who attended a general education program (i.e., not a gifted school or special education program). We excluded children who had difficulty complying with task instructions on any of the tasks administered in the fall ($n = 19$) as well as the spring ($n = 10$). Lastly, we excluded $n = 27$ children due to experimenter error leading to a failure to achieve the basal or ceiling criterion on the Woodcock-Johnson Reading Letter-Word Identification subtest. Our final sample

consisted of $N = 607$ children ($n = 270$ first graders and $n = 337$ second graders; $n = 330$ girls and $n = 277$ boys). The sample consisted of children who were 32.9% African-American, 23.9% Hispanic, 23.4% European-American, 6.9% Asian-American, and 0.3% Native American. The race of 12.6% of children was either undisclosed or reported as multiple ethnicities.

Tasks

To better understand the role of reading anxiety in the reading achievement of young children, this study focused on a subset of the measures from the larger study. All measures were assessed in the fall and again in the spring for both first and second graders.

Reading anxiety

Drawing on expertise as developmental and cognitive psychologists and as educators, we collaboratively developed a measure of children's reading anxiety (see [Appendix](#)). The content of the items focuses on reading experiences common to the first and second grade that may stimulate a high degree of anxiety for novice readers. Hence, we made an effort to capture how students respond to standard reading events (e.g., starting homework) as well as events that present children with novel reading situations (e.g., reading a word you've never seen before) as well as more clearly evaluative situations (e.g., taking a reading test). We modeled our measure of reading anxiety on a previously published measure of math anxiety (Ramirez, Gunderson, Levine, & Beilock, 2013), which was itself adapted from a scale designed to measure mathematics anxiety among older elementary school children (MARS-E; Suinn, Taylor, & Edwards, 1988). An initial, shorter 8-item version of the scale was piloted, and we drew upon our pilot test results to refine the wording of our questionnaire items and to make the response scale easy to use for young children. In addition, we added an additional 8 items for a total of 16 items assessing children's self-reported anxiety for early reading experiences related to classroom activities.

To reduce the cognitive demands on young children, we read the questions out loud and required children to respond using a 5-point Likert scale with smiley faces--a common method for eliciting responses from children in past studies on domain anxiety (Krinzinger, Kaufmann, & Willmes, 2009; McKenna & Kear, 1990). The smiley face scale was anchored by what we described as a "not nervous at all" face (scored as 1) and at the other end, a "very, very nervous face" (scored as 5) (Ramirez et al., 2013; Wu, Barth, Amin, Malcarne, & Menon, 2012). Thus, higher scores represented higher reading anxiety. We describe the psychometric properties of the reading anxiety scale in the results section. See [Appendix](#).

Positive reading affect

We modified a previous scale developed by the Trends in International Mathematics and Science Study (TIMSS; Martin, Mullis, & Foy, 2008) to measure children's positive reading affect (PRA). In the TIMSS, 4th and 8th grade students were presented with three items designed to measure how students feel about mathematics: *I enjoy learning mathematics*; *Mathematics is boring (reverse coded)*; *I like mathematics*. We modified these three items by simply replacing the word "mathematics" with the word "reading". Children were

asked to respond to the scale using a 4-point Likert scale (1: agree a lot to 4: disagree a lot). To facilitate ease of interpretation, we paired the 4-point Likert scale with a picture of a thumb that corresponded with level of agreement (thumbs up–thumbs down).

Reading and math achievement

We assessed children's reading and math achievement in the fall and spring of the school year using subtests from the Woodcock–Johnson III (Woodcock, McGrew, & Mather, 2001), a nationally normed test battery used for assessing a variety of achievement skills for individuals aged 2 to 90 years. Reading achievement was measured using the Letter-Word Identification subtest, which requires children to correctly identify and pronounce items at increasingly difficult levels. The Letter-Word ID subtest begins by asking children to identify individual letters (e.g., “can you point to the letter B?”) and ends by asking children to read complex words (e.g., “conspicuous”). Math achievement was assessed using the Applied Problems subtest which presents children with word problems involving mathematics calculations of increasing difficulty (e.g., “If you have seven pennies and you spend three of them, how many pennies would you have left?”). Many of the word problems are paired with visual referents (i.e., a picture of pennies) and were read out loud to children to circumvent differences in reading ability among 1st and 2nd graders. Both Woodcock–Johnson III subtests require that a basal (six items in a row correct) and ceiling (six items in a row incorrect) are established at the beginning and end of the test, respectively. For most analyses, we used the W-score, a transformation of the raw score into a Rasch-scaled score with equal intervals. A W-score of 500 is considered the approximate average reading performance of a 10-year old. A different, but psychometrically equivalent version of the Letter-Word ID and Applied Problems subtests were used in the fall and spring, respectively.

Procedure

Children's attitudes and achievement were assessed in a one-on-one setting by an experimenter at the child's elementary school. The fall assessment was conducted during the first three months of the school year and the spring assessment was conducted during the last three months of the school year. Each individual's fall and spring assessments were composed of two separate sessions: an achievement session and an emotion session, occurring on different days to minimize possible contamination from achievement measures influencing students' self-reports of reading anxiety. The achievement session always preceded the emotion session and the two sessions typically occurred within seven days of each other for every individual.

Results

We first present the descriptive statistics for our primary measures of interest. We follow up by describing the principle components analysis and reliability of the reading anxiety scale as well as the psychometric properties of the reading anxiety scale by establishing validity in the fall. We end by investigating the relation between reading anxiety and reading achievement longitudinally using path analysis.

Descriptives

Reading achievement

See Table 1 for a full list of descriptives. A repeated measures mixed factor ANOVA on reading achievement was carried out with time (fall versus spring) as a within subjects factor and grade and gender as between subjects factors. The main effects of time, $F(1,589) = 890.96$, $p < 0.001$, $\eta^2 = 0.60$, and grade, $F(1,589) = 111.82$, $p < 0.001$, $\eta^2 = 0.16$, were both significant. Students in the spring and second graders overall showed higher achievement than students in the fall and first graders. The time x grade interaction was significant, $F(1,589) = 63.20$, $p < 0.001$, $\eta^2 = 0.10$ which appears to be driven by first graders showing faster growth in reading achievement from fall to spring than second graders. No other main effects (including the main effect of gender) or interactions were significant ($ps > 0.05$).

Math achievement

A repeated measures mixed factor ANOVA on math achievement was carried out with time (fall and spring) as the within subjects factors and grade and gender as the between subjects factors. The main effects of time, $F(1,591) = 364.40$, $p < 0.001$, $\eta^2 = 0.38$ and grade, $F(1,591) = 108.16$, $p < 0.001$, $\eta^2 = 0.16$, were both significant and in a similar direction as reading achievement. There were no other significant main effects or interactions.

Positive reading affect

We reverse scored one item (“reading is boring”) before calculating the average of the three-item positive reading affect (PRA) scale. The three items for the fall positive reading affect scale demonstrated adequate internal consistency (Cronbach’s alpha = 0.68) for research with early elementary school children. On average, children in the fall had relatively positive attitudes about reading with over 80% of children indicating “agree a little” to “agree a lot” to the statements posed by the positive affect towards reading measure. We ran a repeated measures mixed factor ANOVA on PRA with time (fall and spring) as the within subjects factor and grade and gender as the between subjects factor. Only the grade, $F(1,552) = 4.12$, $p = 0.043$, $\eta^2 = 0.01$, and gender, $F(1,552) = 7.47$, $p = 0.006$, $\eta^2 = 0.01$ main effects were significant. Second graders and girls overall showed more positive attitudes towards reading than first graders and boys overall. None of the remaining main effects or interactions were significant.

Table 1. Descriptive statistics for all measures, by grade, gender, and time point.

		Reading Anxiety	Reading Achievement	Positive Reading Affect	Mathematics Achievement
Fall		M (SD)	M (SD)	M (SD)	M (SD)
1st Grade	Girls	2.61 (.84)	430.63 (34.74)	3.48 (.72)	450.66 (17.84)
	Boys	2.50 (.85)	435.46 (33.88)	3.48 (.70)	454.14 (18.71)
2nd Grade	Girls	2.22 (.72)	467.08 (25.32)	3.69 (.51)	470.61 (17.49)
	Boys	2.34 (.87)	462.57 (33.36)	3.47 (.77)	468.61 (22.71)
Spring					
1st Grade	Girls	2.41 (.75)	458.54 (30.26)	3.57 (.68)	462.91 (21.24)
	Boys	2.24 (.70)	462.49 (29.29)	3.48 (.72)	465.40 (21.44)
2nd Grade	Girls	2.09 (.72)	482.62 (24.45)	3.68 (.56)	481.46 (20.76)
	Boys	2.11 (.82)	478.13 (31.75)	3.47 (.71)	479.65 (24.83)

Reading anxiety

Internal consistency (using Cronbach's alpha) for the 16 items in the reading anxiety scale in the fall was $\alpha = 0.86$. A repeated measures mixed factor ANOVA on reading anxiety with time (fall and spring) as the within subjects factor, and grade and gender as between-subjects factors, revealed that only the time of the school year, $F(1,543) = 35.82$, $p < 0.001$, $\eta p^2 = 0.06$, and grade, $F(1,543) = 15.25$, $p < 0.001$, $\eta p^2 = 0.03$, were significant. Children showed significantly higher reading anxiety in the fall (relative to the spring) and in first grade (relative to second grade). None of the remaining main effects and interactions were significant.

Establishing validity

The results presented in Table 2 reveal that reading anxiety showed good predictive validity by correlating with fall reading achievement, $r(563) = -0.41$, $p < 0.001$. This relation remained significant even after we controlled for fall math achievement $r(562) = -0.29$, $p < 0.001$. As a test for discriminate validity, we examined whether reading anxiety in the fall relates to fall math achievement. The reading anxiety scale also correlated with fall math achievement, $r(563) = -0.31$, $p < 0.001$, but not when we controlled for fall reading achievement, $r(562) = -0.05$, $p > 0.05$. The difference between the reading anxiety-reading achievement coefficient (controlling for math achievement) and the reading anxiety-math achievement coefficient (controlling for reading achievement) was statistically significant, $Z = -4.16$, $p < 0.001$.

Reading anxiety was negatively related to positive reading affect in the fall, $r(563) = -0.18$, $p < 0.001$, which provides evidence for convergent validity. However, the low to modest correlation between reading anxiety and positive reading affect also speaks to the independence of the valence (Baumeister et al., 2001). We also examined how the fall relation between reading anxiety and reading achievement compared to the fall relation between positive reading affect and reading achievement. The relation between reading anxiety and reading achievement, $r(563) = -0.41$, $p < 0.001$ was stronger than the relation between positive reading affect and reading achievement, $r(570) = 0.10$, $p = 0.014$. The difference between the two independent correlation coefficients was statistically significant, $Z = -5.64$, $p < 0.001$. In fact, fall reading anxiety continued to predict fall reading achievement even after controlling for fall positive reading affect, $r(562) = -0.41$, $p < 0.001$, but fall positive reading affect was no longer a significant predictor of fall reading achievement after controlling for reading anxiety, $r(562) = 0.02$, $p > 0.05$.

Table 2. Correlation coefficients for main variables of interest.

Variable Name	1	2	3	4	5	6	7
1 Fall Reading Anxiety							
2 Fall Positive Reading Affect	-0.18**	-					
3 Fall Reading Achievement	-0.41**	0.10*	-				
4 Fall Math Achievement	-0.31**	0.13**	0.68**	-			
5 Spring Reading Anxiety	0.55**	-0.14**	-0.42**	-0.36**	-		
6 Spring Positive Reading Affect	-0.17**	0.20**	0.10*	0.14**	-0.27**	-	
7 Spring Reading Achievement	-0.42**	0.10*	0.86**	0.62**	-0.46**	-0.13**	-
8 Spring Math Achievement	-0.36**	0.11*	0.66**	0.81**	-0.43**	0.15**	0.67**

* $p < 0.05$, ** $p < 0.001$.

Quadratic component

Given that previous research has found a nonlinear association between anxiety and achievement in the domain of math (e.g., Wang et al., 2015), we explored whether a similar curvilinear relation might exist between reading anxiety and reading achievement in the early elementary school years. Polynomial regression revealed a test of the quadratic component was non-significant, both across the general sample and when split by gender and positive reading affect (all p 's > 0.05). Thus, we turn to the bidirectional relation of anxiety and achievement in the next section.

Path analysis

In order to test the direction of the relations between reading anxiety and reading achievement, we conducted a cross-lagged path analysis in MPlus version 7.31 (Muthén & Muthén, 1998-2012). This path analysis (Model 1, Figure 1) included fall reading anxiety and fall reading achievement as predictors of spring reading anxiety and spring reading achievement. Reading anxiety and reading achievement were allowed to correlate within each time point. A preliminary multiple-groups analysis found that the relations between reading anxiety and reading achievement did not differ by grade level (see Appendix Table A1). Therefore, grade level was entered as a control measure predicting fall reading anxiety and reading achievement.

We used full information maximum likelihood (FIML) estimation, which uses all available data and is less biased than other methods of accounting for missing data (Enders & Bandalos, 2001). We used the following criteria to assess model fit: root mean square error of approximation (RMSEA) values < 0.06 good and values < 0.08 acceptable; comparative fit index (CFI) values > 0.90 acceptable and values \geq 0.95 good; Tucker-Lewis index (TLI) values > 0.90 acceptable and values \geq 0.95 good; standardized root mean square residual (SRMR) values < 0.08 good (Bentler & Bonett, 1980; Hu & Bentler, 1999). We did not consider the chi-square goodness-of-fit test to assess model fit, as it is nearly always statistically significant for large sample sizes (Bentler & Bonett, 1980). The fit of Model 1 was acceptable-to-good (Table 3).

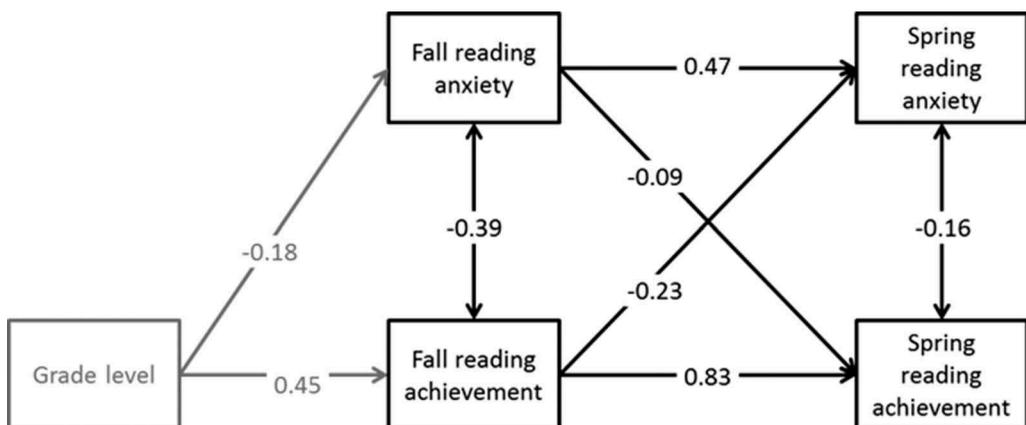


Figure 1. Cross-lagged path analysis showing longitudinal relations between reading anxiety and reading achievement (Model 1). Solid lines indicate significant paths ($p < 0.05$) and are labeled with standardized coefficients. Control variables and their relations to key measures are shown in gray.

Table 3. Model fit statistics and model comparison.

Model	RMSEA	CFI	TLI	SRMR	χ^2	df	χ^2 difference test ^a
1. Overall model (without gender)	0.076	0.995	0.974	0.013	8.972	2	-
2. Fully constrained: Genders constrained to be same on all paths and correlations	0.056	0.992	0.986	0.085	23.306	12	-
3. Partially unconstrained: Genders allowed to differ on relations between reading anxiety and reading achievement	0.048	0.996	0.989	0.105	13.655	8	$\chi^2(4) = 9.651$, $p = 0.047$

The χ^2 difference test is calculated by comparison to the fully constrained gender differences model (Model 2).

The results of this path analysis show a reciprocal relation between reading anxiety and reading achievement over time (Model 1, [Figure 1](#)). As expected, fall reading achievement significantly predicted spring reading achievement ($\beta = 0.83$, $SE = 0.02$, $p < 0.001$), and fall reading anxiety also significantly predicted spring reading anxiety ($\beta = 0.47$, $SE = 0.03$, $p < 0.001$). Fall reading achievement significantly predicted spring reading anxiety ($\beta = -0.23$, $SE = 0.04$, $p < 0.001$), and fall reading anxiety significantly predicted spring reading achievement ($\beta = -0.09$, $SE = 0.02$, $p < 0.001$). In addition, reading achievement and reading anxiety were significantly related within each time point (fall: $\beta = -0.39$, $SE = 0.04$, $p < 0.001$, spring: $\beta = -0.16$, $SE = 0.02$, $p < 0.001$).

We were also interested in whether the impact of reading anxiety on achievement was stronger for boys than girls, as boys face negative stereotypes in reading. To test this, we used a multiple groups path analytic approach to test for model invariance between genders. First, we tested a constrained model, in which all paths and correlations were constrained to be the same for boys and girls. Second, we tested a partially-unconstrained model in which the paths and correlations relating reading anxiety and reading achievement, both within and across time points, were allowed to differ. We chose not to test a fully-unconstrained model, because we were interested in specifically isolating gender differences in the relations between reading anxiety and reading achievement, rather than possible gender differences in other modeled relations (e.g., between grade and reading anxiety, grade and reading achievement, etc.). We then compared the fully-constrained model to the partially-unconstrained model using a chi-square difference test. A significant difference between the models would indicate that gender moderates the relations between reading anxiety and reading achievement.

Both the fully-constrained gender model (Model 2) and the partially-unconstrained gender model (Model 3) had acceptable-to-good model fit ([Table 3](#)). Importantly, the chi-square difference test showed that the partially-unconstrained model significantly differed from the fully-constrained model ([Table 3](#)). In other words, boys and girls significantly differed in the relations between reading anxiety and reading achievement. [Figure 2](#) shows the results of Model 3 for boys and girls. Several differences are worth noting. For boys, the path from fall reading anxiety to spring reading achievement is statistically significant ($\beta = -0.13$, $SE = 0.03$, $p < 0.001$), whereas this path was not significant for girls ($\beta = -0.05$, $SE = 0.03$, $p = 0.139$). In addition, for boys, the relation between spring reading anxiety and spring reading achievement was statistically significant ($\beta = -0.22$, $SE = 0.06$, $p < 0.001$), while for girls it was not ($\beta = -0.11$, $SE = 0.06$, $p = 0.086$). Thus, boys showed consistently stronger relations between reading anxiety and reading achievement than girls.

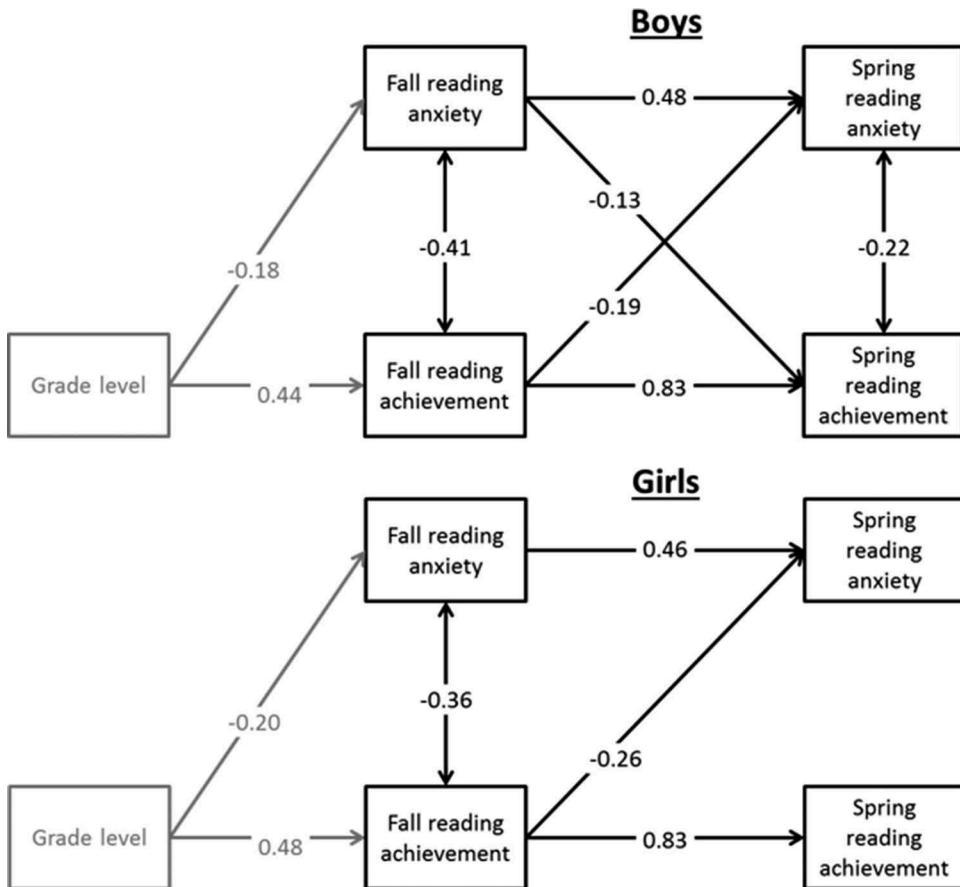


Figure 2. Multiple groups path analysis showing longitudinal relations between reading anxiety and reading achievement for boys and girls (Model 3). Paths and correlations relating reading anxiety and reading achievement were allowed to vary between genders. Solid lines indicate significant paths ($p < 0.05$) and are labeled with standardized coefficients. Control variables and their relations to key measures are shown in gray.

Discussion

In the current study we asked if student affect, particularly negative affect, might relate to students' reading achievement in the formative years of reading acquisition. We used a novel measure of reading anxiety to determine the relation between students' anxious thoughts about common reading scenarios and achievement across the school year. Our results demonstrate that children early in elementary school vary in their fear around novel, evaluative reading situations.

Students' reports of reading anxiety, while correlated between fall and spring, are not stable in magnitude. Reading anxiety is more pronounced in the fall than the spring, which could be due to the increased novelty of the evaluative reading situations in the fall. When reading scenarios take place in the beginning of the school year while students are acclimating to their teachers, classmates, and learning environment, they likely will experience increased anxiety about their reading ability and performance. First graders

possibly demonstrate higher reading anxiety for a similar reason: compared to second-graders, first-graders may be less familiar, and thus less comfortable, with the expectations around reading instruction and reading performance in the classroom. However, our current measures do not allow for inferences of this sort, and thus the most we can do at this time is conjecture. Future research is required to examine the relation between situation novelty and reading anxiety over time.

Our results also show that reading anxiety relates to how well children perform in reading. Children's reports of reading anxiety were inversely related to their reading achievement both in the fall and spring. Within fall, the relation between reading anxiety and reading achievement appears to be unique to the domain of reading. We interpret these results to suggest that reading anxiety is specifically reflecting anxiety related to reading and not more general academic anxiety or academic difficulties. Longitudinally, we also found that higher reading anxiety in the fall was related to lower reading achievement in the spring. Furthermore, higher reading achievement in the fall predicted lower reading anxiety in the spring. However, the achievement to anxiety relation was much stronger than the anxiety to achievement relation. Our results provide support for an account that reading anxiety is both a cause and outcome of poor reading achievement. These results are in line with findings that math anxiety and math achievement are related in a reciprocal manner among adolescents (Ma & Xu, 2004; Meece et al., 1990) as well as first and second graders (Gunderson et al., 2018).

Why might lower reading achievement relate to higher reading anxiety? Students' perceptions of their own abilities and their broader interpretive and meaning-making lens can shape the emotional response that they subsequently have toward academic domains (Jamieson, Mendes, Blackstock, & Schmader, 2010; Lewin, 1947; Masten et al., 2005; Meece et al., 1990). Early setbacks in reading achievement may predispose students to adopt a personal narrative about their abilities in reading, which go on to create reading anxiety. This *interpretation account* was recently put forth by Ramirez et al. (2018), who draw on previous math anxiety literature to suggest that a significant factor leading individuals to develop math anxiety is their maladaptive appraisals of previous academic experiences (Lewin, 1947). If this is the case, then parents and teachers who model a positive disposition towards disfluent reading experiences could be a fruitful venue towards preventing children from developing reading anxiety in the first place (Haimovitz & Dweck, 2016).

Our findings also revealed some differences in the reading achievement-anxiety relation for boys versus girls (Figure 2). To start, we found no overall gender differences in reading anxiety or in reading achievement. Of course, gender differences in reading anxiety or reading achievement are not necessary conditions for boys to be particularly vulnerable to the deleterious effects of reading anxiety. For boys, we found a relation between reading anxiety and achievement in the fall and spring, whereas for girls we found this relation only in the fall. For boys, as well as girls, fall reading achievement predicted spring reading anxiety (in support of a reduced competency view). However, for boys, but not girls, fall reading anxiety predicted spring reading achievement (in support of a disruption view). Thus, it appears to be the case that boys are particularly vulnerable to the early effects of reading anxiety on later reading achievement. This finding may reflect the stereotype that boys are in general poorer readers than girls. Under this view, it may be the case that in the process of learning to read, young boys are exposed to the stereotype that girls are better at reading than boys. They may subsequently develop anxious

thoughts about reading in response to the fear of confirming the negative stereotype, which leads to decreased performance and increased anxiety across time. If this is the case, boys may have stronger positive responses to interventions designed to address fears and concerns regarding reading to the extent that they also dismantle students' stereotypical beliefs about boys and reading. However, since lower initial achievement was a better predictor of higher reading anxiety, providing both boys and girls information that prompts them to change the way they view their early reading achievement outcomes could prove an important remediation strategy for children regardless of gender (Lewin, 1947; Wilson & Linville, 1982).

Given the predominant focus of prior research on positive, as opposed to negative, reading affect, a secondary question we sought to address in this study was whether one form of affect might be a stronger predictor of reading outcomes than the other. Our results show that reading anxiety (i.e., negative affect) is a stronger predictor of reading achievement than positive reading affect. When fall positive reading affect was controlled for, fall reading anxiety was still significantly correlated with fall reading achievement. But the reverse did not hold: fall positive reading affect, when controlling for fall reading anxiety, did not predict fall reading achievement. This finding has two important implications: first, negative and positive affect in regard to reading do not have a simple inverse relation such that increasing one will automatically decrease the other. Second, because of the unique contribution of negative affect about reading, addressing negative attitudes about reading might be more effective in improving reading outcomes than focusing solely on encouraging positive reading attitudes.

It is interesting to note that even though girls reported overall higher levels of *positive* reading affect, no differences emerged between boys' and girls' reports of reading anxiety. Girls' increased endorsement of positive reading affect is in line with previous research showing that girls, as a group, tend to report higher enjoyment of reading and identify themselves more with reading than boys (Logan & Johnston, 2009). The results from several other studies (Hembree, 1990) suggest that girls are particularly susceptible to experiencing higher levels of math anxiety. By contrast, this is one of the first studies to examine gender differences in reading anxiety, and to show that boys demonstrate a more consistent bi-directional relation between reading anxiety and reading achievement. The correlational nature of the current work is a clear limitation that prevents us from making causal claims about the direction of the relation between reading anxiety and reading achievement. Our study also used an achievement battery as a measure of reading outcomes rather than students' actual reading performance in the classroom context. Despite these limitations, this study raises the possibility that reading anxiety is a unique affective obstacle that may disproportionately impact the reading acquisition of young boys, who showed increased vulnerability to the negative bi-directional relation between anxiety and achievement.

In conclusion, our findings indicate that early reading anxiety can act as both a cause and consequence of poor reading achievement, and that this bidirectional relation is particularly apparent for boys. As such, we suggest that reading anxiety and reading achievement are related in a recursive negative feedback loop: low reading achievement can lead to anxiety about reading and anxious thoughts about reading can create intrusive worries around ability that decrease reading performance above and beyond one's skill level. This has important implications as students move through the grades and reading becomes a greater source of students' knowledge across content areas. These results point to intervention approaches that comprehensively

address children's reading skills, negative affect about reading, and maladaptive interpretations of their own reading achievement to disrupt this feedback loop at the start of formal schooling.

Disclosure statement

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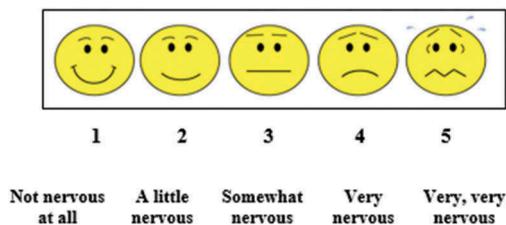
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Appendix

Reading Anxiety Measure



Say, “Now I’m going to ask you some questions about what kinds of things make you feel nervous, anxious, or tense. Do you know what it means to be nervous? Sometimes people feel nervous when they are worried about something or are afraid they might not know the answer. I want you to tell me how nervous each thing makes you feel. [Demonstrating with the face scale.]

See, this side [point] means ‘not nervous at all (1)’, this [point] would mean ‘a little nervous (2)’, this [point] means ‘somewhat nervous (3)’, this [point] would mean ‘very nervous (4)’ and this side [point] means ‘very, very nervous (5)’ [point]. You can point to any one of these faces to answer how nervous each thing makes you feel. Let’s get started.”

1. How would you feel if you were asked to read these words? [Show child card.] You don’t have to read them, just tell me how you would feel. raft trumpet cradle.
2. How do you feel when you are about to take a big test in your reading class?
3. How do you feel when you try to read a word you’ve never seen before?
4. How do you feel when you have to sit down and start your reading homework?
5. How would you feel if you were asked to read these words? [Show child card.] bug sheep bath.
6. How would you feel if you were asked to read this sentence? [Show child card.] Dan’s bus was coming.
7. How do you feel when seeing all the words in a storybook?
8. How do you feel when you are reading in class and don’t understand something?
9. How would you feel if you were asked to spell the word “cooked”?
10. How do you feel when your teacher asks you to read out loud during class?
11. How would you feel if you were asked to read some words you’ve never seen before, like these? [Show child card.] distrust chur vorse.
12. How would you feel if you are asked to read this sentence? [Show child card.] When Maria woke up, she jumped out of bed.
13. How would you feel if your teacher asked you to say what these words mean? [Show child card.] shut carpet repair.
14. How do you feel when your teacher asks you to write a word on the blackboard?
15. How would you feel if you were asked to spell the word “shoe”?
16. How do you feel when you are in reading class and your teacher is about to teach something new?

Table A1. Model fit statistics and model comparison for multiple groups analysis of grade level (1st versus 2nd grades).

Model	RMSEA	CFI	TLI	SRMR	χ^2	df	χ^2 difference test ^a
1. Fully constrained: Grades constrained to be same on all paths & correlations	0.033	0.998	0.997	0.174	7.963	6	-
2. Partially unconstrained: Grades allowed to differ on relations between reading anxiety and reading achievement	0.055	0.998	0.991	0.138	3.846	2	χ^2 (4) = 4.117, $p = 0.390$

The χ^2 difference test is calculated by comparison to the fully constrained grade-level differences model (Model 1).