Retention of Reading Intervention Effects from Fourth to Fifth Grade for Students with Reading Difficulties

Jeanne Wanzek

Vanderbilt University

Yaacov Petscher

Florida State University

Stephanie Al Otaiba

Southern Methodist University

Rachel E. Donegan

Vanderbilt University

Published 2019

Wanzek, J. Petscher, Y., Al Otaiba, S., & Donegan, R. E. (2019). Retention of reading intervention effets from fourth to fifth grade for students with reading difficulties. *Reading and Writing Quarterly, 35*, 277-288.

Peer Review URL: https://authorservices.taylorandfrancis.com/what-to-expect-during-peer-review/

Author note

Jeanne Wanzek, Department of Special Education, Vanderbilt University; Yaacov Petscher, Florida Center for Reading Research, Florida State University; Stephanie Al Otaiba,

Simmons School of Education , Southern Methodist University; Rachel E. Donegan, Department of Special Education, Vanderbilt University

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R324A150269 to Vanderbilt University. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

Correspondence should be addressed to Jeanne Wanzek, Department of Special Education, Vanderbilt University, 110 Magnolia Circle, Nashville, TN 37203.

Email: jeanne.wanzek@vanderbilt.edu

Abstract

This study examined and quantified the maintenance of reading comprehension effects from a fourth grade intervention for students with reading difficulties across the summer into the fall of fifth grade. Fourth grade students with reading comprehension difficulties were randomly assigned to a multi-component reading intervention (Passport) or to typical school services. Students in the treatment received daily intervention in small groups of 4-7 students across the fourth grade school year. Students (n = 269) were followed into their fifth grade year. Groups were equivalent at baseline and the treatment group significantly outperformed the comparison group at posttest. Students in the treatment continued to grow in reading comprehension over the summer at a rate of approximately 25% of the original growth, suggesting partially fleeting effects of the intervention. Treatment students maintained the higher levels of reading comprehension from the end of the fourth grade intervention to the beginning of fifth grade.

Retention of Reading Intervention Effects from Fourth to Fifth Grade for Students with Reading Difficulties

Response to intervention (RTI) models, and multi-tiered systems of support (MTSS) are designed to provide a structured, databased system for educators to deliver appropriate levels of instructional support for students through the grade levels. In these models, supplemental interventions are provided to students who do not make adequate progress with grade level, classroom instruction. A large body of research substantiates the value of supplemental, small group reading intervention of varying intensity levels across the elementary grades for students with reading difficulties (e.g., Gersten et al., 2008; O'Connor, Fulmer, Harty, & Bell, 2005; Vadasy & Sanders, 2009; Wanzek et al., 2017; Wanzek, Wexler, Vaughn, Cuillo, 2010). Gersten et al. (2008) noted the strong evidence for intensive, systematic instruction on foundational skills for students with reading difficulties in the early elementary grades. Research also supports small group, supplemental reading interventions provided in the upper elementary grades with positive effects for word recognition and comprehension interventions, and some of the highest effects noted for multicomponent interventions (Wanzek et al., 2010). The majority of the research on these interventions has highlighted accelerated learning for students with reading difficulties within a grade level as an important effect. Studies reporting long-term effects of reading interventions note decreased, but sustained effects on average (Suggate, 2014). Less studied, are the specific effects of these interventions from one grade level to the start of the next grade level when instruction often discontinues for the summer months.

Summer breaks can provide difficulties for the continuous implementation of RTI/MTSS models, wherein student response to an intervention provides the required information for future instructional decisions. Entwisle, Alexander, and Olson (2000) discuss a faucet theory that is

useful to RTI/MTSS model implementation. In this theory, the school year offers a resource faucet that is turned on with all children having access to the resources needed to make learning gains. In RTI/MTSS models, these resources include supplemental interventions and databased decision making regarding the intensity level of instruction a student requires for learning. However, when school is not in session, such as summer break, the resource faucet is turned off, and students with learning difficulties no longer have access to interventions delivered in school to allow them to continue making gains, or perhaps even maintain their current gains. Thus, instructional decisions for a student may look different from the end of fourth grade to the beginning of the fifth grade simply because the faucet was turned off for several months; a fact that is not explicitly part of RTI/MTSS model decision making. In this study, we sought to quantify the extent to which fourth grade students with reading difficulties retained their learning over the summer after participating in a successful supplemental reading intervention. That is, to what extent did fourth grade students with reading difficulties maintain, accelerate, or decelerate their learning advantage from fourth grade to fifth grade when intervention resources were not available.

Retention of Learning

Retention of learning requires not only memory of the information learned, but the ability to retrieve the information at appropriate times (Bennett & Rebello, 2012). As researchers and educators we seek instructional practices that will allow students to effectively learn new knowledge and skills, for example to read and understand text, as well as successfully retain that information for application and future learning, such as reading more complex text or reading to learn in a content area. McCoach and Kaniskan (2010) describe three possible retention scenarios following successful instruction. The first is a persistent effect, wherein the instruction

increases student learning and that increase persists over time. For example, consider a reading intervention that is found to accelerate typical student learning by a half a standard deviation. This intervention effect is persistent when these students are still a half a standard deviation ahead even months after the intervention was completed. Alternatively, the accelerated learning may have allowed students to continue to learn at greater rates and the persistent effect exists because they continue to grow in their reading skills at a similar or faster rate even after the intervention ended, demonstrating they are more than a half a standard deviation ahead months after the intervention. A second possible outcome is a fully fleeting effect of intervention. Students increased their learning in an intervention, but those accelerated effects disappeared over time. In this case, students are no longer ahead months after the intervention was completed because the initial accelerated learning completely dissipated. A third possibility is that the learning effects do not fully persist over time, but do not fully dissipate either; only some degree of the effects of instruction were fleeting. For example, 25% of the effects are lost over time but 75% of the effects persist. In our previous example, this would mean that, over time, students were no longer a half a standard deviation ahead in their learning but they were still a little more than a third of a standard deviation ahead in their learning, demonstrating the effect of the intervention has not completely disappeared but that there were some fleeting effects. McCoach and Kaniskan's retention framework provides us a way to quantify the retention of effects of a successful intervention over the summer break between grades.

Retention of learning from grade to grade (i.e. retention of learning over the summer break) for students with reading difficulties who receive supplemental reading interventions is a key, albeit under-researched, area of interest in RTI/MTSS model implementation. Understanding the amount of accelerated learning that can be retained into the next grade level after a successful

supplemental reading intervention can assist schools in selecting appropriate interventions to help students close the achievement gap over time rather than spending significant time regaining learning momentum. Undoubtedly, students who have reading difficulties can close the gap with grade level expectations efficiently if they: 1) participate in effective, research-based interventions that are designed to accelerate learning, 2) are able to accelerate learning to meet or close the gap with grade level expectations, and 3) can retain high amounts of that learning into the next grade level when the intervention resource faucet is turned on again.

On average, students do lose ground in academics over the summer. Average learning loss over the summer is approximately one month of learning, with some students experiencing more significant loss (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). Students from low-income backgrounds, in particular, tend to lose more ground in reading than their higher income peers (Alexander, Entwisle, & Olson, 2001; Benson & Borman, 2010). These effects seem to accumulate through the elementary grades with students from low-income backgrounds falling further and further behind their peers (Entwisle et al., 1997). Additionally, as grade level increases, so does summer learning loss (Hill, Bloom, Black, & Lipsey, 2007). However, in a summary of basic learning research, McCombs et al. (2011) noted that it is also the case that higher amounts of initial learning lead to longer retention, which is one reason researchers and educators seek interventions with the highest effects. We might expect that students with learning difficulties, who have lower levels of initial learning, may experience larger than average losses between grades. Yet, the retention effects of a successful reading intervention have not been quantified in the research for students with reading difficulties. We sought to examine the retention of intervention effects from one grade level for students with reading difficulties as they began the next grade level.

Passport Reading Intervention

We recently conducted a study examining a widely used, multi-component reading intervention for fourth grade students with reading difficulties (Wanzek et al., 2017). Previous research for students with reading difficulties in the upper elementary grades suggests the possible importance of addressing multiple reading components for these older students (O'Connor et al., 2002; Ritchey, Silverman, Montanaro, Speece, & Schatschneider, 2012; Therrien, Wickstrom, & Jones, 2006; Vadasy & Sanders, 2008; Wanzek & Roberts, 2012; Wanzek et al., 2010). The Passport intervention (Voyager Sopris Learning, 2008) applies principles of behavioral learning theory and cognitive psychology (Flavell, 1992; Palincsar & Brown, 1984), providing explicit instruction and strategies for reasoning in the foundational components of reading (e.g., decoding, word reading) as well as reading comprehension and vocabulary. The first 6 weeks of the instruction emphasized the foundational components with application to text reading and reading for understanding, while the rest of the intervention provided brief instruction in foundational skills and emphasized text reading and reading comprehension practices. The lessons built in a systematic process and provided explicit instruction in new reading practices with modeling and scaffolded instruction to assist students in gaining mastery.

We examined 451 students scoring at or below the 30th percentile in reading comprehension who were randomly assigned to the multi-component reading intervention (Passport) or to comparison (typical school services). Students in the treatment group received the Passport intervention for 30 min daily in small groups of 4-7 students across the school year. At the end of the school year, students in the treatment performed similarly to students in the comparison group in word reading and vocabulary, but significantly outperformed students in the comparison

group on reading comprehension (ES = 0.38; Wanzek et al., 2017). Thus, on average, students with reading difficulties receiving the Passport intervention ended the school year with higher levels of reading comprehension than students with reading difficulties receiving typical school services.

Purpose

We were interested in the retention of these accelerated reading comprehension effects resulting from fourth grade intervention into the following grade level, fifth grade. We sought to extend the existing literature in two ways: (1) examine the retention of accelerated learning from a school year intervention during the summer months (retention of intervention effects from the end of one grade to the beginning of the next when intervention resources are turned off) specifically for students with reading difficulties who had completed a successful intervention, and (2) quantify the retention of these intervention effects into the next grade level using the McCoach and Kaniskan's framework. Specifically, we addressed the following research question: How much of the initial treatment effect on reading comprehension for fourth grade Passport intervention remains at the start of fifth grade? We hypothesized a partially fleeting effect on average for these students with reading difficulties, as they did not receive summer intervention between their fourth and fifth grade year.

Method

Participants

Our sample comprises 269 students (125 treatment and 144 comparison) who qualified for intervention in fourth grade (mean age = 9.57 years; SD = 0.70 years) based on a reading comprehension score at or below the 30th percentile on the Gates-MacGinitie Reading Test (GMRT; MacGinitie, MacGinitie, Maria, Dreyer, & Hughes, 2006) and also participated in the

follow-up testing in the fall of fifth grade. Students in the follow-up sample came from 11 public elementary schools located in four school districts at sites in the southeastern and southwestern United States. Fifty-one percent of students were male, 20% were identified as having limited English proficiency, 50% were identified as low income, and 12% were identified as having a disability. Fifty two percent of students identified their ethnicity as Hispanic. The sample was also racially diverse with 42% White, 32%, Black, 21% American Indian, 1% Asian, and 4% multiracial.

Data Collection Procedures and Measures

The students were tested on the reading comprehension measure in the fall of fourth grade prior to intervention, in the spring of their fourth-grade year after intervention completion, and once more in the fall of their fifth-grade year after a 10 week summer break. All testing was completed by test administrators trained by the research team. Test administrators were blind to study conditions.

The reading comprehension subtest of the Gates MacGinitie Reading Tests (MacGinitie et al., 2006) is a group-administered, norm-referenced test. Students independently read brief passages and answer a series of multiple-choice questions about each reading. The questions cover facts, inferences, and drawing conclusions. Students have 35 min to complete the test. The test-retest reliability for fourth grade students is above .85. Internal consistency is .96. Construct validity estimates for the Gates range from .79-.81 with the earlier addition of the test, the Preliminary Scholastic Assessment (PSAT), the Scholastic Assessment Tests (SAT), and the American College Testing Program (ACT).

Intervention Procedures

The intervention is fully described in the efficacy study (Wanzek et al., 2017). We provide a summary of the procedures and components here for reference to the current study. Students with reading comprehension difficulties in the fall of first fourth grade were randomly assigned to receive the Passport intervention (treatment) or to receive typical school services (comparison). The students assigned to the treatment condition received the Passport intervention for 30 min daily in groups of 4-7 students throughout the fourth grade school year, typically during the school's designated intervention time. Students received a mean of 92 sessions (mean of 2,760 min) over the course of the school year.

Passport is a multicomponent reading intervention that includes instruction in phonics and word recognition, vocabulary, comprehension, and fluency. Lessons are grouped in 10-day units with overarching themes (e.g. Faraway Places). Each lesson of Passport is divided into two major components: Word Works and Read to Understand. Instruction during Word Works focuses on phonics and word recognition and word reading fluency. During Word Works, teachers lead students in word study on letter sound correspondence and common letter patterns, affixes, and common syllable types. This portion of the lesson includes instruction and practice in reading and spelling decodable words, irregular words, and using syllabication and affixes to read multi-syllabic words. The second portion of the lesson, Read to Understand, focuses on instruction in vocabulary, comprehension, and includes some fluency practice with connected text. This portion of the lesson includes a selected text that alternates between fiction and nonfiction throughout the lessons. Students are taught how to preview text and make predictions. Instruction also includes modeling and practice with comprehension strategies such as main idea, making inferences, drawing conclusions, summarizing, and comprehension monitoring. During the first six weeks of instruction, each lesson consists of 20 min of Word

Works followed by 10 min of Read to Understand. After the first six weeks of instruction, the focus of the lesson shifts and Word Works is reduced to 5 min with 25 min devoted to Read to Understand.

Training and Fidelity of Implementation. Ten trained intervention tutors who were members of the research team administered the intervention. All tutors had bachelors' degrees, 2 tutors also had master's degree, and 1 tutor was in the process of obtaining a doctorate degree. Five of the tutors were certified teachers. All tutors were female. Three tutors identified their ethnicity as Hispanic. Six tutors were White, 3 were Black, and 1 declined to identify her race.

All tutors were trained in the implementation of the intervention by project coordinators before intervention sessions began. Training was completed in 8 hr, over 2 days and included instruction in the goals of the program, instructional routine, and practice implementing various components. In addition to the initial training, project coordinators completed two coaching visits each month with each tutor and held monthly meetings to review implementation of intervention components and provide continued support.

Implementation fidelity data for the treatment were collected once per month for each intervention tutor. Observers rated each lesson component for fidelity of implementation, quality of implementation, and student engagement. Implementation was rated on a 0 to 3-point scale with 0 indicating the component was not implemented and 3 indicating all or nearly all of the required elements were implemented. Engagement and instructional quality were also rated from 1 (*weak engagement or quality*) to 3 (*excellent engagement or quality*). Instructional quality indicators included ongoing monitoring, redirection of off-task behavior, positive and corrective feedback, organization of materials, and appropriate selection of additional items for practice when needed. All observers established 90% or higher levels of agreement with the first

author before completing observations. Implementation of the intervention was consistently high. Mean implementation ratings of the intervention components ranged from 2.82 to 3.00 for each intervention tutor. Mean quality ratings ranged from 2.76 to 2.97 for each tutor. Mean student engagement ranged from 2.82 to 2.95 for each intervention tutor. Implementation further verified that instruction focused on developing students' reading comprehension and vocabulary (62% of intervention time).

Typical School Services. All students participated in Tier I, core classroom reading instruction as required. This instruction was largely focused on reading comprehension and vocabulary development (46% of time) and largely provided in a whole class grouping (60% of time). As part of school-delivered RTI services, a total of 103 students (51 in treatment and 52 in comparison group) received supplemental reading instruction provided by their school in addition to their core reading instruction at some point during the school year. This instruction also focused on reading comprehension and vocabulary (45% of the time). Instructors reported intervention sessions to be 5 to 30 min in length for 14% of students, 31 to 50 min for 57% of students and more than 50 min for 29% of students. The supplemental intervention was delivered by the classroom teacher 8% of the time, other certified teachers 44% of the time, paraprofessionals or volunteers 37% of the time, speech-language pathologists or speech therapists 9% of the time, or via video technology 2% of the time.

Data Analysis

Where the previous study reported significant effects of Passport treatment stemming from latent constructs of reading comprehension (Wanzek et al., 2017), the study was focused on simple pretest-posttest collection efforts. As the current study was focused on the extent to which the effects of the intervention were maintained into the next grade level following

cessation of intervention implementation, we used a series of multilevel growth models to identify the rate of change and whether change was discontinuous between the treatment and comparison groups. Whereas many studies of follow-up effects simply focus on between-group analyses testing the efficacy of the intervention at the individual follow-up occasion, we opted to use piecewise growth models and treat the effect of the intervention as a time-varying covariate (McCoach & Kaniskan, 2010). When modeling data from a two-group, two-wave efficacy design, a categorical variable is typically created that represents the grouping of students as participating in the intervention group (i.e., coded as "1") or the comparison group (i.e., coded as "0)". This coding scheme is invariant over time meaning that the comparison group is always coded as 0, 0 for the pretest and posttest and the intervention group is always coded as 1, 1 for the pretest and posttest. By coding the grouping variable as a time-varying covariate (TVC) in a growth model, it is possible to test how the treatment effect changes from pretest to posttest and posttest to follow-up. It is important to note that in a growth model that treats group as a TVC, there are, minimally, two covariates in the growth model: 1) the effect of time (e.g., 0, 1, and 2 for three wave design), and 2) the TVC effect of group.

One example of a plausible coding design of the grouping variable as a TVC is when testing for persistent treatment effects (PTE). The PTE model supposes that the effect from pretest to posttest is fully maintained from posttest to follow-up; participants in the comparison group would be coded as 0, 0, 0 for all three time points because at no time was there treatment for those students. Individuals in the treatment condition would be coded as 0 at the pretest as no intervention was provided then, 1 at the posttest to denote the change from pretest to posttest, and 1 at follow-up to denote that the effect observed from pretest to posttest was fully maintained. An alternative coding design for the grouping variable as a TVC is for

circumstances where researchers hypothesize a diminishing treatment effect (DTE) from posttest to the follow-up assessment. As in the PTE model, the comparison group is coded as 0, 0, 0 for all three waves and the intervention group is coded as 0, 1, 0 to reflect that the observed effect from pretest to posttest fully diminished to baseline at the third time-point. A special case of the DTE is that one may hypothesize that the treatment effect diminishes but not fully to baseline. For example, the observed data patterns might suggest that the effect diminishes by 50% in which case the intervention group would be coded as 0, 1, .5. Another observed data pattern might suggest that the treatment effect diminishes by 75% resulting in a coding of 0, 1, .25 for the intervention group. These examples serve to highlight that treating the coding of the grouping variable for the intervention group is flexible to allow for an empirical test of how the effect should best be modeled.

Five separate, multilevel growth models of students nested within classrooms and schools were tested to determine the functional form of growth and the extent to which treatment effects persisted. Model 1 included only time as covariate (coded as 0, 1, 2 for pretest, posttest, and follow-up) but treated the random effects of intercept and slope as fixed across all nesting units. Model 2 included random effects for the intercepts across all levels and fixed slopes; Model 3 included random intercepts and slopes across levels. The best fitting growth model among these three comparisons was selected by comparing the AIC and sample adjusted BIC indexes (nBIC), Models 4 and 5 then separately added a TVC testing for a persistent treatment effect (i.e., Model 4) or a diminishing treatment effect (Model 5). The AIC and nBIC were used for choosing the final growth model between Models 4 and 5. Although the nature of the data was such that students were longitudinally cross-classified, classroom and school information was not

collected at the follow-up period, thus the original nesting during the intervention study was used to account for non-independence of observations.

Results

Descriptive Statistics

A review of data completeness revealed that no missing data were observed at either the pretest or the follow-up and 2% of the data were missing from the posttest. Little's test of data missing completely at random (MCAR) was not statistically significant, $\chi^2(2) = 0.09$, $p > .500$, indicating that the data met MCAR criteria. Full information maximum likelihood was used to account for the missing data in the growth models. Descriptive statistics for the sample are reported in Table 1 and demonstrated that the groups were approximately equivalent in their pretest score (Passport M = 437.37, SD = 21.05; Comparison M = 440.06, SD = 18.15; Hedges' g = -0.14). Consistent with previously published findings, the treatment group significantly outperformed the comparison group at posttest, $F(2,263) = 16.02$; Hedges' g = 0.16, with the treatment group showing an approximate 20 point gain from pretest to posttest compared to an approximate 15 point gain for the comparison group. Moreover, at the fifth grade follow-up, the treatment group maintained a descriptive advantage in GMRT reading comprehension performance (M = 462.22, SD = 23.18) compared to the comparison group (M = 460.02, SD = 25.57) with each group growing approximately five additional scaled points over the summer, though this difference was not statistically significant.

Intervention Follow-up Effects

Table 2 provides the fit for the three baseline growth models: 1) the fixed intercept and fixed slope (Model 1); 2) random intercept and fixed growth (Model 2); and 3) random intercept and random slope (Model 3). Comparisons among these three baseline growth showed that

Model 2 fit better than Model 1 based on both the AIC (ΔAIC = 88.80) and the *n*BIC (Δ*n*BIC = 101.50). For context, a Δ*n*BIC of at least 5 is considered to be a practically important difference between models (Raftery, 1995). Moreover, Model 3 fit better than Model 2 on both indices (ΔAIC = 13.20; Δ*n*BIC =17.20); thus, the best fitting model was one that included random intercepts and slopes (i.e., Model 3; Table 2). The specific configuration of the random intercept and slopes model included random intercepts at the student and school levels along with random slopes at the classroom and school levels. Using this basic growth model, we then examined the persistent and fleeting effects models. Model 4 included the TVC for persistent treatment effects and Model 5 included the TVC for a diminishing effect. In order to best optimize the coding for the TVC in Model 5, the proportional mean score differences over time based on observed scores in the treatment group were evaluated. Table 1 shows that from posttest to follow-up, the treatment group changed an average of 5.01 points. Relative to their mean change from pretest to posttest (i.e., 19.84), the mean posttest to follow-up change was 25% of the original observed change (i.e., 5.01/19.84). As such, we coded the TVC in Model 5 as 0, 1, .25 to reflect a 75% diminished growth estimate. Both Models 4 and 5 fit better than Model 3 by values of at least 5, and comparisons between Models 4 and 5 in Table 2 pointed to the diminished treatment effects (DTE) model providing better fit to the data compared to the persistent treatment effects (PTE) model (ΔAIC = 4.10, Δ*n*BIC = 4.10) Figure 1 plots the observed scores as well as the predicted group estimates from the DTE model (Table 3) showing that where groups were equivalent at baseline on the predicted scores and the treatment group outperformed the comparison group at the posttest on the predicted scores, the treatment group did not maintain growth at their initial change level, preventing the treatment group from further outperforming the comparison group at the follow-up assessment. The estimated treatment effect at the follow-up assessment was *g* =

0.14, and compared to the post-test treatment effect of $g = 0.16$, reflects the fact even where the growth trajectory from post-test to follow-up was fleeting, or deviating from an expected growth trajectory, the standardized difference between the groups was largely maintained from the post-test (0.16) to follow-up (0.14).

Discussion

The purpose of this study was to examine and quantify the retention of reading comprehension effects of a fourth grade reading intervention across the summer break into the fifth grade year. We found that, on average, the reading comprehension effects of the intervention were partially fleeting. On average, students in the treatment continued to grow at a rate of approximately 25% of the original change they made during the fourth grade intervention. The students in the comparison group made similar gains to the treatment group over the summer. Notably, if the intervention had a persistent effect, we would have observed students in the treatment continuing to grow at a faster rate over the summer relative to the comparison group. We had hypothesized a partially fleeting effect of the intervention due to the lack of instruction or intervention between the grades when the intervention resource faucet was turned off. As with many schools in the United States, there was no summer school available to the students in this study sample. Thus, based on previous research related to summer learning loss, the fleeting effect is to be expected, and the finding that the effect was partially fleeting (25% of the original growth trajectory continued over the summer) is positive. Similarly, the fact that the comparison students also did not experience summer learning loss, but continued to grow is also positive.

Relative to the comparison group, students still gained an advantage in reading comprehension from the Passport intervention overall. Although there was a partially fleeting

effect of the intervention over the summer (25% of the original growth trajectory), our study adds to the research base on RTI/MTSS by demonstrating that the students in the treatment group began fifth grade with the same advantage over the comparison group in reading comprehension that they had demonstrated at posttest. In other words, they maintained the accelerated reading comprehension growth from fourth grade (grew at the same rate as the comparison group over the summer), but did not continue to show accelerated growth over the comparison group in reading comprehension over the summer. The small group, supplemental, multi-component reading intervention increased student reading comprehension over and above typical school services and this effect was retained into the fifth grade year when the intervention resources faucet was turned back on for the students, allowing the treatment group to begin fifth grade at a higher reading comprehension level than they otherwise would have without the intervention. This is positive news for the treatment group's ability to close the gap with grade level expectations over time. These students could continue in the RTI/MTSS process without having lost ground they had gained from a previous intervention. It is also notable that students in this sample (treatment and comparison) did not experience summer learning loss in reading comprehension, particularly given the large percentage of students with low socioeconomic status (Alexander et al., 2001; Benson & Borman, 2010) and the fact that no summer school programming was provided.

Fleeting effects of reading intervention, particularly over summer breaks, are an important conversation as we consider RTI/MTSS models. A student may be a responder to an intervention at the end of one grade level and arrive back at school for the next grade level demonstrating lower learning levels, requiring intervention simply to reach previous achievements. The lack of summer programming for the current sample of students no doubt

contributed to the partially fleeting effects of the intervention. In fact, when no summer programming is available, as was the case with the current sample, it is reasonable to expect a fully fleeting effect (no further growth during that time period). The fact that these students with reading difficulties experienced only a partially fleeting effect, 25% of their original growth, in their accelerated learning despite the summer break is a positive finding. Of course, the most efficient learning for students with learning difficulties would occur with an intervention that not only accelerates student learning, but also demonstrates high levels of persistent effects when the intervention is completed. The question is whether these interventions exist, particularly between grades when the intervention resources are turned off for several months and students experience a break without continued instruction. A variety of home and school summer programs intended to keep that instructional faucet running have shown positive effects in reading (Kim & Quinn, 2013). As a field we may need to consider the potential role of summer interventions within RTI/MTSS models in order to serve students with reading difficulties more effectively and efficiently.

Overall, the Passport intervention allowed students with reading difficulties to accelerate their reading comprehension and retain that learning into the next grade level. As a result, this group of students can begin fifth grade instruction and intervention with levels of reading comprehension that are similar to where they ended fourth grade, allowing for efficient learning in fifth grade interventions to further close the gap with grade level expectations. The students in the comparison group were also able to maintain their reading comprehension levels from fourth grade, albeit at a lower level than students in the treatment group.

Limitations

The students in this sample did have a few weeks of school prior to their fifth grade testing which may have improved some of their learning from the summer (Hill et al., 2007). Testing in the first week of school may have shown effects that were even more fleeting. However, the treatment and comparison students were tested during the same weeks of school so they had equal opportunity to any instruction. In addition, schools were still doing their own testing and no supplemental interventions had yet begun. Future research could assist in determining whether students gain back any fleeting effects of intervention from the summer and how long it takes to gain these effects back after they resume instruction.

We examined retention and fleeting effects for one specific intervention. The findings are specific to the Passport intervention, but do provide the field with a comparison as the summer effects of other reading interventions are quantified. We also did not collect information about students' independent summer reading, number of books, magazines, or e-books or computer/technology-based reading programs available in the home, or whether students accessed public libraries. We argue that educators need information on effective and efficient reading interventions that will allow students to accelerate their learning during the intervention and retain that learning, if not continue to grow, particularly across grades that often includes a significant break without instruction.

References

Alexander, K. L., Entwisle, D. R., & Olson, L.S. (2001). Schools, Achievement, and Inequality: A Seasonal Perspective, *Educational Evaluation and Policy Analysis, 23*, 171–191.

Bennett, A. G. & Rebello, N. S. (2012). Retention and learning. In N. M. Seel (Ed.), *Encyclopedia of the Sciences of Learning* (pp. 2856-2859). New York, NY: Springer.

Benson, J., & Borman, G. D. (2010). Family, neighborhood, and school settings across seasons: When do socioeconomic context and racial composition matter for the reading achievement growth of young children?, *Teacher's College Record, 112*, 1338–1390.

Cooper, H., Nye, B., Charlton, K., Lindsay, J., & Greathouse, S. (1996). The effects of summer vacation on achievement test scores: A narrative and meta-analytic review, *Review of Educational Research*, *66*, 227–268.

Entwisle, D. R., Alexander, K. L., & Olson, L. S. (1997). *Children, schools, and inequality.* Boulder, CO: Westview.

Entwisle, D. R., Alexander, K. L., & Olson. L. S. (2000). Summer learning and home environment. In R. D. Kahlenberg (Ed.), *A notion at risk: Preserving public education as an engine for social mobility* (pp. 9–30). New York: Century Foundation Press.

Flavell, J. H. (1992). Cognitive development: Past, present, and future. *Developmental psychology, 28,* 998-1005. doi:10.1037/0012-1649.28.6.998

Gersten, R., Compton, D., Connor, C. M., Dimino, J., Santoro, L., Linan-Thompson, S., & Tilly, W. D. (2008). *Assisting students struggling with reading: Response to Intervention and multi-tier intervention for reading in the primary grades. A practice guide.* (NCEE 2009-4045). Washington, DC: National Center for Education Evaluation and Regional

Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/publications/practiceguides/.

Hill, C. J., Bloom, H. S., Black, A. R., & Lipsey, M. W. (2007). *Empirical benchmarks for interpreting effect sizes in research*, New York: MDRC.

Kim, J. S., & Quinn, D. M. (2013). The effects of summer reading on low-income children's literacy achievement from kindergarten to grade 8: A meta-analysis of classroom and home interventions. Review of Educational Research, 83, 386-431.

MacGinitie, W. H., MacGinitie, R. K., Maria, K., Dreyer, L. G., & Hughes, K. E. (2006). *Gates-MacGinitie Reading Tests* (4th ed.). Rolling Meadows, IL: Riverside Publishing.

McCoach, D. B., & Kaniskan, B. (2010). Using time-varying covariates in multilevel growth models. *Frontiers in Psychology, 1(17)*, 1-12. doi: 10.3389/fpsyg.2010.00017

McCombs, J. S., Augustine, C. H., Schwartz, H. L., Bodilly, S. J., Mcinnis, B. Lichet, D. S., & Cross, A. B. (2011). *Making summer count: How summer programs can boost children's learning*. Santa Monica, CA: Rand Corporation.

O'Connor, R. E., Bell, K. M., Harty, K. R., Larkin, L. K., Sackor, S. M., & Zigmond, N. (2002). Teaching reading to poor readers in the intermediate grades: A comparison of text difficulty. *Journal of Educational Psychology, 94*, 474-485. doi:10.1037/0022-0663.94.3.474

O'Connor R. E., Fulmer D., Harty, K. R., & Bell, K. M. (2005). Layers of reading intervention in kindergarten through third grade. *Journal of Learning Disabilities*, *38*, 440-455.

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1*, 117-175. doi: 10.1207/s1532690xci0102_1

Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological methodology*, 111-163.

Ritchey, K. D., Silverman, R. D., Montanaro, E. A., Speece, D. L., & Schatschneider, C. (2012). Effects of a tier 2 supplemental reading intervention for at-risk fourth-grade students. *Exceptional Children, 78*, 318-334. doi: 10.1177/001440291207800304

Suggate, S. P. (2014) A meta-analysis of the long-term effects of phonemic awareness, phonics, fluency, and reading comprehension interventions. *Journal of Learning Disablities, 49*, 77-96. doi: 10.1177/0022219414528540.

Therrien, W. J., Wickstrom, K., & Jones, K. (2006). Effect of a combined repeated reading and question generation intervention on reading achievement. *Learning Disabilities Research & Practice, 21*, 89-97. doi:10.1111/j.1540-5826.2006.00209.x

Vadasy, P. F., & Sanders, E. A. (2008). Repeated reading intervention: Outcomes and interactions with readers' skills and classroom instruction. *Journal of Educational Psychology, 100*, 272-290. doi: 10.1037/0022-0663.100.2.272

Vadasy, P. F., & Sanders, E. A. (2009). Supplemental fluency intervention and determinants of reading outcomes. Scientific Studies of Reading, 13,383-425. doi: 0.1080/10888430903162894

Voyager Sopris Learning (2008). *Passport*. Dallas, TX.

Wanzek, J., & Roberts, G. (2012). Reading interventions with varying instructional emphases for fourth graders with reading difficulties. *Learning Disability Quarterly, 35*(2), 90-101.

Wanzek, J., Petscher, Y., Al Otaiba, S., Rivas, B. K., Jones, F. G., Kent, S. C., Schatschneider, C., & Mehta, P. (2017*).* Effects of a year long supplemental reading intervention for

students with reading difficulties in fourth grade. *Journal of Educational Psychology*, 109, 1103-1119.

Wanzek, J., Vaughn, S., Scammacca, N., Gatlin, B., Walker, M. A., & Capin, P. (2016). Meta-analyses of the effects of tier 2 type reading interventions in grades K-3. *Educational Psychology Review, 28*, 551-576.

Wanzek, J., Wexler, J., Vaughn, S., & Ciullo, S. (2010). Reading interventions for struggling readers in the upper elementary grades: A synthesis of 20 years of research. *Reading and Writing: An Interdisciplinary Journal, 23,* 889-912.

Table 1

Descriptive statistics for Passport and Comparison group by assessment wave

			GMRT Reading Comp.		
Condition	Time point	N	Mean	SD	Mean Difference
Passport	Pretest	125	437.37	21.05	
	Posttest	124	457.21	24.99	19.84
	Follow-Up	125	462.22	23.18	5.01
Comparison	Pretest	144	440.06	18.15	
	Posttest	140	454.73	23.75	14.67
	Follow-up	144	460.02	25.57	5.29

Note. GMRT = Gates MacGinitie Reading Test.

Table 2

Fit index comparison for growth models

Model	AIC	*n*BIC	Deviance
1. Fixed Intercept & Growth	7305.4	7310.1	7303.4
2. Random Intercept/Fixed Growth	7216.6	7208.6	7208.6
3. Random Intercept & Growth	7203.4	7191.4	7191.4
4. Persistent Effect (PTE)	7191.2	7179.2	7179.2
5. Diminishing Effect - 75% (DTE)	7187.1	7175.1	7175.1

Note. AIC = Akaike Information Criteria, *n*BIC = sample-adjusted Bayes Information Criteria

Table 3

Fixed and random effects from Fleeting – 75% treatment effects model

Fixed Effects	Estimate	SE	df	*t*-value	*p*-value
Intercept	439.72	1.37	799	321.4	<.001
Time	10.88	0.94	799	11.56	<.001
Flee75	7.55	2.08	799	3.62	<.001

Random Effect	Estimate	SE	*z*-value	*p*-value
Student Intercept	81.49	33.17	2.46	0.007
Student Slope	0			
Teacher Intercept	0			
Teacher Slope	5.54	9.42	0.59	0.278
School Intercept	8.62	5.15	1.67	0.095
School Slope	2.94	4.56	0.65	0.259
Residual	337.08	20.97	16.08	<.001

Note. The G-matrix for the students slope and teacher intercept random effects was a non-positive definite resulting in a near-0/0 estimate.

SE = Standard Error. Df = degrees of freedom. Flee75 = Fleeting at 75% .

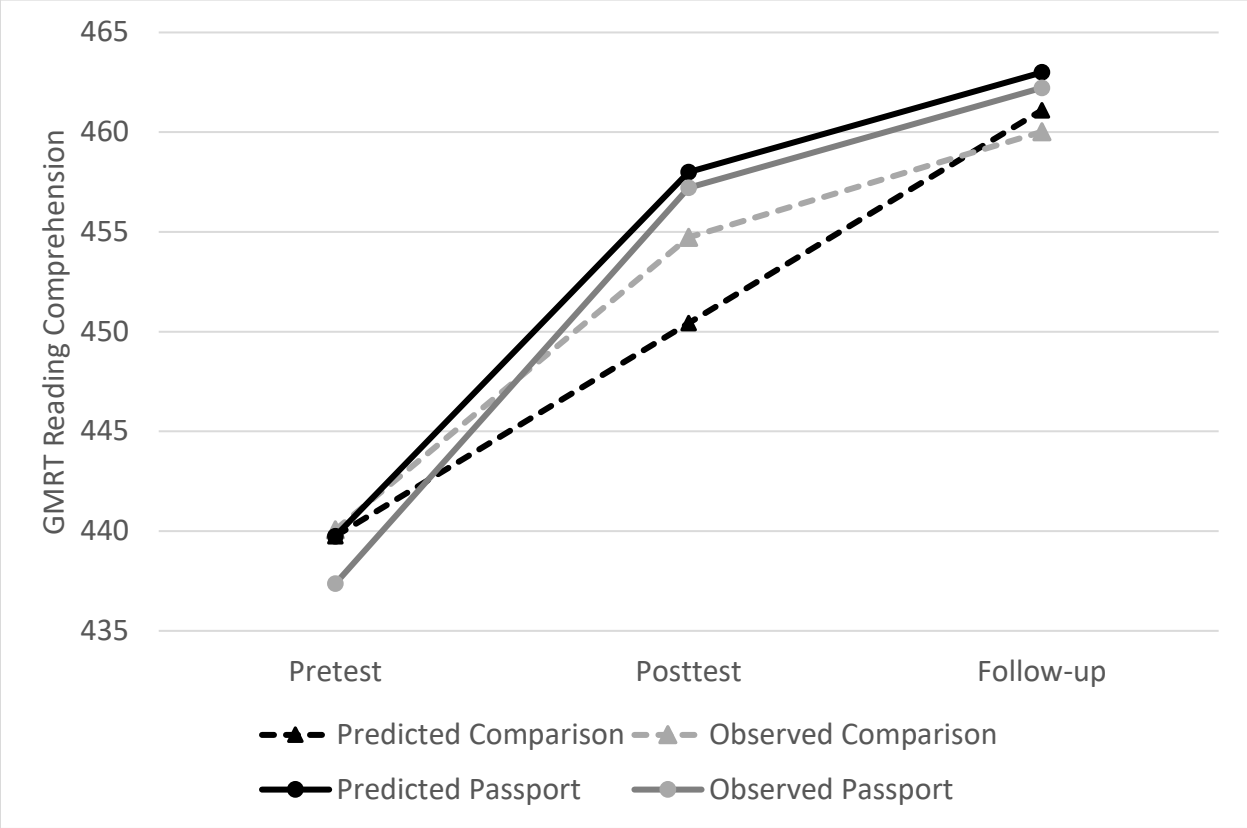

Figure 1. Comparison of observed and predicted means by each time-point for Passport and Comparison groups.