Running Head: THE EFFICACY OF A SUPPLEMENTARY MULTISENSORY READING PROGRAM

The Efficacy of a Supplementary Multisensory Reading Program for First-Grade Students

Debora L. Scheffel

Colorado Department of Education

Jack C. Shaw

University of Northern Colorado

Rose Shaw

Metrica

Debora L. Scheffel, Ph.D. Chair, Director of Colorado Reading First and Competitive Grants and Awards, Colorado Department of Education, 1560 Broadway, Suite 1450, Denver, CO 80202, 303-866-6635, FAX: 303-866-6647, EMAIL: Scheffel_D@cde.state.co.us

Jack C. Shaw, Ph.D. Candidate, Department of Applied Statistics and Research Methods, University of Northern Colorado, Greeley, CO 80632, 970-396-9085, FAX: 970-339-5599 EMAIL: jack@inteo.com

Rose Shaw, Ph.D., Statistician, Metrica, 1703 36th Avenue Court, Greeley, CO 80634-0103, 970-330-3161, FAX: 970-339-5599 EMAIL: roseshaw@cybox.com

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Abstract

The purpose of this study was to evaluate the efficacy of the Institute for Multi-Sensory Education's supplementary Orton-Gillingham based reading program across three schools in a single school district. Dynamic Indicators of Basic Early Literacy Skills (DIBELS) assessments were used to measure the reading skills of 224 treatment and 476 comparison group first-grade students, with control group students receiving traditional reading instruction for 90 minutes per day in a core reading program and treatment group students receiving instruction using the supplementary reading program for 30 additional minutes per day. Classroom observations by reading professionals revealed satisfactory program implementation. Collected teacher surveys demonstrated high teacher satisfaction with the program. Alphabetic principle and phonemic awareness skills in the treatment group made significant improvement relative to the comparison group. Treatment group female Hispanics made the greatest gains in alphabetic principle skills.

The Efficacy of a Supplementary Multisensory Reading Program for First-Grade Students

The purpose of this study was to examine the effectiveness of an Orton-Gillingham (OG) based multisensory reading program as a supplement to regular first-grade classroom instruction in three elementary schools in a high-needs school district. Both comparison and treatment groups were taught using the district's core reading program during a 90-minute reading block, and the treatment group's reading instruction was supplemented with an Institute of Multi-Sensory Education (IMSE) reading program for 30 minutes per day. First-grade students in the three treatment schools made the most dramatic improvement in acquiring alphabetic principle skills. There was also substantial evidence that phonemic awareness skills improved more for students in the treatment group than in the comparison group. Hispanic female students demonstrated the greatest improvement in alphabetic principle skills after receiving IMSE's reading program.

The IMSE supplemental reading program is designed to be incorporated into existing reading curricula to provide a multisensory, phonetic, and structured instructional tool. The program is based on the Orton-Gillingham method of reading instruction originally developed by neurologist Dr. Samuel T. Orton and educator Anna Gillingham. The IMSE reading program involves a daily, five-part 30-minute intervention. The reading program offers a method of organized, direct instruction in phonemic awareness and application of phonetic rules and word-attack strategies. The reading program relies on directly teaching the fundamental structure of language, beginning with simple sound-symbol relationships and progressing logically to phonetic rules and word-attack strategies using multisensory methods. The first part of the program is called the three-part drill. The three-part drill is a review of all phonetic concepts known or taught including practicing phonetically regular words using all learning pathways: visual, auditory, and kinesthetic (VAK). The second part of the program involves teaching a new phoneme-rule using multisensory techniques for encoding and decoding words and writing/reading sentences. Vocabulary and syllable division are taught using a multisensory method in the third part of the program. Vocabulary words are taken from all components of the program, whereas syllable division of multi-syllabic words is based upon phonetic components which are learned. The fourth aspect of the lesson is devoted to reviewing and teaching non-phonetic and high-frequency words or both. The fifth portion of the program incorporates reciprocal reading strategies during oral reading. Reciprocal teaching, as developed by Palinscar and Brown (1984, 1986), is used to foster

comprehension of orally read text by asking students to summarize, question, clarify, and predict from text (Liuzzo, 2003).

The IMSE reading program in this study is aligned with the U.S. Department of Education and the National Institute for Literacy's (2001) guide *Reading: Know What Works* which is based directly on the reports of the National Reading Panel (2000) and the National Research Council (Snow, Burns, & Griffin, 1998) and delivers guidelines for reading teachers in Title 1 schools. In order to get meaning from print, students must understand the alphabetic principle, have phonemic awareness, and be supported by direct teaching of sound-symbol relationships. The guide indicates that phonics is an important reading skill and that building phonics skills such as decoding is most effectively done through explicit, systematic instruction. Among the skills needed for building comprehension are summarizing, questioning, clarifying, and predicting, all of which are embedded in IMSE's reciprocal teaching.

A study in an inner city school provided empirical evidence that multisensory methodology guided by Orton-Gillingham is effective in improving reading (Joshi, Dahlgren, & Boulware-Gooden, 2002). This was a timely study because, as the authors indicated, almost all prior studies were in clinical settings with special populations or small-group settings, and empirical support for the added benefit of multisensory techniques had not been demonstrated. Jones (2001) reported that Multisensory Structured Language Education (MSLE) has been practiced by teachers and clinicians since the earliest teaching guides (e.g., Montessori in 1912) and that current findings such as those studying the relationship between brain function and learning have brought us closer to understanding why generations of teachers have been committed to MSLE.

The purpose of this investigation was not to separate and examine individual components of the IMSE supplemental reading program; the purpose was to study the effectiveness of this program in a real-world setting in which the teachers in the treatment group implemented this program and the comparison group teachers did not. Specifically, after instruction in the first grade, did treatment group children perform significantly better than comparison group children in basic reading fluency skills as measured by Phoneme Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency subtests on the *Dynamic Indicators of Basic Early Literacy Skills*?

Method

The current intervention study was based on the revised IMSE program (2000) and reciprocal teaching. Because the reading program instruction and materials combined auditory, visual, and kinesthetic learning styles, it is called *multisensory*. Each lesson is designed to use two or more multisensory modalities.

This investigation was planned, coordinated, and carried out by three individuals who contracted with the IMSE to conduct the study. The lead member of this research group was the liaison between the IMSE and the district. A contract between the district and the IMSE was signed, with a clause that the trained teachers would use the IMSE program in their classrooms a minimum of 30 minutes a day, five days a week for the school year and that they would put forth a good faith effort in implementing the methodology, the required assessment procedures, and the protocol required. District administrators distributed information about the study to school principals. Dissemination of information about the project to the teachers was the responsibility of the school district and principals; it was not under direct control of the research team. The three schools volunteering to be a part of the treatment group were required to have the full commitment of principals and all their first-grade teachers.

Classroom teachers, lead teachers, and literacy coaches from these three schools participated in 30 hours of training in a one-week summer session. During the 30-hour training, teachers learned the theory and practice of the IMSE method of language instruction including the five parts that comprise the IMSE reading intervention program. Materials distributed to teachers to implement the IMSE method included syllable division cards, red word screens, and teacher card packs as well as other classroom materials (e.g., sand trays, sand, blending boards, red word screens, and controlled readers). The training content included student assessment of the above skills and guidelines for weekly lesson plans to achieve student learning objectives. Upon completion of the training, teachers had the tools to implement this program into their current curriculum.

One of these three treatment schools chose to drop out of the study when school began in the fall, indicating that they would continue to use the supplementary reading program and materials, but would not be part of the study. The research team agreed that this school would not be part of the comparison or treatment group.

The study's liaison identified a replacement school for the treatment group to replace the school that was initially part of the study. Teachers in this newly participating school received training in the program using video tapes of the 30-hour summer training session with supplementary on-site training from the IMSE trainer. Training was completed in November, and full implementation of the supplemental reading program in this school began in December.

In addition to the 30 hours of training, the Institute for Multi-Sensory Education's trainer made three teacher-directed visits to the classroom of teachers participating in the study in October, February, and May. To guide this process, teachers completed a request form before each visit to specify the kind of consultation that would be most beneficial to the teachers, such as demonstration lessons, reviewing assessment data, or addressing the needs of individual students.

The study applied multiple measures to assess the effectiveness of the training and quality of program implementation. Three of the summer training sessions were observed and evaluated by the research team using a professional development observation protocol (Shaw, 2003). An implementation checklist, developed by the research team in collaboration with the trainer, was used during each of the three classroom visits (Drake, 2006). The checklist included sections on assessment, the three-part drill, teaching a new concept, organization, red words (phonetically irregular words), decoding of multi-syllabic words, and reading comprehension. Teachers completed opinion surveys during the summer training and at the end of the school year to assess their satisfaction with the IMSE program.

Student progress was measured, using the Dynamic Indicators of Basic Early Literacy (DIBELS) reading assessment (Good & Kaminski, 2003), which was designed to assess the five major skill areas in early reading identified by the National Reading Panel (NICHHD, 2000) and the National Research Panel (Snow et al., 1998) including phonemic awareness, phonics, vocabulary, fluency, and comprehension. In first grade, DIBELS primarily assesses three skill areas: phonemic awareness, alphabetic principle, and fluency with connected text. These skills are measured using the DIBELS subtests termed Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency (NWF), and Oral Reading Fluency (ORF), respectively. In first grade, PSF and NWF are administered during fall, winter, and spring benchmark assessment periods, while ORF is administered during the winter and spring benchmark assessment periods.

DIBELS benchmark target scores represent minimum acceptable scores that predict future reading success for a child (Good, Simmons, Kame'enui, Kaminski, & Wallin, 2002). Based on the predictive validity associated with individual DIBELS measures, children should be proficient in phonemic awareness skills by the end of kindergarten, alphabetic principle skills by the middle of first grade and appropriate fluency and comprehension skills through later grades (Good et al., 2002). Preventing reading failure in later grades involves identifying skill deficits as early as possible in kindergarten and first grade, and providing targeted instruction based on these

deficiencies. Additionally, DIBELS assessments separate student scores into risk categories from lowest to highest (i.e., low risk, some risk, at risk) based on the probability that a student will attain desired future reading outcomes based on current skills. Students identified as *low risk* have approximately an 80% chance, those in the *some risk* category have approximately a 50% chance, and children in the *at risk* category have a 20% or lower chance of meeting the next DIBELS benchmark target score. In-depth descriptions and information on the reliability and validity of the PSF, NWF, and ORF DIBELS assessments are provided by Good and Kaminski (2003).

Schools included in this study had used DIBELS to assess student achievement since the 2001-02 school year. DIBELS data used in this investigation were collected by test administrators trained in appropriate DIBELS protocol (Good & Kaminski, 2003) during the fall, winter, and spring benchmark assessment periods of the 2005-06 school year.

Participants

Treatment group participants came from three elementary schools in a school district with approximately 18,000 students in a suburban school district in the state of Colorado. In the district, 50% of the students are Hispanic; 47%, White; 1%, African American; 1%, Native American; and 1%, Asian. Two of the treatment schools were *low*, and one was *average* in overall academic performance as measured by the statewide assessment measure, Colorado Student Assessment Program (CSAP). For the nine comparison group schools, four were *low* and five were *average* in overall academic performance. The average school enrollment stability was 97% and 96% for the treatment group and comparison groups, respectively. The treatment group included 227 students (51% male and 49% female) who were primarily Hispanic (56%) or White (41%). The comparison group included 535 students (52% male and 48% female) who were also primarily Hispanic (59%) or White (39%). Two of the three treatment group schools and five of the nine comparison groups were Title 1 schools. Only students with complete data for fall, winter, and spring benchmark assessments were used in analyses (i.e., casewise deletion). As a result, 224 children from the treatment group and 476 children from the comparison group remained in the study throughout the school year.

Results

Implementation Results

Two members of the research team recorded capsule ratings equal to “4” (4: *accomplished, effective professional development*) for the three observed training sessions on a scale of 1 to 5 (5: *high*). Ten teachers

completed a survey at the end of the first day of training in which they rated from 1 to 5 (5: *excellent*; 4: *good*; 3: *satisfactory*; 2: *fair*; and 1: *poor*) the day's training and their enthusiasm for being part of the study. Mean ratings were 4.5 for trainer's ability to hold participants' attention, trainer's effectiveness in answering questions, written information, the three-part drill, and interest in *learning more tomorrow*. The mean ratings for overall training organization and respondents' enthusiasm for being part of the study were 4.4 and 4.1, respectively. At the end of the second day the mean rating for enthusiasm for being part of the study had increased to 4.4, and the mean overall training rating was 4.7. In addition to conducting surveys, discussions with the participants were led by the research team at the end of the third, fourth and fifth days. The research team and trainer emphasized the importance of consistency of implementation with regular instruction supplemented with 30 minutes of reading instruction each day using the IMSE program. Teachers were asked to track the number of days each student received the additional 30 minutes of reading instruction using the IMSE program. During the school year, none of the teachers tracked the number of days students received the additional 30 minutes of training.

The teachers from the school that received their initial training by video and an on-site session rated their initial training retrospectively at the end of the school year using the same rating scale (1 to 5, with 5: *high*). The ratings recorded by these three teachers were 5, 4, and 4.

In all three schools, the IMSE program was implemented in small groups (e.g., students with similar letter-sound abilities were kept together) for 30 minutes daily. Two of the schools implemented the IMSE program for nine months, while one school began the project in December and, thus, implemented it for six months. The supplemental program's progress monitoring assessment objectives were met.

Nine teachers from the three treatment schools completed an evaluation form at the end of the school year on which they rated their implementation of the IMSE program from 1 to 5 (5: *excellent*; 4: *good*; 3: *satisfactory*; 2: *fair*; and 1: *poor*). The mean overall implementation rating was 3.9 across all nine teachers at three schools. Research team classroom observers rated implementation of the supplementary program *satisfactory* for the treatment group as a whole. All nine teachers indicated they would recommend the IMSE supplemental reading program to other first-grade teachers in their school and in the school district. Eight of the nine teachers indicated that they would implement this reading program in their classrooms the following year if they taught first grade.

Student Achievement Results

Students participating in the study were tested using the DIBELS in fall, winter, and spring of the implementation year. Phoneme Segmentation Fluency (PSF) and Nonsense Word Fluency (NWF) were administered in fall, winter, and spring, while Oral Reading Fluency (ORF) was administered in winter and spring. The overall range of PSF scores measured in phoneme segments per minute (psm) decreased substantially more from fall to spring for the treatment group than it did for the comparison group. The interquartile range on PSF for the treatment group (N = 224) was 32.25, 16.00, and 12.00 psm and was 29.00, 25.00, and 15.00 psm for the comparison group (N = 476) during fall, winter, and spring benchmark assessments, respectively (Figure 1). Additionally, students at the 5th percentile during the spring benchmark assessment scored above the DIBELS benchmark at treatment schools (36.00 psm), but below benchmark at comparison schools (28.00 psm).

- Insert Figure 1 -

Treatment group schools transitioned 25.0% of the *some risk* students to the *low risk* category on PSF between the fall and winter benchmark assessments compared with 20.4%who made the same transition in the comparison group (Table 1).

- Insert Table 1 -

The mean student score on NWF increased by 51.47 graphemes per minute (gpm) at treatment schools and 43.93 gpm at comparison schools during the 2005-2006 school year. While there was no statistically significant difference between NWF scores at comparison and treatment schools during the fall benchmark assessment, F (1, 712) = 2.315, p = .129, there was a statistically significant difference between NWF scores, F (1, 712) = 16.55, p = .001, during the spring benchmark assessment. NWF scores were significantly higher for students in the low risk category at treatment schools than at comparison schools in the same category, during the spring benchmark assessment (Table 2).

- Insert Figure 2 –

- Insert Table 2 –

ORF mean scores were similar in the treatment and comparison groups in winter (treatment: M = 19.29, SD = 22.40; comparison: M = 19.5, SD = 24.55) and spring (treatment: M = 38.97, SD = 31.50; comparison: M = 40.21, SD = 31.83).

Discussion

As discussed previously, it is important for early literacy programs to prevent reading difficulties before they occur and to rectify them as efficiently as possible once skill deficits are detected. Overall, this study provided evidence that the IMSE supplemental reading program helped students at treatment schools acquire phonemic awareness (PSF) and alphabetic principle (NWF) skills more effectively than students at comparison schools.

Since phonemic awareness is a skill that should be established in kindergarten, first graders who lack proficiency in this area need to have this deficit addressed as quickly in the year as possible. Phonemic awareness skills were improved during the school year most effectively for students in the treatment group as evidenced by changes in statistical measures of dispersion and the percentage of students who scored at or above the DIBELS benchmark target score during the winter and spring benchmark assessment periods (Figure 1). Treatment schools had a smaller range of scores on PSF during the winter and spring assessments than did comparison schools, indicating that student scores became more homogeneous at treatment schools during the year (Figure 1). This result is important because student scores became more homogeneous concurrent with an increase in the percentage of students who attained the DIBELS benchmark target score. As such, the results represent an increase in the rate of improvement for the lowest-performing students (i.e., those at the greatest risk for reading failure).

Students whose scores were at the 25th percentile in the distribution of PSF scores from the winter benchmark assessment exceeded the DIBELS PSF benchmark target score at treatment schools but were below the benchmark target score at comparison schools (Figure 1). Students whose scores were at the 5th percentile in the distribution of PSF scores from the spring benchmark assessment exceeded the DIBELS PSF benchmark target score at treatment schools but were below the benchmark target at comparison schools (Figure 1). The treatment group transitioned 25% of students from *some risk* to the *low risk* on PSF between fall and winter compared with 20% of students who made the same transition in comparison schools (Table 1). In the spring, 95.5% of treatment group and 92.6% of comparison group students were in the *low risk* PSF category, and as significantly, only 0.9% of students in the treatment group remained in the *high risk* category (Table 1). Exceeding the DIBELS benchmark target score, or moving to a lower risk level, means that the probability of future success is increased for these students. In other words, demonstrated proficiency in this foundational reading skill helps unlock the potential for progress in higher order skills (e.g., reading connected text, comprehension).

Students at both treatment and comparison schools made similar progress in the alphabetic principle as measured by NWF, during the first half of the year, but the rate of progress at treatment schools was greater than comparison schools over the last half of the year (Table 2). Liberman, Shankweiler, and Liberman (1989) identified that mastery of the alphabetic principle is dependent upon one's strength in phonological awareness. It is possible that the improved phonemic awareness skills developed by treatment students during the first half of the year translated into accelerated gains on the alphabetic principle during the last half of the year. If this presumption is accurate, it would lend support to the importance of remediating skill deficits as quickly as possible in early grades.

No substantial differences in the ability to read connected text as measured by ORF, were observed between treatment and comparison students (Table 4).

- Insert Table 4 -

This result is not surprising since phonological awareness has long been identified as a precursor to skilled reading (Liberman, 1971, 1973) and that the development of word recognition is constrained by poor phonological decoding (Rack, Snowling, & Olson, 1992). Lower-performing students at treatment schools who made substantial progress in phonemic awareness and the alphabetic principle would not be expected to show significant gains on reading connected text until after becoming proficient on precursor skills. While data for this study were only collected during first grade, it would be informative to analyze longitudinal data for treatment students to determine if foundational skill improvements in first grade lead to significant progress in reading connected text in second grade.

Conclusion

This study provides strong evidence to support the conclusion that the Institute of Multi-Sensory Education's supplemental reading program led to accelerated acquisition of, and increased student proficiency in, phonemic awareness and alphabetic principle skills for first-grade students when compared with students who did not receive the program. These results are similar to those identified by Joshi et al. (2002) who determined that children who received systematic IMSE-based phonics instruction performed better on tests of phonological awareness and decoding than students who did not receive the additional instruction.

Previous research indicates that the better a young child is at segmenting words into their individual sounds, the more likely they are to read and the faster the reading process develops (Blachman, 1991; Catts, 1991; Fox & Routh, 1983; Griffith & Olson, 1992; Juel, 1988; Perfetti, Beck, Bell, & Hughes, 1987). Several studies have also shown that children having difficulty developing good decoding skills during early grade levels will likely

develop reading problems during later grades (Stanovich, 1986; Walberg & Tsai, 1983). It is, therefore, highly probable that skill improvements documented for students who received the supplemental reading program in this study will translate into improved reading outcomes in later grades for these students.

Another particularly interesting result of this study was the increase in alphabetic principle proficiency demonstrated by Hispanic females (Table 3).

- Insert Table 3 -

While there is insufficient data to explain this outcome based on data from this study, it is compelling enough to be a possible avenue for future investigation to determine if a multisensory supplemental reading program is differentially beneficial to female Hispanic students.

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Figures

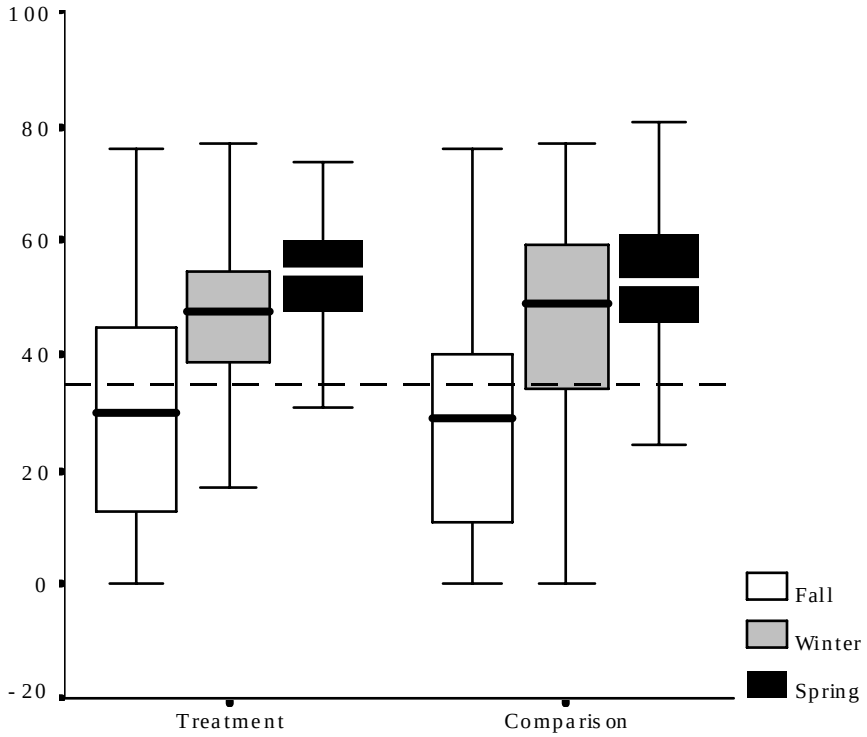

Figure 1. Distributions of treatment and comparison group scores on the DIBELS measure of phonemic awareness (Phoneme Segmentation Fluency: PSF) during fall, winter and spring benchmark assessment. The dashed horizontal line represents the DIBELS benchmark target score of 35 correct phoneme segments per minute.

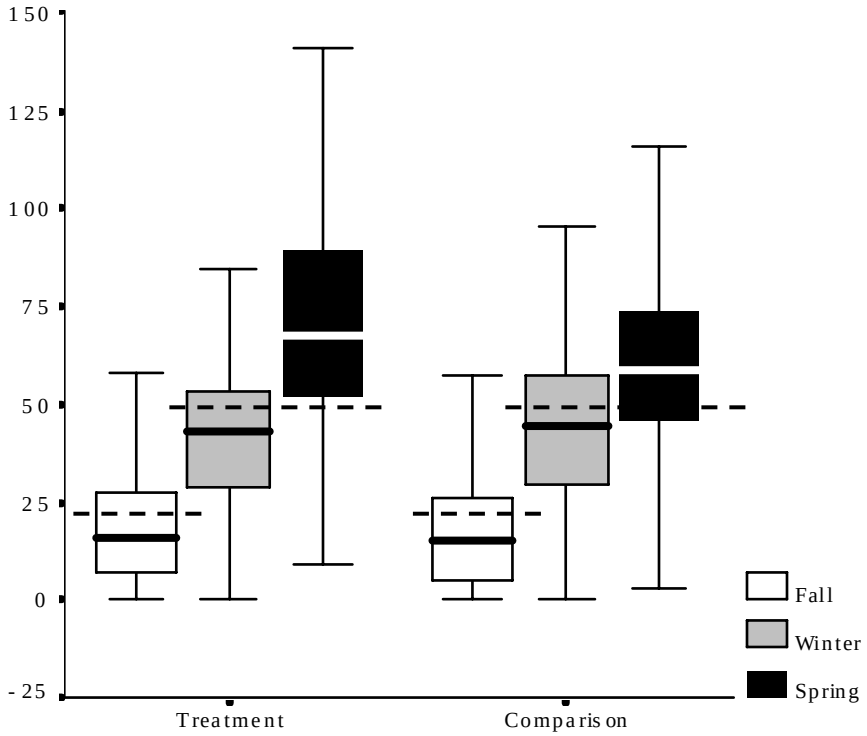

Figure 2. Distributions of treatment and comparison group scores on the DIBELS measure of the alphabetic principle (Nonsense Word Fluency: NWF) during fall, winter, and spring benchmark assessment. Dashed horizontal lines represent the benchmark target scores of 24 graphemes per minute [gpm] (fall) and 50 gpm (winter and spring).

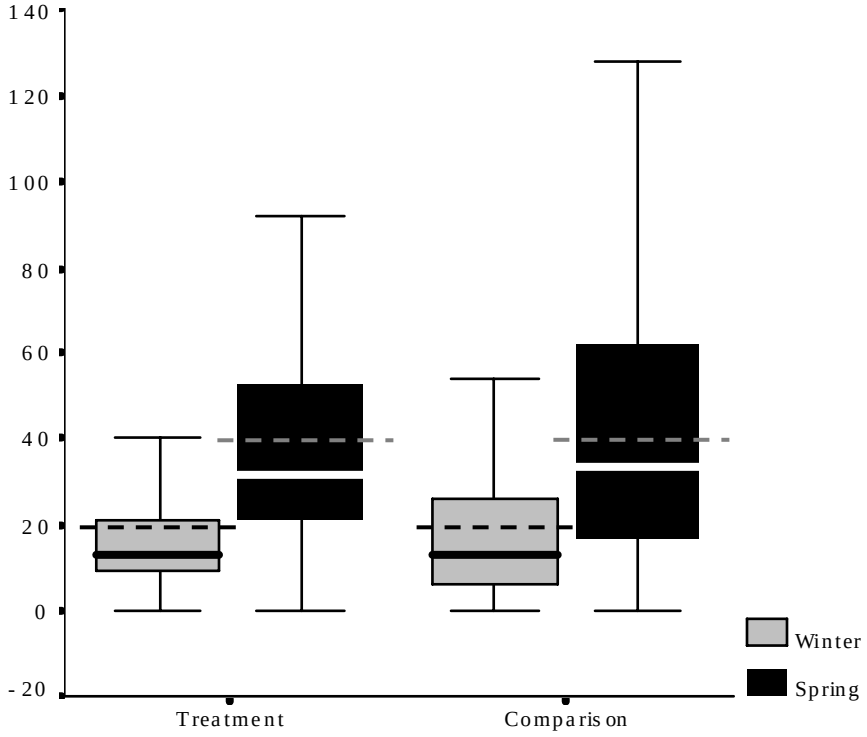

Figure 3. Distributions of treatment and comparison group scores on the DIBELS measure of the fluency (Oral Reading Fluency: ORF) during winter and spring benchmark assessment. Dashed horizontal lines represent the benchmark target scores of 20 words per minute [wpm] (winter) and 40 wpm (spring).

Tables

Table 1

Percentages of Student Scores Organized by DIBELS PSF Risk Category During Fall, Winter, and Spring Assessment Periods for Treatment (N=224) and Comparison Groups (N=476)

PSF Risk Status	Fall		Winter		Spring	
	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison
Low Risk	42.0	37.8	79.5	74.8	95.5	92.6
Some Risk	39.7	39.3	14.7	18.9	3.6	5.7
High Risk	18.3	22.9	5.8	6.3	0.9	1.7

Table 2

Percentages of Student Scores Organized by DIBELS NWF Risk Category During Fall, Winter, and Spring Assessment Periods for Treatment (N=224) and Comparison Groups (N=476)

NWF Risk Status	Fall		Winter		Spring	
	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison
Low Risk	32.6	28.8	30.8	37.6	79.9	68.5
Some Risk	27.2	26.5	43.8	38.2	16.5	23.1
High Risk	40.2	44.7	25.4	24.2	3.6	8.4

Table 3

Mean NWF Scores for Treatment and Comparison Group Students During Fall, Winter, and Spring Assessment Periods for Treatment and Comparison Groups Disaggregated by Gender and Ethnicity

Demographic		Fall		Winter		Spring	
Ethnicity	Gender	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison
Hispanic	Female	25.32	16.01	49.17	42.75	76.42	61.17
Hispanic	Male	15.43	17.25	37.34	41.62	66.58	60.14
White	Female	22.98	22.96	47.26	48.23	72.17	64.86
White	Male	23.89	22.16	45.84	49.87	75.22	66.74

Table 4

Percentages of Student Scores Organized by DIBELS ORF Risk Category During Fall, Winter, and Spring Assessment Periods for Treatment (N=224) and Comparison Groups (N=476)

ORF Risk Status	Winter		Spring	
	Treatment	Comparison	Treatment	Comparison
Low Risk	28.6	29.6	42.4	39.7
Some Risk	49.6	36.6	33.9	28.4
High Risk	21.9	33.8	23.7	31.9