Examining the Effects of Integrating Anxiety Management Instruction Within a Reading

Intervention for Upper Elementary Students with Reading Difficulties

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Abstract

We present findings from the first cohort of third- and fourth-grade students with reading difficulties (128 students from 31 classrooms) who participated in a 2-year intervention examining the effects of a reading intervention with and without anxiety management. Using a randomized controlled trial, students were assigned to one of three conditions: (a) small-group reading intervention with anxiety management instruction (RANX), (b) small-group reading intervention with math fact practice (RMATH), and (c) business-as-usual (BAU) comparison condition (no researcher provided treatment). Personnel from the research team provided participants in the RANX and RMATH the same reading intervention with the variation in the two treatments being whether the same amount of time per lesson was allocated to anxiety management (RANX) or practicing math facts (RMATH). Students in the RANX significantly outperformed students in the BAU on reading comprehension (ES=1.22) and students in the RMATH outperformed BAU on reading comprehension (ES=0.77). Groups did not differ significantly on other reading outcomes. Reading anxiety moderated the main effect of the RANX intervention on TOWRE word reading when contrasted against the BAU group indicating a significant difference favoring RANX where treatment's effect decreased by .94 units (about 1 point on the outcome) on word reading for each additional point increase in reading anxiety.

Keywords: reading intervention, childhood anxiety, reading comprehension

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Determining mechanisms for best serving individuals with academic and behavior

difficulties has been an important focus of response-to-intervention (RTI) models, more recently

referred to as multi-tiered systems of support (MTSS). RTI was initially described as an

approach to preventing academic and behavior difficulties through early screening, ongoing

progress monitoring, research-based classroom practices, and secondary or tertiary interventions

for those students with difficulties (Fuchs & Vaughn, 2012; Vaughn & Fuchs, 2003). Over time,

RTI-type approaches such as MTSS have evolved to serve as frameworks for both prevention

and remediation of academic and behavior problems with implementation occurring across the

grade span including secondary settings (Reed et al., 2012).

One of the most challenging aspects of implementing RTI-type frameworks has been

organizing and effectively implementing interventions for students that address their range of

academic and behavioral needs. This is particularly challenging because many students exhibit

both academic difficulties (i.e., reading and/or math) and social-emotional difficulties (i.e.,

externalizing or internalizing problems; Darney et al., 2013; Roberts et al., 2020; Sayal et al.,

2015). This issue of addressing the academic and social-emotional needs of students is

particularly challenging for schools because educational stakeholders identify adequate time and

resources as some of their most significant barriers to effectively implementing interventions

(Rycroft-Malone & Bucknall, 2011). Additionally, schools have struggled with determining

approaches for addressing both academic and behavioral issues, often resulting in a dual system

(i.e., MTSS for academic and PBIS for behavioral issues; Burns et al., 2012).

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As a means of addressing the needs of students (academically and socially/emotionally),

we integrated two evidence-based approaches to simultaneously address the daunting challenges

of improving reading outcomes for students with reading difficulties in upper elementary grades

and also teaching students anxiety management skills and their application to reading. We

identified reading difficulties and anxiety reduction as our targets because they represent the

most prevalent academic and social-emotional difficulties expressed by upper elementary

students (Grills-Taquechel et al., 2012). We also provide an opportunity for an integrated

approach to designing and testing the efficacy of an intervention.

Reading Difficulties in Upper Elementary Grades

The need for establishing reading interventions early to assure that students are "on

track" for successful reading is well established; however, many students have reading problems

that continue beyond the primary grades and impair successful academic performance. The

National Assessment of Educational Progress (NAEP) provides important benchmarks on how

students are performing in reading and have demonstrated that a large percentage of students

continue to read significantly below grade level and that students with disabilities are performing

far below their peers (NAEP, 2017; 2019). The percentage of fourth-grade students at or above

proficiency in reading in 2017 was 37%; in 2019 it declined to 35%. During the past 10 years

there has been no progress in reading performance in the United States and the lowest-

performing students are doing worse over time (NAEP, 2019).

Considering the dismal performance on reading measures of students in upper elementary

grades, what types of interventions might be efficacious? It may be valuable to recognize that

very few students who fail to meet grade-level reading standards have isolated difficulties in

reading comprehension (Catts et al., 2006; Leach et al., 2003). Rather, the majority of students

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who continue to read below grade level after the early elementary grades require additional

remediation in word-level decoding, fluency, and comprehension (Cirino et al., 2013;

Scammacca et al., 2015; Vaughn et al., 2010). For this reason, interventions aimed at improving

reading outcomes for students in the upper elementary grades typically utilize a multicomponent

approach that includes decoding (often multisyllable words), fluency, vocabulary development,

and reading comprehension.

The efficacy of reading interventions for students in the upper elementary grades has

been the focus of several research syntheses (Wanzek et al., 2010; Donegan et al., 2021). As

reported by Wanzek and collagues (2010), the vast majority of studies targeting students with

reading difficulties in grades 4–5 describe relatively brief interventions (i.e., fewer than 30

sessions) and often address a single reading component (e.g., fluency). These highly focused

interventions provide valuable information contributing to comprehensive interventions.

However, more comprehensive interventions aimed at meeting the range of instructional needs

of upper elementary students (e.g., fluency, multisyllable word reading, comprehension) are

necessary (e.g., O'Connor et al., 2002; Ritchey et al., 2012; Vadasy & Sanders, 2008; Wanzek &

Roberts, 2012; Wanzek et al., 2016).

Recently several lines of research have examined multicomponent interventions (i.e.,

intervention that include two or more of the pillars of reading such as phonemic awareness,

phonics, fluency, and comprehension) with upper elementary students with significant reading

difficulties. Wanzek and colleagues (2016, 2017, 2019) identified that the majority of

interventions representing Tier-2 type and Tier-3 type treatments were multi-component and

reported that these multi-component studies described promising findings and directions for

future research. In the initial Wanzek et al. study (2016), a 1-year intervention was provided to

small groups of students (4–7 per group) for 30 minutes a day, 4 days a week. There were no significant effects on standardized measures of word reading or fluency, but small effects were noted on standardized measures of reading comprehension (effect size [ES] = 0.14 to 0.28). As a follow-up to this study, Wanzek and colleagues (2017) conducted a second study of the same multicomponent intervention with fourth-graders with reading difficulties. They report a significant effect of the intervention on reading comprehension (ES = 0.38), but no significant effects for word reading (ES = 0.05) or vocabulary (ES = 0.08). Interestingly, students in the treatment condition continued their growth in comprehension over the summer and into the fall of fifth grade (Wanzek et al., 2019).

Vaughn and colleagues conducted a set of studies with fourth-graders with reading difficulties reporting findings from one academic year of intervention (Vaughn et al., 2016; Vaughn et al., 2019), and a 2-year intervention (Miciak et al., 2018). In the 1-year study, students with significant reading comprehension problems were randomly assigned on a 2:1 basis to the researcher-provided treatment or business-as-usual (BAU) condition in the schools. However, because two-thirds of their students with significant problems were receiving treatment provided by the research team, the schools used their resources to provide treatment to the students in the BAU condition, resulting in a comparison between researcher-provided and school-provided treatments. For the researcher-provided treatment, fourth-graders with significant reading difficulties were provided a multicomponent intervention including multisyllable word reading, fluent reading of high frequency words and phrases, vocabulary, and comprehension. There were no statistically significant differences reported between students in the researcher-provided intervention and BAU groups; however, examining growth in standard scores, both groups made significant gains in reading outcomes with standard score growth from pretest to posttest of 3

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standard score points on decoding, 5 on fluency, and 2 to 7 standard score points on reading

comprehension measures. In the Miciak et al. study (2018), students were randomly assigned to

one year of intervention, two years of intervention, or a BAU condition (BAU). Students

assigned to two years of intervention demonstrated significantly greater gains in reading fluency

compared to students in the two other conditions, however, students in both the one- and two-

year groups demonstrated similar and significantly larger gains in word reading compared to the

BAU group. No statistically significant differences between the three groups on standardized

measures of reading comprehension were reported.

Using findings from the previous study to adjust treatment, a related study (Vaughn et al.,

2019) further examined a word- and text-based multicomponent intervention with fourth- and

fifth-grade students with significant reading problems. Students were randomly assigned to

treatment or comparison condition (1:1 ratio), with students in the treatment condition provided

small group instruction for 30–45 minutes per lesson for an average of 68 lessons. Students in

the treatment condition performed statistically significantly better on a word reading measure

(ES = 0. 58) and a measure of reading fluency (ES = 0.46). Morris and colleagues (2012)

reported similar findings from a multicomponent reading intervention provided for 70 sessions to

students with significant reading difficulties.

In summary, though relatively understudied compared with interventions for students in

primary grades, recent studies have addressed the effects of multicomponent reading

interventions for students in upper elementary grades providing promise for addressing the

reading challenges of students whose reading difficulties persist beyond grade 3. While many

students struggling to learn how to read in the earlier elementary grades may respond with

effective classroom instruction, students in the upper grades with significant reading problems

likely demonstrate more intractable reading difficulties that represent significant reading

problems and require a more prolonged, multicomponent approach. Further, social and emotional

difficulties may present or become more pronounced among those students who continue to

struggle over time and into the upper elementary grades.

Childhood Anxiety

Childhood anxiety is among the most common of childhood mental health problems with

prevalence rates ranging from 15% to 20% (Grills-Taquechel & Ollendick, 2013). Further, a

substantial number of children experience increased stress or subclinical anxiety that would

benefit from reduction. Concurrent and longitudinal studies have found greater anxiety (i.e.,

global, trait, and/or test) to be associated with poorer academic and achievement performance as

early as first grade (Grills, Vaughn, Fletcher, et al., 2021; Grills-Taquechel et al., 2012; Grills-

Taquechel et al., 2013). With struggling readers, anxiety represents a target for integration with

existing academic interventions, as studies have shown both heightened anxiety among

struggling readers and bi-directional associations between reading intervention response and

anxiety over time (e.g., Grills, Vaughn, Fletcher, et al., 2021; Grills-Taquechel et al., 2013).

Thus, there is evidence suggesting that reading difficulties may result in increased levels of

anxiety and that greater anxiety can adversely affect children's response to reading interventions

(Grills et al., 2013). Addressing anxiety as part of an intervention for addressing reading

difficulties may, then, eliminate such a cycle and produce beneficial outcomes for both domains.

Managing anxiety is particularly relevant to students with reading difficulties because of

the powerful ways in which anxiety negatively influences how we process information and learn

(Izard, 2007). Students who are anxious about academic areas (e.g., reading) are likely to avoid

these learning situations as they are unpleasant (Jalongo, 2007). For some students, anxiety can

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be consuming, such that the brain is taxed with suppressing or managing these emotions and thus inadequate cognitive resources are available to learn or remember, or in the case of reading, read with understanding (Fenske & Raymond, 2006). Fortunately, decades of research have supported the use of cognitive-behavioral therapeutic approaches for addressing anxiety in childhood (e.g., Banneyer et al., 2018; Grills & Ollendick, 2012; James et al., 2015). Cognitive-behavioral therapies tend to be short-term, goal-driven approaches that focus on the development of a collaborative relationship, teaching and application of skills focused on enhancing positive thinking, feelings, and actions, and transfer of skills to address client difficulties (Beck & Beck, 2020).

Reviews have noted the efficacy of school-based cognitive-behavioral interventions for a specific form of anxiety (test anxiety), albeit, predominantly with adolescent students (von der Embse et al., 2013). Another meta-analytic review of cognitive-behavioral anxiety interventions utilized within school settings underscored support for their effectiveness and noted the need to continue exploring the relationship between such interventions and academic outcomes (Schoenfeld & Janney, 2008). Thus, although promising findings have emerged for the reduction of students' anxiety symptoms using school-based interventions, research on the impact of such interventions on students' academic performance remains largely unknown (see Grills & Vaughn, 2021).

Findings from studies of students in the upper elementary grades with significant reading problems as well as research on approaches to reducing anxiety in school-age children have raised important questions about how to remediate reading difficulties and reduce anxiety with these students. We interpret the findings as requiring systematic studies that examine the efficacy

of interventions that integrate practices associated with improving social-emotional functioning,

especially those targeting anxiety.

Study Purpose

This study presents preliminary findings from the first cohort of third- and fourth-grade

students with reading difficulties who participated in a 2-year intervention examining the effects

of a reading intervention with and without anxiety management instruction called Strong

Students Toolbox (Grills, 2015; Grills, Vaughn, Capin, et al., 2021). Using a randomized

controlled trial (RCT), students were assigned to one of three conditions: (a) small-group reading

intervention with anxiety management instruction (RANX), (b) small-group reading intervention

with math fact practice (RMATH), and (c) business-as usual (BAU) comparison condition (no

researcher provided treatment). Our intent was to evaluate the incremental efficacy of an

intervention that integrates evidence-based practices for reducing child anxiety within an

intervention with evidence-based practices for students with reading difficulties in the third- and

fourth-grades. Participants in the RANX and RMATH received the same reading intervention for

the same amount of time. Personnel trained and supervised by the research team provided both

treatment conditions. The variation in the two treatments was that the amount of time allocated to

learning practices for anxiety management in the RANX condition was allocated to practicing

math facts in the RMATH condition. We selected math facts as a form of attention-control

because (a) we wanted to ensure that the reading instruction was the same in both conditions, and

(b) many students with reading difficulties also demonstrate math difficulties, thus providing

them with a game-like, reinforcing approach to math-fact practice that could be academically

beneficial.

This study responds to requests for interventions that address social-emotional, as well as academic, concerns for struggling learners. The data presented here represent Cohort 1 of a double cohort planned design. Although this study is not fully powered, we are presenting the first cohort for a couple reasons. For one, Cohort 2 was disrupted by school closures in response to the COVID-19 public health pandemic, which prevented us from combining cohorts. Second, we intend to increase access to preliminary findings and facilitate open access to our data in a time-sensitive and transparent manner aligning with the research reforms aimed at improving scientific rigor and access (Cook et al., 2018).

Several features of our study are aimed at better understanding the promise of improving interventions for students with reading difficulties, including (a) providing longer-term interventions than has been typical (2 school years); (b) investigating the efficacy of various conceptually derived treatments and designing approaches that can potentially influence both future research and clinical practices; (c) examining intervention effects multiple times over a 2-year period; and (d) determining the efficacy of an intervention that combines an evidence-based approach to reading and anxiety reduction, potentially enhancing the feasibility of such approaches in school settings. The following research questions were addressed: (1) What were the effects of the RANX and the RMATH relative to the BAU condition on the reading performance of students with reading difficulties in the upper elementary grades? (2) To what extent are treatment effects moderated by students' initial levels of reading anxiety?

Method

Research Design

The design for this study was a blocked, RCT in which students were randomized to one of three conditions within teacher (i.e., the design is blocked on teachers and teachers are nested

in schools): RANX, RMATH, or BAU. Blocked designs eliminate the between-groups

component of the total variance estimates, which increases statistical power and improves

precision.

Participants

School Sites

Participants for this study were recruited from three schools in a diverse suburban

Southwestern U.S. school district. School demographic data were accessed from the state

educational agency's website. The 2018 school report card for all three schools showed a state

accountability rating of "met standard." At School 1, 40.4% of students were Caucasian, 36.9%

were Hispanic, 12.5% were African American, and 10.1% were categorized as other

ethnicities/races. Additionally, 34% of students at the participating schools were economically

disadvantaged, 13.7% received special education services, and 2.4% were classified as English

learners. At School 2, 41.6% of students were Caucasian, 39.2% were Hispanic, 11.3% were

African American, and 8.1% were other ethnicities/races. Also, 40.5% of students were

economically disadvantaged, 18.9% received special education services, and 2.8% were English

learners. Lastly, at School 3, 25.5% of students were Caucasian, 61.2% were Hispanic, 8.8%

were African American, and 4.6% were other ethnicities/races. Moreover, 49.1% of students

were economically disadvantaged, 7.2% received special education services, and 40.9% were

English learners.

Students

All third- and fourth-grade students at each school were screened using the Gates-

MacGinitie reading comprehension subtest (GMRT-4; MacGinitie et al., 2000). Across the three

participating schools, 495 students were screened for the study. Students were included in the

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final sample based on the following criteria: (a) performed at or below a standard score of 92

(30th percentile) on the GMRT-4 reading comprehension subtest, (b) parent provided consent for

participation, and (c) student provided assent. The study sample included a total of 128 students

from 31 different classrooms across the three schools. Students were randomly assigned to

RANX ($n = 43$), RMATH ($n = 43$), and BAU ($n = 42$). Table 1 provides the demographic

information available for all participants included in the study.

Similar to past multiyear studies, student attrition occurred over the course of the study,

primarily between Year 1 and Year 2. Of the 128 students who were randomized to condition, 31

students were no longer in the study at the end of Year 2 because they no longer attended a

participating school ($n = 29$) or because their parent withdrew them from the study ($n = 2$). The

majority of the attrition occurred over the summer between Year 1 and Year 2 when 19 students

moved to a new school district. The amount of attrition was very similar across conditions: 11

students attrited from BAU and 10 students attrited from both RANX and RMATH. According

to the What Works Clearinghouse (2017) standards, the rates of overall attrition (24%) and

differential attrition (4%) in this study represent a low threat to internal validity under optimistic

or cautious assumptions. Consistent with journal article reporting standards for quantitative

research (Appelbaum et al., 2018), Figure 1 depicts the flow of participants from screening

through analyses.

Interventionists

The research team recruited and hired interventionists each year to provide instruction to

two to five students at a time. Group sizes varied to accommodate class schedules. The research

team hired interventionists to provide instruction (nine interventionists in Year 1 and six new

interventionists in Year 2). All interventionists were former or retired teachers ($n = 12$) or had

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prior experience providing school-based interventions ($n = 4$). The research team provided 3

days of training to the interventionists over the course of each school year to ensure fidelity of

implementation. Additionally, the research team conducted observations biweekly and met

monthly with interventionists to enhance the fidelity of implementation and instructional quality.

To further support fidelity, interventionists received semi-scripted lessons.

Intervention Implementation Procedures

Students assigned to the RANX and RMATH treatment conditions received

approximately 30 minutes of instruction in small groups 4 to 5 days a week with group sizes

ranging between two to five students. Intervention instruction occurred from October through

March each school year. A total of 150 lessons were completed with the students in the treatment

groups over 2 academic school years (75 lessons per year). The research team worked with

partnering schools to schedule intervention instruction outside of the students' core reading

instructional block, most often during a time schools devoted to intervention and enrichment

instruction. The reading instruction did not differ between RANX and RMATH. In Year 1,

students in RANX and RMATH treatment conditions received, on average, 25 minutes of

reading instruction per session. In Year 2, treatment sessions lasted an average of 27 minutes.

Reading Instruction

Reading instruction targeted multiple components of reading, including word reading,

fluency, vocabulary, and comprehension. The primary reading activities included (a) systematic

decoding instruction and sight word practice; (b) repeated reading with teacher modeling and

feedback; (c) targeted comprehension instruction; and (d) text-based "stretch text" reading

activities, in which students could practice applying taught word reading in challenging texts,

fluency, and comprehension practices to texts that deliberately varied in genres and levels.

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Interventionists taught these instructional activities explicitly using routines for teacher modeling, guided practice, and independent practice coupled with frequent opportunities to practice and receive specific feedback (Archer & Hughes, 2012).

Instruction to Improve Word Reading. Word reading instruction targeted improved sight word recognition and word attack skills. To improve word recognition skills, participants were taught the patterns within researcher-designed lists of high-frequency, challenging words with a goal of achieving accuracy and automaticity in word reading. As students practiced independently or in pairs, interventionists assessed students on their sight word reading and provided feedback. The reading intervention also provided systematic decoding instruction in which students learned vowel sounds, vowel teams, and affixes in isolation and then read word cards that included these word parts.

Instruction to Improve Reading Fluency. Fluency instruction comprised of repeated readings with teacher modeling, feedback, and checks for understanding. At the start of each fluency lesson, interventionists introduced the topic and set a reading goal. Interventionists then modeled fluent reading as the students followed along or read aloud with students (choral read). During the second read, students either read the passage independently (whisper read) or with a partner. After reading the passage twice, interventionists asked comprehension questions orally. In selected lessons, students also wrote main idea statements after fluent reading practice. Interventionists set fluency goals with the students based on their weekly performance.

Instruction to Promote Text Comprehension. About half of all instructional time was dedicated to reading and comprehending connected texts. Comprehension instruction primarily occurred in one of two ways: (a) targeted comprehension instruction, in which students were taught specific comprehension processes, such as inference-making and comprehension

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monitoring, with small sections of text (1–4 sentences) or (b) "stretch text" instruction, in which

students had opportunities to apply taught comprehension practices when reading grade-level

passages. During targeted comprehension instruction, interventionists explicitly taught (a)

inference-making, (b) comprehension monitoring, (c) identifying key main ideas, and (d) asking

and answering questions. To enhance students' inference-making skills, interventionists taught

students to resolve anaphoric references, determine the meaning of unknown words using

context, and using background information to infer text meaning. Comprehension monitoring

instruction involved teaching students to identify errors and correct errors in brief texts,

beginning with a single sentence and increasing to five sentences of text. Interventionists taught

students to identify main ideas using get the gist questioning strategies (Vaughn et al., 2003) and

to monitor and develop their comprehension by asking and answering questions.

Students were taught to apply these targeted comprehension practices while reading texts

that were at or near their grade level. During stretch text lessons, students were taught key

vocabulary and read a long passage broken into smaller text sections. Before reading, the

interventionists set a purpose for reading and built and/or activated background information

about the topic. While reading, students highlighted unknown words, identified words central to

the meaning of the passage (key words), and wrote gist statements (i.e., main idea) for each text

section. After reading the entire passage, students answered comprehension questions, wrote

summaries, and/or discussed written statements with the group.

Anxiety Management Instruction

The anxiety management instruction, Strong Students Toolbox (SST), is built on

evidence-based, cognitive-behavioral practices for children with anxiety (Grills, 2015) and

focused on teaching anxiety management skills to students, as well as providing them with ample

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opportunities to apply these skills in the context of reading. The SST program focuses on

learning and practicing anxiety/stress management skills, and applying these skills in reading and

other academic related settings. The program builds on evidence-based cognitive-behavioral

practices for child anxiety and includes 3 core areas: 1) recognizing different feelings,

specifically those related to anxiety, and understanding how thoughts, feelings and behaviors are

related, 2) practicing various relaxation and stress management skills (e.g., imagery,

diaphragmatic breathing, progressive muscle relaxation); and 3) recognizing anxious and

unhelpful/negative thoughts and changing/managing them.

During the first year of intervention, SST instruction occurred daily for about 5 minutes

per day within the RANX lessons. In Year 2, SST instruction occurred in only about one-third of

lessons and focused primarily on review, maintenance, and transfer of anxiety management

information and skills taught in Year 1. A key aspect of the RANX condition was the integration

of SST within the reading intervention. Using scripted lessons, interventionists taught the anxiety

management practices directly to students, as well as engaged students in the application of these

skills during reading-based activities.

Interventionists taught a total of 10 anxiety management skills centered upon three core

areas: (1) recognizing anxious feelings (see Figure 3 for example); 2) relaxation and stress

management techniques (e.g., diaphragmatic breathing) (see Figure 4 for more examples); and 3)

recognizing anxious and other unhelpful/negative thoughts and using stress management

techniques to manage them. The skills were taught using developmentally appropriate and

engaging instructional practices. For example, interventionists demonstrated how students could

act as a "physician's assistant" when trying to identify physical signs of anxiety in themselves or

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others and provided students with multiple guided practice opportunities. The SST intervention

is described in further detail in (Grills, Vaughn, Capin, et al., 2021).

Math Facts Instruction

To control for the amount of time students engaged in reading activities and participated

in small group instruction across treatment conditions, students assigned to the RMATH

condition spent the same amount of time engaged in math calculation practice as RANX students

spent on SST instruction. Math calculation instruction and practice consisted of students working

with interventionists on math calculation instruction and practice to support students in meeting

below and on grade-level math standards (e.g., addition, subtraction, multiplication, division of

whole numbers, decimals, and fractions). Interventionists provided brief instruction and then

students worked on practice items independently or in pairs as interventionists provided

feedback.

BAU Instruction

Given the previous research documenting that school personnel elect to provide a school-

delivered reading intervention to students in the comparison condition (Vaughn et al., 2016;

Wanzek et al., 2017), we collected information about the supplemental reading instruction that

schools provided to students in the BAU condition during the intervention/enrichment time when

treatment students received the research-provided treatments (i.e., RANX and RMATH). At all

three school sites, school staff members indicated that school-provided intervention instruction

occurred during the 30-minute intervention/enrichment time block. We accumulated information

about the school-provided interventions in two ways: (a) we completed brief interviews with

classroom teachers and other school staff members (e.g., reading specialists, special educators)

who provided instruction to BAU students during the enrichment/intervention time block to

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determine materials and approaches used, and (b) we asked teachers to audio record their

intervention for BAU students during one week in the fall and spring of each school year.

Interviews revealed that 24 of the 41 students (59%) randomized to BAU participated in a

small group, supplemental reading intervention provided in Year 1. In Year 2, 18 of the 32 BAU

students (56%) received a supplemental reading intervention. None of the teachers reported

providing anxiety management instruction during the enrichment/intervention time block.

Teacher interviews indicated that classroom teachers (70%), campus-based reading

interventionist (24%), and/or special education teachers (6%) implemented the school-based

reading interventions. Instruction occurred 4 to 5 days per week with group sizes ranging from

one-on-one to small groups of five students. Teachers reported using a variety of instructional

approaches, including reteaching core instruction, using classroom basal readers to work on

fluency practice, and using a supplemental reading program such as the Wilson Reading System.

Because only a subset of the BAU-assigned students participated in small-group, tutor-led

interventions, the design is best described as *partially nested*, a reality that we address more fully

in the section on analysis. To further understand the counterfactual condition, we asked teachers

to audio record all supplemental reading instruction provided during the enrichment/intervention

time block during one week in the fall and spring of each school year. The research team asked

the interventionists to provide their typical instruction during this time. The research team coded

all audio recordings in order to characterize the instruction that BAU students received and to

determine the amount of overlap with the instruction provided to students in the treatment

conditions. This information is presented below in the section entitled, Overlap Between

Treatment and BAU.

Treatment Fidelity

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Based on previous recommendations for examining treatment fidelity (e.g., O'Donnell, 2008), we measured multiple dimensions of treatment fidelity, including treatment adherence, instructional quality, and program differentiation (overlap between treatment and comparison instruction). All RANX and RMATH treatment sessions were audio-recorded and a sample of BAU instruction was audio-recorded each year. To assess treatment adherence and instructional quality, the research team randomly selected six audio recordings for each treatment group each year. To ensure the audio recordings represented the full range of treatment sessions, we randomly selected two audio recordings from each set of lessons 1–25, 26–50, and 51–75 per year. The research team coded 226 treatment sessions. Additionally, we also asked school staff members to describe any reading interventions provided to BAU students and audio record one week of this instruction each semester to determine the overlap between the treatment and BAU conditions (i.e., program differentiation). We coded all of the audio-recordings from the school-provided reading intervention determining the percentage of time spent on four components of reading instruction (e.g., phonics/word reading, fluency, vocabulary, and comprehension), how often BAU instruction implemented instructional activities that were similar to the activities taught during treatment instruction, and the overall instructional quality.

Three members of the research team completed all of the fidelity coding. Prior to fidelity coding and in accordance with the gold standard method (Gwet, 2001), two members of the research team independently coded an instructional audiotape and met with the lead coder to discuss discrepancies until 90% or greater agreement was reached. Additionally, the lead coder independently coded 20% of all audiotapes and met with the initial coder to reach agreement over differences to maintain reliability. The agreement between the single- and double-coding

exceeded 95% for RANX, RMATH, and BAU audio recordings, indicating minimal observer drift in coding agreement over time.

Adherence and Instructional Quality During Treatment Instruction

Similar to several past studies (e.g., Vaughn et al., 2017), we coded treatment adherence by rating each of the instructional activities on a 4-point Likert type rating scale ranging from 1 (*low*) to 4 (*high*). Coders indicated a score of 4 (*high*) when the interventionist completed all of the required elements and procedures, a score of 3 (*mid-high*) when nearly all elements were completed, a score of 2 (*mid-low*) when some elements were completed, and a score of 1 when one or zero elements were completed. For RANX instruction, the average adherence score across the reading instructional activities and interventionists was 3.51 out of 4 (*SD* = .82). The average adherence for the SST instruction across interventionists was 3.61 (*SD* = .65). For RMATH, the average adherence across interventionists and reading instructional activities was 3.50 (*SD* = .74). The average adherence for the math facts instruction across interventionists was 3.86 (*SD* = .62).

The research team also determined global quality rating using a 5-point Likert type rating scale ranging 1 (*lowest quality*) to 5 (*highest quality*). Based on a detailed rubric, coders assessed instructional quality, feedback to students, classroom management, pacing, and student engagement. For RANX, instructional quality scores were high across dimensions: overall instructional quality (*M* = 4.20, *SD* = 1.11), feedback to students (*M* = 4.35, *SD* = 1.06), classroom management (*M* = 4.08, *SD* = 1.22), instructional pacing (*M* = 4.10, *SD* = 1.34), and student engagement (*M* = 4.34, *SD* = .91). For RMATH, quality scores were similarly high: overall instructional quality (*M* = 4.06, *SD* = 1.20), feedback to students (*M* = 4.17, *SD* = 1.23),

classroom management (*M* = 3.97, *SD* = 1.30), instructional pacing (*M* = 4.08, *SD* = 1.32), and

student engagement (*M* = 4.25, *SD* = .92).

Overlap Between Treatment and BAU Instruction

The research team coded 135 BAU instructional audio tapes, determining (a) the

proportion of time spent on four components of reading (phonics/word reading, fluency,

vocabulary, comprehension), (b) the overall quality of instruction, and (c) overlap with the

instructional activities taught during RANX and RMATH treatment instruction. Across the 2

years, school-provided reading intervention audio recordings showed that intervention sessions

lasted, on average, 21 minutes. All of the school-provided intervention instruction observed

focused on reading; no anxiety management instruction was observed. Fidelity coding indicated

that the school-provided reading intervention provided to BAU students primarily addressed

comprehension (55% of intervention time), fluency (21% of intervention), phonics/word reading

(21% of intervention time), and vocabulary (3%). This distribution of time was similar to the

amount of time spent on the components of reading during the RANX and RMATH reading

instruction: comprehension (61% of reading intervention time), fluency (26%), phonics (13%),

and vocabulary (0%; all vocabulary instruction was embedded with comprehension instruction).

Using the same global quality rubric used for coding the treatment audio recordings, coders also

assessed overall instruction quality, feedback to students, classroom management, pacing, and

student engagement for the school-provided instruction. Scores were similarly high for the

school-provided instruction: overall instructional quality (*M* = 4.20, *SD* = .1.20), feedback to

students (*M* = 4.28, *SD* = .1.24), classroom management (*M* = 4.40, *SD* = 1.09), instructional

pacing (*M* = 4.32, *SD* = 1.32), and student engagement (*M* = 4.45, *SD* = .92).

Although the reading components addressed and instructional quality ratings were similar between the treatment and comparison conditions, the audio tapes revealed there was limited overlap in the specific instructional practices used to target reading components between the researcher- and school-provided reading interventions. In over 135 school-provided intervention sessions coded, the school-provided reading instruction infrequently included instructional practices for improving fluency and comprehension that were moderately or highly aligned to the treatment practices. Specifically, only 2% of the school-provided lessons that included fluency were moderately or highly aligned with the repeated reading routine used in the researcher-provided treatment. Only 21% of the school-provided lessons that included comprehension instruction were moderately or highly consistent with the strategy or text-based comprehension instruction provided during treatment instruction. The most overlap between the school-provided and research-provided reading instruction was present during word reading instruction as 44% of this instruction aligned with the systematic decoding and sight word treatment instruction.

Measures

Research staff, blind to the study condition, administered and scored measures administered to all participating students before and after the treatment instruction that occurred in Year 1 and 2. These measures were administered in quiet areas designated by school personnel. Prior to each testing time point, assessment staff demonstrated 100% accuracy in administration, and scoring on all measures and protocols were double-scored and double-entered by members of the research team.

Test of Word Reading Efficiency Sight Word Efficiency Subtest (TOWRE-2)

The TOWRE-2 (Torgesen et al., 2012*)* sight word efficiency (SWE) subtest is a standardized, individually administered timed test that requires students to read a list of printed

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words in 45 seconds. The test measures an individual's ability to decode real words fluently. The

test-retest reliability is .90 for a sample of third- and fifth-grade students; alternative-form

reliability exceeds .90. The concurrent validity of the SWE subtest and the word identification

subset of Woodcock Reading Mastery Tests-Revised (WRMT-R) is .79.

Gates MacGinitie Reading Test (GMRT-4) Reading Comprehension Subtest

The GMRT-4 (MacGinitie et al., 2000) is a group-administered standardized reading test

that is norm referenced for K–12 and adulthood. The test requires students to answer 48

multiple-choice questions after silently reading narrative and expository passages. The length of

these passages ranges from 3 to 15 sentences. Internal consistency ranges from .91 to .93 and

alternate-form reliability ranges from .80 to .87 (MacGinitie et al., 2000).

Test of Silent Reading Efficiency and Comprehension (TOSREC)

The TOSREC (Wagner et al., 2010) is a group-administered standardized measure of

reading fluency and comprehension. Students are provided 3 minutes to read and assess the

veracity of a series of short sentences. The TOSREC has an average correlation coefficient that is

greater than .76 with various standardized reading comprehension measures (Wagner et al.,

2010). For upper elementary students, the alternate-form reliability exceeds .86.

Kaufman Test of Educational Achievement (KTEA-3) Reading Comprehension Subtest

The KTEA-3 (Kaufman & Kaufman, 2014) is an individually administered test that is

norm referenced for persons ages 4 to 25. The reading comprehension subtest involves

identifying a symbol or word(s) to match a corresponding picture as directed by written

instructions (e.g., look up). Subsequent items require students to read passages and answer

comprehension questions. During testing, the tester establishes basal when the examinee

correctly responds to the first two items of a set of questions. Examiner continues testing until a

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student scores zero on four items in a set or has five consecutive scores of zero. Internal

consistency of the reading comprehension subtest for third- and fourth-grade students ranges

from .88 to .91, and alternate-form reliability is reported as .76 (Kaufman & Kaufman, 2014).

The Test of Silent Contextual Reading Fluency (TOSCRF)

The TOSCRF (Hammill et al., 2006) was also used to assess reading fluency and

comprehension. The TOSCRF presents students with short passages in which all words are

printed in uppercase without any spaces or punctuation between the words (e.g.,

AYELLOWBIRDWITHBLUEWINGS). Students are asked to draw a line between as many

recognizable words as possible within 3 minutes (e.g.,

A/YELLOW/BIRD/WITH/BLUE/WINGS). The passages become gradually more complex in

their content, vocabulary, and grammar.

Main Idea and Inferencing for Reading Comprehension (MINI-RC)

An untimed, 20-item researcher-developed measure of reading comprehension assessed

students' comprehension monitoring, main idea generation, and inference-making. The MINI-

RC has been used in several past studies to assess the efficacy of reading interventions for

middle grade students (e.g, Barth et al., 2016; Roberts et al., 2018). The assessment includes a

mix of multiple choice (16) and open-ended items (4). The information in the passages read was

not covered during the reading intervention.

The Reading Anxiety Scale

The reading anxiety scale (Grills, 2014) assessed students' anxiety about reading, reading

instruction, and reading tests. The scale has six self-report items that students rate on a 5-point

Likert-type scale (1 = Never; 5 = Always). High scores on the reading anxiety scale indicate

higher levels of reading-related anxiety while low scores are indicative of lower levels of

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reading-related anxiety. An example item on the scale is "Taking reading tests scares me." Factor

analysis indicated that one factor exists in the data (Grills, Vaughn, Roberts, et al., 2021).

Furthermore, fit indices from a confirmatory factor analysis also showed a good fit supporting

the items' unidimensional structure (CFI = .998; TLI = .997; RMSEA = .016 [95% CI = .00,

.06]; SRMR = .024). The scale has eight self-report items that students rate on a 5-point Likert-

type scale. The eight items load on a common factor (RMSEA < .05) as hypothesized. A

"reliability-like" coefficient was estimated as $1 - \sigma^2_E / \sigma^2_X$, where σ^2_X is the variance in true

scores and σ^2_E is the expected value for the squared reciprocal of the total test information

function, I_s (Raju et al., 2006). This value, .80 in this case, is conceptually similar to an alpha

coefficient and can be interpreted as such for practical purposes (Raju et al., 2006).

Results

Data Analysis Plan

We evaluated the effects of the reading and anxiety intervention (RANX) and the reading

and math intervention (RMATH) on students' reading outcomes. We also examined the

possibility that students' anxiety at pretest moderated treatments' effect. The data were fully

nested in teacher and partially nested in interventionists, as described elsewhere. We included

pretest scores for each outcome as covariates. Three main contrasts were evaluated: (a) RANX

versus BAU, (b) RMATH versus BAU, and (c) RANX versus RMATH. False discovery rates

associated with multiple comparisons (i.e., Type 1 error) were controlled using the Benjamini-

Hochberg correction (Benjamini & Hochberg, 1995). Effect sizes were estimated as the ratio

between the model-derived treatment coefficients and the unadjusted pooled within-group

standard deviation across conditions at posttest. Two student-level factors were considered as

potential moderators: (a) reading anxiety and (b) word reading, as measured by TOWRE sight

word efficiency. Moderators were grand-mean centered. Interaction terms were estimated as the product of the moderator and treatment condition, with BAU coded as 0 for contrasts 1 and 2. RMATH was the baseline (i.e., dummy-coded as 0) for contrast 3. Significant interactions were followed by the Johnson-Neyman technique (Preacher et al., 2006) to identify values along the continuum of the moderator at which the effect of intervention transitions from statistically significant to nonsignificant.

Main Effect Analysis

Table 2 displays means and standard deviations for each measure. All variables distributed normally based on estimates of skewness and kurtosis. No outlying values were identified. The empty means model indicated that 11% of the variance in Gates-MacGinitie comprehension and 2% of variance in the word reading measure was associated with interventionist. There was no interventionist-related partial nesting for the other outcomes. Also, teacher-level clustering was trivial across all outcomes. Accordingly, we modeled data as partially nested (Luo et al., 2015), with nesting in tutor only in active treatment conditions, RANX and RMATH, for the Gates-MacGinitie comprehension and the TOWRE sight word (see Table 3). Intervention-level partial nesting was not included in models for the other outcomes (see Table 4 for further details). On the MINI-RC measure, students in RANX outperformed students in BAU. The effect size was 1.22. The difference between RMATH and BAU was also statistically significant, indicating higher average performance for students in the RMATH intervention compared to BAU. The effect size was 0.77. Groups did not differ on other reading outcomes.

Moderation Analysis

Reading anxiety moderated the main effect of the RANX intervention on TOWRE word reading when contrasted against the BAU group (Figure 2). The coefficient for the interaction was negative and statistically significant (β = -1.08, SE = 0.43, p = .01), indicating a significant difference favoring RANX (lower scores indicate lower anxiety on the RAS), where treatment's effect decreases by 1.08 units (about 1 point on the outcome) on the TOWRE for each additional point *increase* in reading anxiety. The region of statistical significance indicates that the effect favoring RANX remained significant for students scoring 11 points or fewer on the reading anxiety measure. Because the sample mean for the RAS was 15.88 and the standard deviation was 5.82, students scoring below about 1 standard deviation from the mean (i.e., students with the *lowest* reading-related anxiety at pretest) benefited from the RANX intervention when contrasted with the BAU. The difference between groups was nonsignificant for students who scored above 11 on the reading anxiety measure.

Discussion

This study provides preliminary findings from an initial cohort of third- and fourth-grade students with reading difficulties who participated in a 2-year study examining the relative effects of: (a) reading intervention with anxiety management (RANX), (b) reading intervention with math facts (RMATH), and (c) BAU or school-provided reading. We were interested in examining the efficacy of implementing an intervention that integrates evidence-based practices for child anxiety management within an intervention with evidence-based practices for improving reading outcomes for upper elementary students with significant reading difficulties. In light of the emphasis within MTSS for providing both academic and behavioral interventions, districts have been challenged to allocate the necessary school time and to identify appropriate instructional approaches for meeting the growing needs of students with academic and

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behavioral needs. In this study, we selected anxiety management as the social-emotional target for our combined intervention (reading and anxiety management) for several reasons. First, there is a growing number of students who express anxiety management difficulties in academic and testing situations and these anxiety difficulties are heightened for students with reading problems (Grills-Taquechel et al., 2012). Second, school personnel recognize the need to meet the needs of these students but also perceive they have inadequate knowledge and resources to do so. This study aimed to determine the extent to which practitioners could integrate a reading and anxiety management intervention with fidelity and the initial efficacy of the approach.

Initial findings are promising suggesting that students who participated in the RANX treatment made statistically significant gains on reading comprehension when compared with BAU and larger effect sizes than the RMATH condition that provided the same reading treatment but with no instruction on anxiety management. Students' perceptions of reading anxiety moderated the main effect of the RANX intervention on word reading (TOWRE; Torgesen et al., 2012) when contrasted with the BAU group. The coefficient for the interaction was negative and statistically significant indicating a significant difference favoring RANX for students with moderate and low levels of reading anxiety. We interpret the findings from the moderation analysis as suggesting potentially promising findings for the RANX treatment. The findings indicated that the treatment effect decreased by .94 units—about 1 point on the outcome on the TOWRE word reading (Torgesen et al., 2012)—for each additional point of increase in reading anxiety. Specifically, students with moderate or low levels of reading anxiety (15 or lower on the Reading Anxiety Scale) at pretest in the RANX condition outperformed BAU students with similar levels of reading anxiety on the TOWRE at posttest. Students who have more negative perceptions of their word reading have lower effects from the reading treatment.

While other reading outcomes were not statistically significant, visual inspection reveals the

outcomes are promising in favor of the RANX treatment. For example, the data reveal strong

standard score increases across conditions and across reading comprehension measures from pre

to posttest. It may be that for those students whose reading anxiety was in the low-moderate

range, the anxiety skills were able to be applied more quickly and allowed them to make greater

reading gains. In contrast, for students reporting higher reading anxiety at the beginning of the

year, the potential benefits of the anxiety skills may require more practice.

We recognize these results are preliminary and we argue strongly that we need further

research to substantiate their influence. We are currently hoping to conduct a cohort (cohort 3) of

third and fourth-graders with reading difficulties in a replication RCT. While the potential for

another cohort improves our understanding of treatment effects by providing a larger overall

sample, we think there are important reasons to share these preliminary findings. First, we will

be unable to combine cohort 1 (reported here) and cohort 2 because COVID-19 altered our

implementation and data collection in Cohort 2. Second, school leaders and classroom teachers

are making decisions daily to meet the needs of students with reading difficulties and social-

emotional challenges. Ideally, they make these decisions with the best evidence available.

While we consider these findings as preliminary, we do have findings from previous

studies that allow us to consider them as promising and worthy of further investigation. First,

there is significant research documenting the associations between academic difficulties and

anxiety and, separately, on the beneficial outcomes of cognitive-behavioral approaches to

managing anxiety across age ranges including those represented in this study (Francis et al.,

2019; Grills-Taquechel & Ollendick, 2013; Grills-Taquechel et al., 2012; 2013; Grover et al.,

2005; Ialongo et al., 1994; Mychailyszyn et al., 2010; Owens et al., 2012; Voltas et al, 2014),

The Strong Student Toolbox (Grills, 2015) integrated into this reading intervention is an example of these cognitive-behavioral practices. Understudied has been the integration of these cognitive-behavioral practices for managing behavioral issues within academic interventions such as the reading intervention conducted in this study – even though students with greater reading difficulty at the beginning of the year are more likely to have higher reading anxiety at the end of the year (Ramirez et al., 2019). Second, as in this study, Grills-Taquechel and colleagues (2014) reported levels of anxiety predicting response to reading intervention with students' high levels of anxiety predicting low response to intervention. Third, Grills, Vaughn, Capin, et al. (2021), compared struggling readers who did and did not meet reading benchmarks after a year of intervention and found minimal differences at the beginning of the year, but numerous differences at year-end, with students exhibiting persistent reading struggles reporting significantly greater distress than those who met benchmarks. In addition, bidirectional associations emerged with beginning of year group status (struggling or typically achieving readers) predicting internalizing symptoms and beginning of year internalizing symptoms predicting end of year intervention response group status. Finally, while the majority of studies integrating behavioral treatments within academic interventions have focused on addressing behavior problems (Roberts et al., 2020), motivation (Toste et al, 2017), or self-regulation (Vaughn et al., 2019), this initial study as well as a previously conducted pilot study (Grills & Vaughn, 2021) provide a rationale for focusing on anxiety management within reading interventions.

The high levels of fidelity and the low overlap between treatment conditions and BAU suggest confidence in the promising outcomes for teachers reliably implementing the RANX and RMATH treatment. It appears as though the elements of the treatment with the scripted lessons

provide adequate support for high implementation reliability, which bodes favorably for generalization of treatment effects.

Limitations

The most substantial limitation to this study is the sample size. Although it is larger than the vast majority of RCTs conducted with upper elementary students with reading difficulties (Scammacca et al., 2015), it is still underpowered to confidently address the efficacy of the treatment. The original study design provided for a second cohort of participants providing athe desired sample size, however, the COVID-19 pandemic prevented the research team from completing the treatment and collecting post-test measures. Additional measures that address anxiety growth over time would benefit the interpretation of the findings from this study. We are currently collecting these measures, and upon the completion of our next cohort, we anticipate reporting both reading and anxiety outcomes for a larger sample of students with reading difficulties. We also recognize that this study is an efficacy study with the intervention provided by personnel hired and trained by the research team. It would be valuable to determine the extent to which educators could effectively implement these practices within school settings. Observing the ease to which our research tutors acquired proficiency in using the anxiety management practices, we are hopeful that other educators could also acquire and use them within their classroom setting. The participants in this study were identified based on their reading difficulties and not on elevated anxiety. We think it would be interesting to determine the extent to which an anxiety management approach such as the one used in this study might be beneficial for students with clinical as well as sub clinical levels of anxiety.

Implications

Managing anxiety is a significant contributor to the social and emotional health of individuals, including elementary students. The unstable educational opportunities provided during the pandemic and the increased concerns over our health have been prevalent issues world-wide and certainly for school-age youngsters contributing to heightened anxiety. We are committed to better understanding practices for integrating anxiety management approaches into the academic learning of students – particularly for students who are most vulnerable. Recognizing that there is considerable research to be done, we encourage educators to review the approaches to anxiety management available through the Strong Student Toolbox as well as other sources (e.g., Brave-ONLINE, March, Spence, & Donovan, 2009; Camp Cope-A-Lot, Crawford et al., 2013, Khanna & Kendall, 2010) to support students within their academic learning.

Future Research

Extensive research is needed to further understand the role of anxiety management and reading interventions including the efficacy of an integrated approach to improving both outcomes. We are also interested in the extent to which anxiety management approaches integrated with reading approaches might be utilized within classroom instruction (Tier 1) effectively. Further, we are interested in whether even more intensive interventions addressing anxiety and reading might facilitate outcomes for students with the significant anxiety and reading difficulties.

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Table 1. Characteristics of Grades 3 and 4 Student Participants

Demographic variable	RANX		RMATH		BAU		Overall sample	
	n	%	*n*	%	*n*	%	*n*	%
Gender								
Male	18	41	22	51	27	65	67	52
Female	26	59	21	49	14	35	61	48
Grade								
3	24	54	25	58	23	56	72	56
4	20	46	18	42	18	43	56	44
Ethnicity/Race								
African American	7	16	9	21	12	30	28	22
Caucasian	13	30	12	28	7	17	32	25
Hispanic/Latino	22	50	20	47	21	0.51	63	49
Other	2	0	2	4	1	0.2	5	4
Home language								
English	37	84	34	79	31	76	102	80
Spanish	5	11	8	19	9	22	22	17
Not reported	2	5	1	2	1	2	4	3
Special education								
Yes	10	23	5	12	11	27	26	20
No	34	77	38	88	30	73	102	80

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Note. RANX = small-group reading intervention with anxiety management instruction; RMATH

= small-group reading intervention with math fact practice; BAU = business-as-usual

comparison condition.

Table 2. Year 1 Pretest and Year 2 Posttest Means with Standard Deviations for Reading

Outcome Measures

Measure	Group	Year 1: Pretest			Year 2: Posttest		
		n	*M*	*SD*	*n*	*M*	*SD*
Gates Reading							
Comprehension subtest	BAU	41	83.27	7.48	31	89.36	10.42
	RANX	43	84.81	6.24	33	91.52	11.36
	RMath	43	84.07	7.87	32	88.92	9.01
KTEA-3 Reading							
Comprehension subtest[a]	BAU	37	83.78	5.04	31	83.94	4.40
	RANX	38	83.68	5.87	33	85.52	7.87
	RMath	39	84.03	5.79	33	84.18	4.35
TOWRE-2: Sight Word							
Efficiency subtest	BAU	41	86.44	13.07	31	90.48	11.27
	RANX	44	88.11	12.13	33	94.67	14.04
	RMath	43	87.02	10.84	33	90.24	11.31
TOSREC	BAU	40	88.13	11.35	31	96.26	10.84
	RANX	44	88.95	12.39	33	100.12	14.37
	RMath	43	88.23	10.98	33	98.18	11.02
TOSCF	BAU	40	76.80	14.77	31	88.87	11.45
	RANX	43	84.14	15.75	33	92.88	13.61
	RMath	43	80.14	13.77	32	89.22	12.94

MINI-RC	BAU	39	17.31	4.05	31	20.00	4.32
	RANX	44	16.05	3.71	33	24.91	4.75
	RMath	43	15.74	4.25	33	23.30	6.43

Note. RANX = group receiving reading intervention with anxiety management instruction; RMATH = group receiving reading intervention with math fact practice; BAU = business-as-usual comparison group; Gates = Gates MacGinitie Reading Test-4 (MacGinitie et al., 2000); KTEA = Kaufman Test of Educational Achievement-3 (Kaufman & Kaufman, 2014); TOWRE = Test of Word Reading Efficiency (Torgesen et al., 2012); TOSREC = Test of Silent Reading Efficiency and Comprehension (Wagner et al., 2010); TOSCF = Test of Silent Contextual Reading Fluency (Hammill et al., 2006); MINI-RC = Main Idea and Inferencing for Reading Comprehension.

[a]KTEA measure was administered for the first time at posttest in Year 1. We used that score as covariate in the analysis.

Table 3. Results from Partially Nested Models Testing Effects of Intervention at End of Year 2, Controlling for Differences at

Beginning of Year 1

Test	Effect	Estimate	SE	FDR adjusted p value	ES	Variance	ICC
Gates Reading Comprehension	Fixed effect						
	Intercept	90.57	1.74	0.00			
	Pretest	0.53	0.13	0.00			
	RANX vs. BAU	0.16	2.56	0.95	0.01		
	RMATH vs. BAU	-1.72	2.59	0.51	-0.18		
	RANX vs. RMATH	1.88	2.31	0.77	0.18		
	Random effects						
	Student-level						
	variance					82.40	0.90
	Tutor-level variance					8.80	0.10
TOWRE Sight Word Efficiency	Fixed effect						
	Intercept	91.66	1.85	0.00			

	Pretest	0.59	0.09	0.00			
	RANX vs. BAU	1.73	2.74	0.72	0.14		
	RMATH vs. BAU	-1.02	2.76	0.72	-0.09		
	RANX vs. RMATH	2.75	2.47	0.72	0.22		
	Random effects						
	Student-level variance					94.71	0.90
	Tutor-level variance					10.47	0.10
MINI-RC	Fixed effect						
	Intercept	19.33	0.90	0.00			
	Pretest	0.47	0.12	0.00			
	RANX vs. BAU	**5.55**	**1.26**	**0.00**	**1.22**		
	RMATH vs. BAU	**4.26**	**1.27**	**0.00**	**0.77**		
	RANX vs. RMATH	1.30	1.21	0.29	0.23		
	Random effects						

Student-level variance	23.71	0.98
Tutor-level variance	0.47	0.02

Note. FDR = false discovery rate; Gates = Gates MacGinitie Reading Test-4 (MacGinitie et al., 2000); RANX = reading and anxiety intervention; RMath = reading and math intervention; BAU = business as usual; TOWRE = Test of Word Reading Efficiency (Torgesen et al., 2012); MINI-RC = Main Idea and Inferencing for Reading Comprehension. Bold items indicate statistically significant difference with a p-value less than .05

Table 4. Results from Regression Models Testing Effects of Intervention at the End of Year 2, Controlling for Differences at the Beginning of Year 1

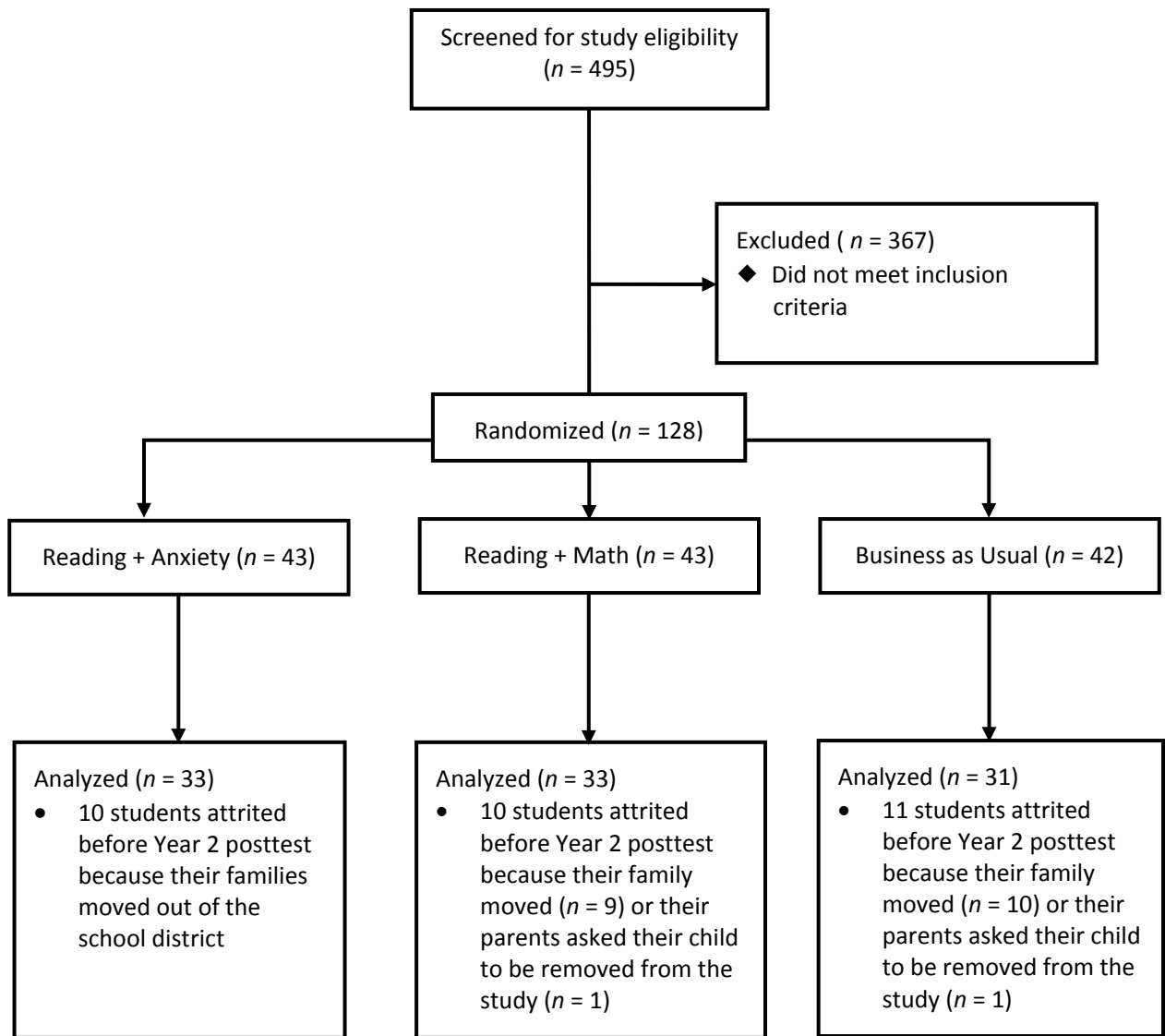| Test	Fixed effect	Estimate	SE	FDR adjusted p value	ES
KTEA-3 Reading Comprehension					
	Intercept	83.95	0.79	0.00	
	Pretest	0.64	0.13	0.00	
	RANX vs. BAU	1.54	1.20	0.41	0.24
	RMATH vs. BAU	0.25	1.10	0.84	0.06
	RANX vs. RMATH	1.30	1.18	0.41	0.20
TOSREC					
	Intercept	96.59	1.41	0.00	
	Pretest	0.56	0.10	0.00	
	RANX vs. BAU	3.03	2.46	0.62	0.24
	RMATH vs. BAU	1.79	2.26	0.62	0.16
	RANX vs. RMATH	1.24	2.50	0.62	0.10
TOSCF					
	Intercept	90.83	2.14	0.00	
	Pretest	0.47	0.11	0.00	
	RANX vs. BAU	-0.43	3.04	0.88	-0.03

|				
RMATH vs. BAU	-0.94	2.76	0.88	-0.08
RANX vs. RMATH	0.50	2.74	0.87	0.04

Note. FDR = false discovery rate; KTEA Kaufman Test of Educational Achievement-3

(Kaufman & Kaufman, 2014); RANX = reading and anxiety intervention; RMath = reading and

math intervention; BAU = business as usual; TOSREC = Test of Silent Reading Efficiency and

Comprehension (Wagner et al., 2010); TOSCF = Test of Silent Contextual Reading Fluency

(Hammill et al., 2006).

INTEGRATING READING AND ANXIETY INTERVENTION

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Screened for study eligibility
(*n* = 495)

Excluded (*n* = 367)
◆ Did not meet inclusion
criteria

Randomized (*n* = 128)

Reading + Anxiety (*n* = 43)

Reading + Math (*n* = 43)

Business as Usual (*n* = 42)

Analyzed (*n* = 33)
• 10 students attrited
before Year 2 posttest
because their families
moved out of the
school district

Analyzed (*n* = 33)
• 10 students attrited
before Year 2 posttest
because their family
moved (*n* = 9) or their
parents asked their child
to be removed from the
study (*n* = 1)

Analyzed (*n* = 31)
• 11 students attrited
before Year 2 posttest
because their family
moved (*n* = 10) or their
parents asked their child
to be removed from the
study (*n* = 1)

Figure 1. Study Sample Flow Diagram.

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INTEGRATING READING AND ANXIETY INTERVENTION
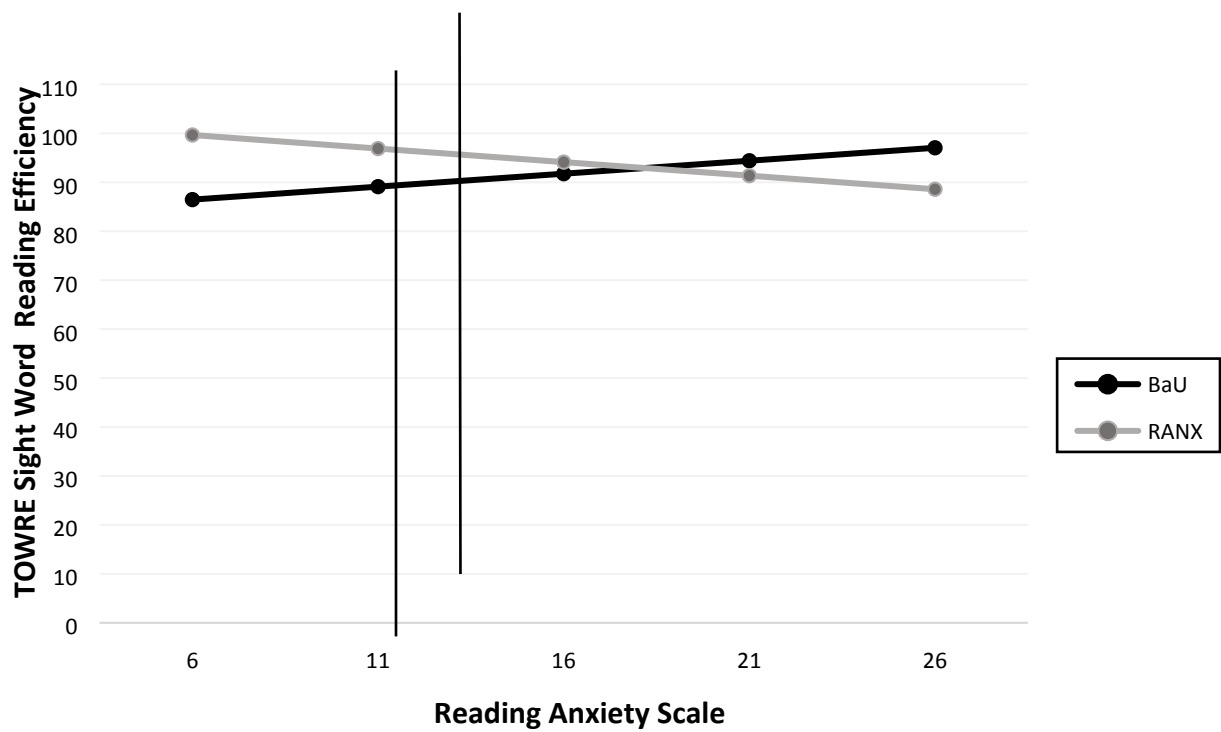
Figure 2. Visualization of Reading Anxiety as a Moderator of Intervention Effect Between the

BAU and RANX Conditions on TOWRE Word Reading Efficiency at Posttest.

Strong Students Toolbox Intervention Packet

Lesson 1–Sam Story

Keywords: Stressed, worry, science

Hi—My name is Sam and I am going to tell you my most favorite and least favorite parts of the day.

My least favorite part of the day is when I feel **stressed** about school. I don't like when I have a test.

Especially on the days I have a science **test**, I wake up anxious and wish I could just stay home. I

worry about failing or what my teacher or friends will say if they see how bad I am going to do. Even

in class, I can't pay attention because I just think about the stupid science test. Sometimes I get so

stressed my hands shake and I get sweaty. Then I think about how sick I feel and I forget to study

sometimes. During class, sometimes I just stare at my desk but I can't even focus on the teacher. It is

the worst. My favorite part of the day is music lessons. I love to play guitar and I can't wait until we

have a talent show at school and I can play for all my friends.

   1. What is something that makes Sam feel stressed? _____

   _____

   2. What is this story mostly about using the key words? _____

   _____

Figure 3. Recognizing anxious feelings.

The Relaxers Try some out at home ☑

1. ☐ **Arms & Hands**– squeeze your fist, then relax

2. ☐ **Shoulders & Back Muscles**– stretch your arms out and up, then relax

3. ☐ **Neck & Head**– pull your head in, hold tight, then relax

4. ☐ **Mouth & Jaws**– bite down hard, then relax

5. ☐ **Face**– wrinkle up your nose and get it off, then relax

6. ☐ **Stomach**– squeeze and suck your stomach in tight, then relax

7. ☐ **Feet & Legs**– squish your toes down deep, push with your legs, then relax

Figure 4. Relaxation and Stress Management Techniques