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Primary prevention of reading failure: Effect of universal peer tutoring in the early grades

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ABSTRACT

Reading is typically considered a survival skill in our technology- and literacy-bound culture. Individuals who struggle with learning to read are at significantly elevated risk for a number of negative outcomes, including school failure, under- and unemployment, and special education placement. Thus, those who do not learn to read fluently will likely be a greater drain on society's resources. The authors examined the effects of a universal (school district-wide) implementation of a well-validated peer-tutoring reading intervention as a system-wide prevention measure in kindergarten through Grade 3 in a small metropolitan area in Canada. Results suggest that nearly all children demonstrated improved reading fluency over time. Yet those at highest-risk for poor outcomes, including those living in poverty and those who face learning challenges due to English as a second-language status or special education enrollment, did not make parallel gains to same-age peers in more affluent schools. Implications for educational policy are discussed.

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Reading instruction is a central goal in most educational settings and active programming to prevent reading failure is nearly universal. One well-regarded reading intervention is Peer-Assisted Learning Strategies (PALS), a classroom prevention/intervention technique initially developed for elementary school students. PALS is a highly structured peer tutoring–based reading intervention program that flexibly pairs higher and lower functioning peers for decoding, fluency, and comprehension activities. PALS is one of very few programs to receive Best Practice status from the U.S. Department of Education Program Effectiveness Panel (McMaster, Fuchs, & Fuchs, 2006) but there are few studies documenting its effectiveness in Canadian schools. The majority of the research with PALS has been conducted in the Southeastern United States, largely with teachers who were directly or indirectly involved in the development and/or refinements of the program originally. To our knowledge, this study represents one of two studies of the implementation of PALS in Canada. Although there are a number of similarities between American and Canadian educational environments, it cannot be assumed that all American programs will be similarly effective when implemented in Canada. The other study documenting the implementation of PALS in Canada (Mattatall, 2011) is an as-of-yet unpublished dissertation completed at Queen's University. The results from that study suggest that first-grade children in a single Ontario school board ($n = 436$) learned to read at a greater rate after the implementation of PALS than before. Furthermore, the best predictor of reading development was not the demographic factors that have often been used as risk indicators, but rather that poor letter-sound fluency and word identification fluency at the beginning of the year predicted slower, less proficient reading acquisition.

Initially developed in collaboration with in-service teachers as a prereferral intervention strategy (D. Fuchs & Fuchs, 1998), PALS allows for the engaged participation of learners at diverse levels of reading achievement in the intervention. Because it is highly manualized, teachers can reliably implement the program without significant time invested in preparing materials or activities. Results from previous efficacy studies suggest that the majority (i.e., 80%) of children show gains from PALS with those children who do not make adequate progress over time are typically among the ranks of the lowest performers prior to PALS (McMaster et al., 2006). Yet, extant research suggests that all levels of readers are positively affected by participation in the PALS program in Grade 1 (Mathes, Howard, Allen, & Fuchs, 1998). Improvements have been noted in reading fluency, accuracy, and comprehension (D. Fuchs, Fuchs, & Burish, 2000). Gains have also been noted in social skills and self-confidence for lower performing students (D. Fuchs, Fuchs, Mathes, & Simmons, 1997). These secondary gains are particularly important, as highlighted in research suggesting effective intervention for academic problems needs to include remediation of noncognitive skills, such as prosocial behaviors (Rothstein, 2004). Although highly effective and well developed, the PALS intervention is both time- and resource-intensive to implement, often with significant changes over more whole-language focused curricula such as that which is endorsed by Ontario's Ministry of Education. Review of the

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Ontario curricula suggests it prescribes limited emphasis on phonetically based decoding strategies with significant time devoted to more global language acquisition strategies, such as metacognition, inference making, and critical thinking, beginning in the early elementary grades (http://www.edu.gov.on.ca/eng/teachers/curriculum.html). Thus, the Ontario language curriculum for the early grades is heavily focused on oral language development and the ability to gather information, but has been criticized for its lack of emphasis of direct instruction on phonetics and decoding strategies.

The PALS intervention was developed to combine systematic phonics instruction and more contextualized reading experiences (Mathes, Howard, Allen, & Fuchs, 1998). According to the developers (Fuchs, Fuchs, Mathes, & Simmons, 1997), the intention of PALS was to integrate phonetic knowledge with reading fluency and comprehension in the context of classroom-based peer tutoring. The partnering of students was designed to help students take greater responsibility for their learning while the teacher provides support as needed to the pairs. Pairs and assigned roles are flexible but there is always a coach and a reader. Each pair uses the PALS tutoring materials and procedures that are taught by the teacher. The class is divided into two teams with pairs earning points for their team through their cooperative behavior and tutoring activities. Younger children (kindergarten and Grade 1) and struggling readers focus on basic decoding and reading fluency, whereas older, more advanced readers work on higher order reading skills, such as comprehension and making inferences. For example, beginning readers practice the sounds the letters make, recognizing sight words, decoding phonetically regular words, and reading fluency. More advanced readers continue to acquire sight words, decode longer or more advanced words, and also work on reading comprehension by making and checking predictions. The PALS program also includes a regular assessment component beyond the actual intervention activities, called curriculum-based measurement (CBM). These regular assessments by an adult provide the teacher with information necessary to form coaching pairs and provide feedback about each student's improvement over time. These scores were also intended to allow teachers to monitor student progress and make instructional changes as needed. CBM assessments are in four domains (letter-sound fluency, word identification fluency, passage reading fluency, and maze fluency) but domains are only administered as developmentally appropriate. The PALS pairs are also re-arranged over time following ongoing assessments with CBM. PALS and CBM procedures have been well described in a number of studies (D. Fuchs & Fuchs, 1998; D. Fuchs et al., 2000; Fuchs, Fuchs, Mathes, & Simmons, 1997; Mathes et al., 1998).

The goal with the present study was to document Grade 3 students' progress through the PALS program. Furthermore, we were interested in the implementation process and the efficacy of the intervention. We also split a subsample into schools with excellent implementation, typical implementation, and significant challenges to implementation to examine differences in progress with PALS. Last, we compared PALS progress with end-of-the-year provincial reading testing results.

Method

PALS implementation

When PALS was originally developed and implemented in the mid-1990s, researchers at Vanderbilt University and cooperating teachers in the surrounding school boards partnered to develop the interventions. Although several members of the research team had been classroom teachers in the past, they relied on the classroom teachers to tell them if the interventions were acceptable and if they were effective from the teachers' perspectives. Adjustments were made in the program over time, reflecting both data-driven results and teacher experiences. The PALS program has been well validated by research as previously described.

With regard to the present study, a school board decided in 2007 to implement PALS. A consultant from the Vanderbilt research group was hired to provide training and ongoing consultation for the implementation team. The pilot stage involved eight schools (four PALS schools and four control schools) and began in 2007. Early CBM results were encouraging and full-scale implementation began in 2008. As a result of limitations within negotiated teacher contracts, it was decided that learning support specialists (special education teachers) would provide the PALS instruction to all students during teacher planning periods. These specialists also conducted the CBM assessments. As of 2010, students as young as junior kindergarten (4 years old by December of the academic year) and through Grade 3 are receiving the PALS program on a daily basis. Additionally, the program is also being used in small group withdrawal support special education programs. PALS was used for reading instruction but students also received more comprehensive language instruction beyond PALS from their classroom teachers, particularly in the areas of oral language communication, written communication, and metacognitive strategies.

With this implementation, PALS instructors used data from the CBM assessments and from provincially mandated assessments (PM benchmarks) to form the pairs, taking into account interpersonal factors within each classroom. The pairing generally rank ordered the class and then divided it in half to form pairs starting at the top of the list. For example, in a class with 20 students, student ranked ordered one would be paired with student rank ordered eleven and so on. The more advanced student was the coach each tutoring session and the pairs were flexibly arranged following each CBM assessment. The tutoring portion of the program involved phonics-focused materials (Mathes et al., 1998) with developmentally sequenced decoding sounds/words, sight words practice, and oral reading practice at every session. Once students had progressed to the point of more contextual reading practice, teachers provided graded reading materials purchased from a commercial book publisher that were designed to supplement classroom reading materials. These materials were designed to be within the reading range of the lower reader but still somewhat challenging. With these books, coaches asked their partners to make predictions about what they were about to read aloud and then helped their partners check their predictions.

Participants

The participants in this study were third-grade students across an entire school board in Southwestern Ontario in 2011–2012. Third-grade students were chosen because all third-grade students complete their first province-wide achievement testing, including reading, at the end of the academic year. Participants included 1,429 students across 38 elementary schools. Specific demographic information for individual students was not available, but the elementary school population in general for this school board represents a racially diverse population. The school populations were roughly evenly split between male and female students. Neighborhoods in school zones vary from impoverished to affluent with most families at approximately middle class socio-economic status.

Measures

Curriculum-based measurement

All kindergarten through Grade 3 students within the school board began completing CBM eight times per year when PALS was fully implemented. These CBM assessments were originally developed as companion assessments for the PALS program and have well documented psychometric properties (L. S. Fuchs & Fuchs, 2002, 2004). The CBM assessments were intended to provide ongoing feedback to teachers that they may use to modifying their instruction for students. By Grade 3, students are completing passage reading fluency (PRF), which assesses the student's reading fluency (speed and accuracy) for grade-level text passages over a 1-min period. The score is calculated by subtracting the number of words omitted or read incorrectly from the total number of words attempted within the time limit.

Education Quality and Accountability Office assessments

The Education Quality and Accountability Office (EQAO) assessments are provincially mandated assessments that are first completed by students in Grade 3 (http://www.eqao.com/en/assessments/primary-division). According to information on the EQAO website, these assessments are linked to the academic curriculum in Ontario (http://www.eqao.com/en/assessments/primarydivision/parents/Pages/parents.aspx). In these assessments, students read short and longer texts with assessment of the explicit and implicit information provided in the texts. EQAO is group administered, and the questions are multiple-choice responses in Grade 3. The texts for the reading assessments were chosen to represent information from across the curriculum, including mathematics, the arts, health and science, and the social sciences. Scores used were those reported on a provincial website with the reported score reflecting the percentage of children for a given school at or above the mandated level of achievement.

Data preparation

Prior to conducting the main analyses, the data were assessed for patterns of missingness and missing CBM data was subsequently imputed using the expectation-maximization procedure in SPSS. The overall rate of missing data was approximately 20% across the full dataset. Those students who were missing more than 50% of their CBM scores were excluded from the analyses. CBM scores for individual students were combined to calculate mean CBM scores for schools at each assessment point. The school mean CBM scores were used to calculate slopes (representing the rate of change over time) for each school. These slopes were fairly normally distributed ($M = 1.14$; $SD = 0.18$; skewness = .046; kurtosis = –.636). The distribution is depicted in Figure 1.

Analyses

To answer the question of whether a school's implementation of PALS makes a difference in mean CBM rate of progress over time, the schools were categorized into three groups based on the challenges the schools faced in implementing the PALS project over two academic years (2010–2011 and 2011–2012). Using the expertise of the school board's lead psychologist who was been integrally involved in the PALS implementation, approximately seven schools per category reflecting the best examples of the categories were assigned. The exceptional implementation schools were defined as those schools with significant resources (financial and human) to devote to program implementation, few environmental stressors, such as low socioeconomic status in a large percentage of students, a relatively low rate of student transfers, and strong leadership for PALS implementation. The typical implementation schools were defined as those schools that are typical of schools in the region, without the significant extra resources or significant extra challenges that were more common in the other groups. The programming challenges schools were those schools that faced significant problems, including issues such as a significant percentage of students living in poverty, high rates of student transfers, and recent changes in school leadership. As a check on these groupings, we also examined the percentage of students who were English as a second language learners (ESL) and the percentage of students with special needs in each school. Although we did not detect a statistical difference between groups for percentage of students with special needs,

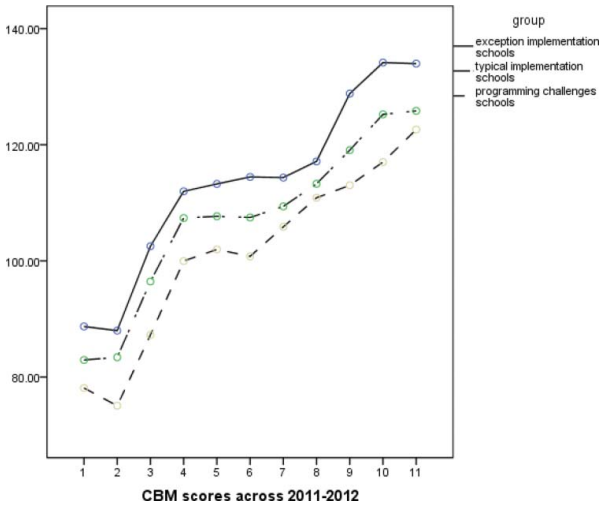

Figure 1. CBM scores for 2011–2012 school year by implementation group.

we noted a medium to large effect ($\eta^2 = .124$) for students with special needs. Although the cell sizes were too small to permit statistical testing for individual group differences, examining the means of the groups suggests that there were no real differences between the exceptional and typical groups (means of 11.0% and 11.2%, respectively), but the programming challenges group had a far greater percentage of their students with special needs (mean percentage of students receiving services = 17.9%). No differences across groups were noted for percentage of ESL students, reflecting the high level of diversity in the community and within the school board. Overall, these results offer modest support for the grouping strategy and Table 1 summarizes the main analyses.

The analyses were completed in three stages. For the first stage, the implementation groups were used to test whether an individual school's implementation predicted mean CBM rate of progress over time using a repeated measures analysis of variance (ANOVA). For the second set of analyses, we tested the mean CBM rates of change as a predictor of Grade 3 EQAO reading scores in 2011–2012 using correlations with post hoc analyses. For the third set of analyses, we examined the effect of PALS on EQAO reading scores starting in 2007–2008 and continuing until 2011–2012 with repeated measures ANOVA by implementation group.

Table 1. Mean CBM scores for all students and by implementation group.

	Group	*M*	SD	*n*
CBM1	1.00	88.7152	8.74270	7
	2.00	82.9471	13.41044	7
	3.00	78.1111	12.51397	7
	Total	83.2578	11.98296	21
CBM2	1.00	87.9928	8.69662	7
	2.00	83.4049	14.78589	7
	3.00	75.0584	12.55110	7
	Total	82.1520	12.86998	21
CBM3	1.00	102.5336	8.82729	7
	2.00	96.4531	14.34395	7
	3.00	87.2614	14.45226	7
	Total	95.4160	13.75292	21
CBM4	1.00	111.9831	9.15993	7
	2.00	107.3879	15.36996	7
	3.00	99.9727	14.47276	7
	Total	106.4479	13.58630	21
CBM5	1.00	113.2560	14.62036	7
	2.00	107.6785	17.62156	7
	3.00	101.9768	14.92986	7
	Total	107.6371	15.69767	21
CBM6	1.00	114.4633	6.01423	7
	2.00	107.4775	15.84273	7
	3.00	100.7769	16.64047	7
	Total	107.5725	14.21287	21
CBM7	1.00	114.3520	8.92513	7
	2.00	109.3876	14.30100	7
	3.00	105.8625	16.07268	7
	Total	109.8674	13.24709	21
CBM8	1.00	117.1312	10.66133	7
	2.00	113.2750	15.36238	7
	3.00	110.8772	15.81523	7
	Total	113.7612	13.67133	21
CBM9	1.00	128.8084	10.70447	7
	2.00	119.0785	14.63983	7
	3.00	113.0253	15.28438	7
	Total	120.3040	14.59927	21
CBM10	1.00	134.1478	10.66365	7
	2.00	125.2350	16.31650	7
	3.00	117.0130	14.65118	7
	Total	125.4652	15.15874	21
CBM11	1.00	133.9695	12.09756	7
	2.00	125.8357	13.66802	7
	3.00	122.6149	15.40264	7
	Total	127.4734	13.96754	21

Note. 1 = exceptional implementation schools; 2 = typical implementation schools; 3 = programming challenges schools.

Results

For the first set of analyses, we conducted a repeated-measures ANOVA with mean school rate of progress on CBMs as the within-subjects factor and the implementation group as the between subjects factor to address whether or not a school's PALS implementation pattern makes a difference in CBM progress over time. Although all three groups showed significant gains over time, the differences between the groups were not statistically significant, $F(2, 1427) = 1.55$, $p = .24$, but there was a medium-large effect size (partial $\eta^2 = .147$) for this analysis. Thus, all schools showed significant improvement in CBM scores over time. A plot for the three groups over time is depicted in Figure 1.

For the second set of analyses, we calculated the correlation between the slopes of the CBM score by school with each school's EQAO 2011-2012 score. This correlation was not significant ($r = -.05$, $p = .78$). As a post hoc test, we calculated the correlations of EQAO scores with first and last CBM probes. Both of these correlations were highly significant ($r = .67$, $p \leq .0001$ and $r = .59$, $p \leq .0001$, respectively). Additionally, we used multiple regression analysis to examine the predictive value in using first and last CBM probes to predict EQAO scores. Together, first and last CBM probes account for 40.9% of the variance (adjusted R^2) in EQAO scores.

For the third set of analyses, we used repeated measures ANOVA with implementation grouping as the between subjects variable. The within subjects variable was Grade 3 EQAO scores from 2007 to 2012. The result of this analysis were also not statistically significant ($p = .72$). Follow-up analyses revealed that although the groups were clearly separated on EQAO reading scores over time and scores were highly correlated in proximal years ($p < .01$), the correlations more distally in time were modest as best. Furthermore, as depicted in Figure 2, the EQAO scores did not show a general improvement over time for the full sample or within groups.

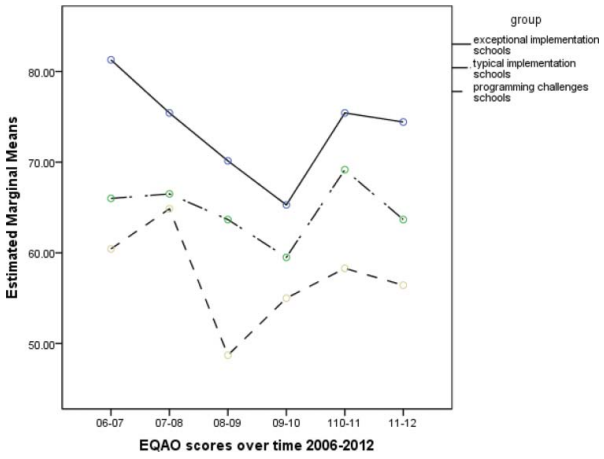

Figure 2. EQAO scores by implementation group across time.

Discussion

In this study, we analyzed data from a local school board to assess the effects of an empirically validated reading intervention on the Grade 3 provincially mandated reading achievement test scores. Results indicated that the reading fluency of students, a well-validated predictor of long-term reading success (Ritchey, Silverman, Schatschneider, & Speece, 2013), improves in the majority of students over time. Preliminary results suggest that all children experience gains over time but the group with the greatest challenges to implementation did not catch up with students in other schools. In other words, those who were at high risk for poor outcomes, including school failure and premature drop-out (Ring, Barefoot, Avrit, Brown, & Black, 2013), likely need additional support beyond the implementation of PALS.

Other studies have demonstrated that children living in poverty and with other challenges are less likely to receive significant early literacy exposure (Pigott & Israel, 2005). This predicts poorer response to early reading instruction, even when that instruction is intensive (Pigott & Israel, 2005). The data from our study suggest that these students continue to face challenges in the educational environment, including poorer reading achievement scores in the middle elementary school years. It may also be that children living in poverty, especially those with less exposure to literary-rich environments that are more common in affluent settings, may benefit more from a more phonetically driven instructional method that prioritizes decoding and other basic reading skills over metacognitive skills. These results may also support calls for policy changes at the early childhood instructional level for children to receive more intensive language and prereading instruction prior to official school entry.

One facet of the study that was not easily testable but may be notable to policy makers is the implementation of PALS in this context was very different from the implementation in the original Vanderbilt associated schools. In the case of the present study, classroom teachers did not provide the instruction for the PALS procedures and specialists in learning (i.e., special education teachers) were brought to the classroom for this instruction. Thus, "teacher buy-in" may have been different from other contexts where PALS has been used. Future researchers examining the efficacy of interventions like PALS may benefit from including variables of teaching style and orientation, as well as integration of similar learning principles across other parts of the school day.

EQAO scores were not related to rate of progress on CBM, but baseline and end-of-year CBM scores were highly correlated with EQAO. This is likely due to the improvements made in reading fluency across groups and schools (i.e., limited variability in rate of progress), which make it difficult to detect a small to medium effect. The effects for baseline and end-of-year CBM scores, on the other hand, likely reflect factors beyond PALS implementation, including other risk factors, such as poverty and significant absences from school. These results may also reflect extant concerns in the literature about the utility of CBM testing beyond the beginning reading stage. Furthermore, EQAO scores likely tap into numerous other skills involved in reading comprehension, which may explain the null findings. The use of cross-curricular reading materials for the EQAO assessments, as well as the testing format, might have produced results akin to ours. Specifically, the EQAO testing format (i.e., multiple-choice, scantron high-stakes group testing) was likely novel to many of the third-grade students, which may have differentially impacted students across reading achievement levels.

The empirical literature base on reading fluency is unequivocal: Children with better reading fluency have better outcomes on a number of factors, including improved reading comprehension (Eason, Sabatini, Goldberg, Bruce, & Cutting, 2013), lower rates of special education placement (Denton et al., 2013), and higher high school graduation rates (Taylor, Pearson, Peterson, & Rodriguez, 2005). It is clearly to the benefit of students and school systems if student receive early intervention to prevent poor reading fluency. Based on the results from our analyses, the majority of students across the school board made tremendous gains in their reading fluency, even when there were multiple challenges in the implementation of the intervention. Unfortunately due to small cell sizes (seven schools per group), we were not able to clearly assess the effect of challenges to the intervention. If one examines just the effect sizes, there is a moderate effect for implementation group. This suggests that if we had more schools per group, we may have been able to detect a statistically significant difference.

Also notably, the CBM strategy that is attached to PALS is effective as a predictor of EQAO performance. Schools whose CBM scores reflect students with poorer reading fluency at the beginning of the year and at the end of the year will have the lowest scores on EQAO. This may suggest that these students need a more targeted intervention or enhanced services in order for their reading performance to improve. The developers of the PALS program have noted that the lowest performing students in any environment are unlikely to experience excellent improvement following the PALS intervention and will probably need additional assistance (D. Fuchs, Compton, Fuchs, Bryant, & Davis, 2008). It is likely that these data reflect this scenario. These data also have a good news element: because all students improve at a steadily similar rate within the PALS intervention, it is clear that all students are benefiting from this relatively time- and cost-intensive intervention.

Regardless of the positive outcomes associated with the PALS intervention, this study was not without limitations. First of all, we did not find the significant outcomes that we hypothesized in all cases. Part of this is the inherent limitation in using provincially mandated testing as an outcome. These tests are group-administered and the reading tests actually assess the ability to comprehend content across a number of content domains as well as requiring significant test-taking skills on the part of students. The modest correlations of the EQAO scores over time without significant changes in student populations are indicators of the problems associated with this kind of testing. Although our grouping variable may be judged as problematic, we were limited by the available data. Yet, data reflecting socioeconomic status of the cachement areas for the schools partially validates our strategy. Future researchers may benefit from a more independently derived grouping variable. Last, these results represent the experiences of one school district in Southwestern Ontario (Canada). As a result, the results may not generalize to other

districts, particularly those that are significantly more rural or with different risk factors for reading failure.

The use of CBM as an intervention monitoring system has also been criticized by some researchers. Although there are a small handful of studies suggesting that CBM should robustly predict performance on group high-stakes testing such as EQAO (e.g., Schmitt, Balles, & Venesky, 2013), this assessment method is not without flaws. There are several studies suggesting that students who are English-as-a-second-language learners or who are receiving special education services (Reschley, Busch, Betts, Deno, & Long, 2009; Yeo, 2010) may not demonstrate the same highly predictive relations between CBM and high-stakes testing performance. A more recent study also reported that the relations between CBM performance and end-of-year testing are attenuated in lower achieving readings (Kilgus, Methe, Maggin, & Tomasula, 2014). The emphasis on speeded performance (fluency) in the CBM assessments also did not address comprehension or the ability to apply information learned through reading. Likewise, research in a more behaviorally focused paradigm has criticized CBM for not considering the source of errors during reading and the poor control (nonequivalence) of passage reading difficulty (Ardoin, Roof, Klubnick, & Carfolite, 2008). Furthermore, studies that have included measures of reading attitudes as well as CBM data in predicting end-of-year reading achievement have reported significant effects for reading attitudes (e.g., Martinez, Aricak, & Jewell, 2008). Thus, although there is significant support for the use of CBM, particular in the context of the PALS program, this strategy has also received significant critical attention. In the case of this particular study, there may have been stronger results if lower performing students had also received more instruction to promote oral language development or more exposure to global knowledge.

In summary, our results indicate that PALS is an effective intervention, even when delivered in a very different context than in which it was developed. Across the school board in which PALS was implemented, students experienced improvements in their reading fluency. Although the intervention required significant re-allocations of time and human resources, students clearly benefited. As school boards consider how to deliver elementary school instruction in light of ongoing concerns about budgeting and Ministry of Education curricula, it is critical that the learning needs of students be considered.

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