



RESEARCH REPORT

Luke Waites Center for Dyslexia and Learning Disorders

BUILD: A K-1 Early Reading Intervention

Findings from a Public-School Pilot Sample

Summer 2024

Anna Middleton, Ph.D., CALT



Intervention studies of children who struggle to learn to read have shown that treatments that provide instruction in phonological awareness and letter-sound correspondences can improve the primary deficits associated with developmental dyslexia and other word-reading difficulties (e.g., Lovett et al., 2000; McArthur et al., 2015; Torgesen et al., 2001). The most effective method for remediating reading difficulties is systematic phonics instruction, which helps students to better understand the rules and patterns of written language (orthography; Castles et al., 2018; Ehri et al., 2001). Comprehensive reading instruction, however, involves more than just an emphasis on the structure of English orthography but also includes targeted vocabulary development, comprehension strategy instruction, and extended reading practice for developing fluency (e.g., Fletcher et al., 2018). Furthermore, the same practices which have proven effective in remediating core deficits associated with dyslexia are successful in preventing later reading failure (Hatcher et al., 1994).

Early intervention for struggling young readers is paramount and can mitigate the development of more severe reading impairments (Castles et al., 2018; Foorman et al., 2016). Word reading interventions are often more effective when implemented in early elementary grades than in later grades (Wanzek et al., 2016). The “dyslexia paradox” arises from the tendency to diagnose dyslexia after a child has already past the timeframe in which intervention may be most effective (Ozernov-Palichik & Gaab, 2016). Toward this end, many states – including Texas – have mandated dyslexia screening for all children in early elementary grades. Students who may be at risk for reading disabilities based on this screening must then be provided remedial instruction. However, few early reading intervention programs exist for students at risk for dyslexia in these early grades.

The Intervention

To meet the needs of the K-1 students who have been identified at risk for dyslexia, the staff of the Luke Waites Center for Dyslexia and Learning Disorders at Scottish Rite for Children (SRC) has developed an early reading intervention called *Build: A K-1 Early Reading Intervention*. The *Build* curriculum is an early reading intervention program designed for K-1 students either at risk for, or already identified with, reading disabilities. *Build*, a derivative program of SRC’s standard *Take Flight* intervention, was developed for use in an early intervention setting.

Build is a comprehensive program that integrates best practices in a developmentally appropriate sequence for students in early elementary grades. It is a one-year early reading intervention derived from evidence-based instructional principles. It integrates evidence-based best practices for teaching the important components of a comprehensive reading program including phonological awareness, phonics, fluency, vocabulary, and comprehension. The curriculum scope and sequence is presented in 100 lessons. Each component is taught developmentally using a direct, systematic, cumulative, multisensory method of introduction and practice to meet the specific needs of kindergarten and first grade students who are struggling in reading. Because of its comprehensive and sequential instructional approach, *Build* may also be used with students in early elementary grades who have been diagnosed with dyslexia.

The intervention used in the current pilot study is a comprehensive program that integrates important components of comprehensive reading intervention (National Reading Panel, 2000). Each component is taught developmentally using a direct, systematic, cumulative, multisensory method of introduction and practice to meet the specific needs of early elementary students. The current study provides descriptive evidence towards the use of such a developmentally tailored intervention in remediating multiple component literacy skills.

Participants

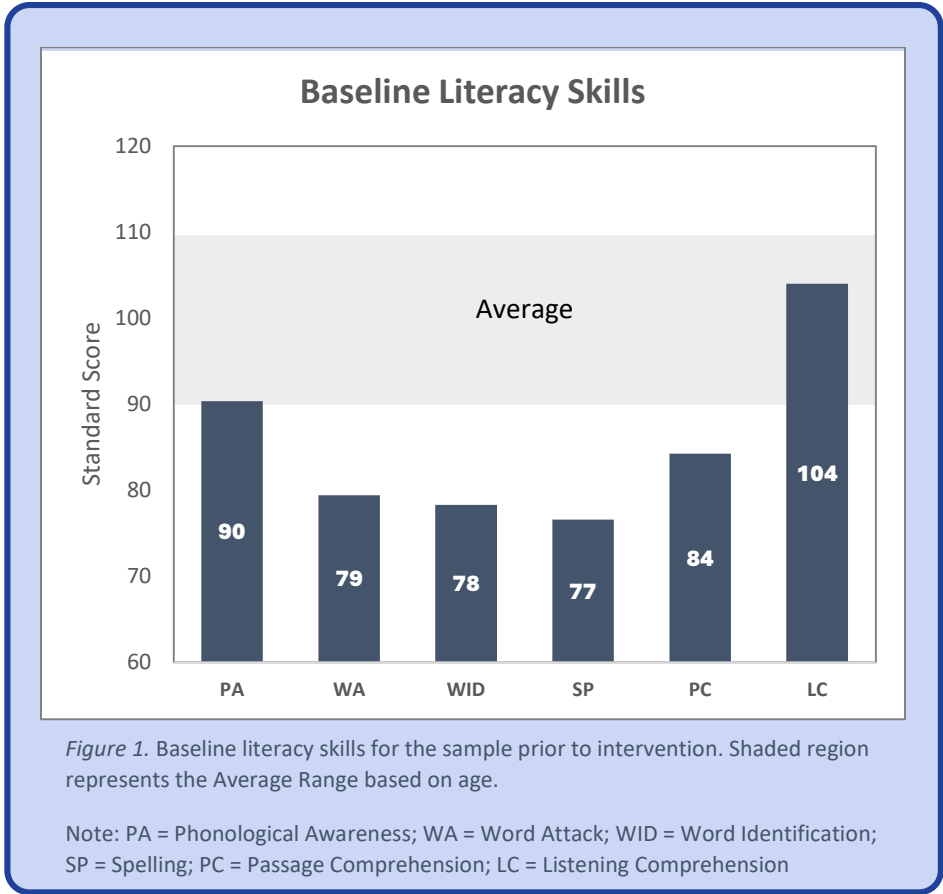
The *Build* intervention was piloted in a sample of thirty 1st-2nd grade students receiving dyslexia intervention in a large suburban district in the southwestern United States. All instruction was delivered by district dyslexia therapists who completed training in the use of the *Build* curriculum. All assessments and intervention activities were completed as standard procedure for the district. Demographic and outcome data were collected retrospectively by district personnel, deidentified, and shared through a secure online data management system hosted at Scottish Rite for Children (Harris et al., 2009; Harris et al., 2019).

Table 1. *Sample Demographics*

	Mean (SD)	Range
Age (years; months)	7;9 (0;8)	6;0 - 8;5
Gender (Female %)	43%	
Ethnicity (Hispanic %)	17%	
Race:		
Black / African Am.	20%	
White	73%	
Other	7%	
Free/Reduced Lunch (% yes)	20%	

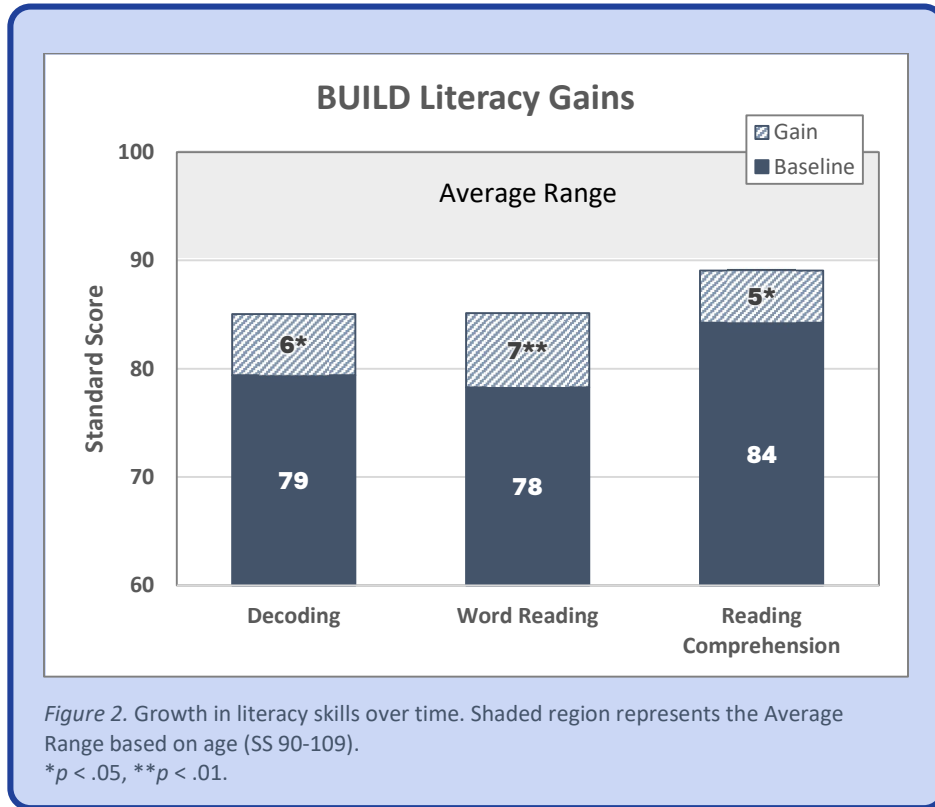
Measures

District baseline evaluation batteries measured a range of language and literacy skills to confirm a characteristic profile of dyslexia in order to aid in the determination of appropriate need for dyslexia instruction. For most students in the current sample, the baseline battery included the Phonological Awareness composite score from the Comprehensive Test of Phonological Processing, 2nd Edition (CTOPP 2; Wagner et al., 2013) and the Word Attack, Word Identification, Passage Comprehension, and Listening Comprehension subtests of the Woodcock Reading Mastery Tests, 3rd Edition (WRMT-3; Woodcock, 2011). The Word Attack, Word Identification, and Passage Comprehension subtests of the WRMT-3 were re-administered to each child at the completion of the intervention to measure growth in targeted literacy skills. All students completed post-intervention assessments using the WRMT-3. Four students' baseline data was collected using another instrument, and an additional six students were missing Passage Comprehension scores at baseline. Regression-based imputation was used to replace these missing values using post-test scores and baseline age.



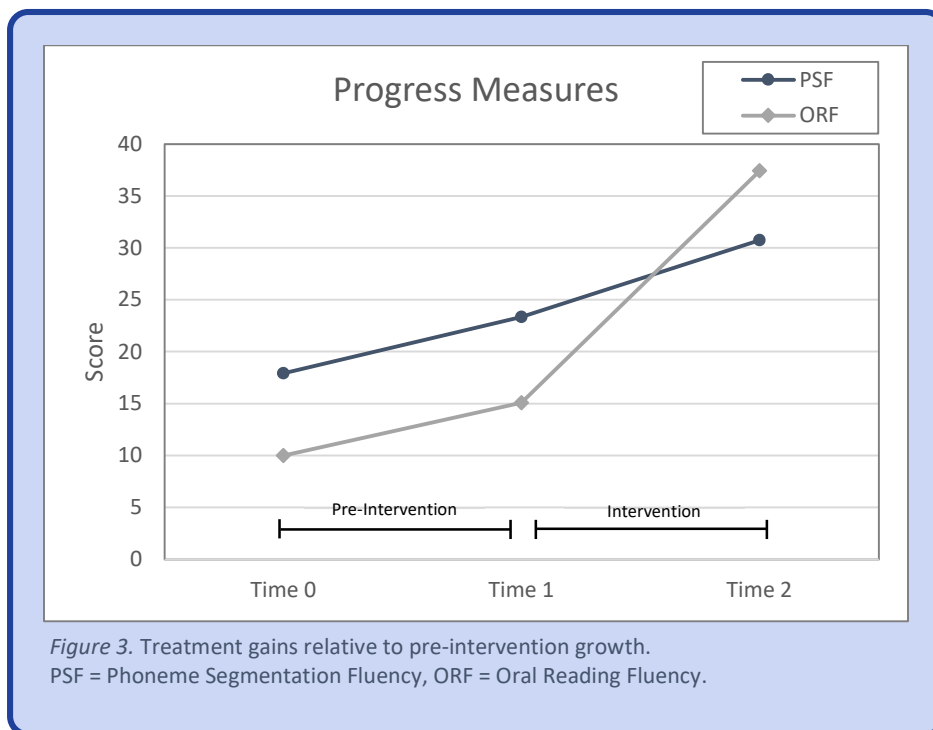
Baseline Literacy Skills

Pre- and post-intervention literacy performance was evaluated using norm-referenced measures of phonological processing, word reading, language skills, and comprehension. These measures were administered by the district as a routine part of the dyslexia identification process, with an average evaluation-intervention latency period of 3.13 months. For both baseline and post-test assessments, subtest raw values were converted to age-based standard scores, representing each individual child’s measured performance relative to children of the same age in the norming sample at the time of test (Average Range: SS = 90-109). Prior to receiving the intervention, students in the sample demonstrated deficiencies in written language measures, including word-level decoding, word recognition, spelling, and passage comprehension (all SS < 84). Measured oral language skills, including phonological awareness and listening comprehension, were relative strengths compared to written language and fell within the average range.



Treatment Effects

Decoding, Word Reading, and Reading Comprehension were administered pre- and post-intervention to assess changes in standard score performance for students receiving the intervention. Group means on these measures at baseline and post-intervention timepoints are shown in Figure 1. For all three measured literacy outcomes, mean performance for the sample was below the average range prior to the intervention. Profile analyses revealed significant improvements in literacy skills over the course of treatment, Wilks' $\Lambda = .66$, $F(3,27) = 4.58$, $p = .01$, $\eta_p^2 = .34$. Because standard scores represent performance relative to developmental norms, this change in performance indicates that during the intervention period students' literacy skills accelerated at a rate faster than their age-equivalent peers, bringing them closer to the average range by the end of treatment. Follow-up analyses of each individual outcome measure revealed both statistically and clinically significant gains in individual skills. Word reading skills improved significantly over the course of the intervention, $F(1,29) = 13.78$, $p = .001$, $\eta_p^2 = .32$. Significant gains were also observed for Decoding, $F(1,29) = 5.07$, $p = .03$, $\eta_p^2 = .15$, and Comprehension, $F(1,29) = 5.13$, $p = .03$, $\eta_p^2 = .15$.



Progress Measures

Progress monitoring data were also collected as available at beginning of year (BOY), middle of year (MOY), and end of year (EOY) timepoints using the mCLASS progress monitoring system. The mCLASS system is a digital presentation of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; University of Oregon, 2018-2020). This district utilizes mCLASS data to assess risk for reading difficulties and make instructional support decisions for students at various levels of ability. These data were used to examine changes in literacy development during the first semester of intervention compared to a pre-intervention control period using repeated measures profile analysis.

Because students in the pilot sample began the intervention at various points throughout the school year, and performance thresholds for mCLASS subtests vary by timepoint and grade level, a subset of 14 students with available data were selected for analysis of mCLASS progress data. For this group of students, performance was examined at three timepoints over two subsequent semesters. For example, for students who began the intervention early in the spring semester, the T0 to T1 timeframe represented changes in performance prior to beginning the intervention (fall semester, control period), whereas the T1 to T2 timeframe represented changes in performance during the first semester of intervention (spring, treatment period). The subset of students utilized for analysis of progress data did not differ from the students excluded from analysis on any demographic or baseline performance measures. Repeated measures profile analyses were run on measures of phonological awareness (Phoneme Segmentation Fluency) and oral reading (Oral Reading Fluency) separately.

Phonological awareness significantly improved over the course of two semesters, $F(2,22) = 7.75$, $p = .003$, $\eta_p^2 = .41$. Planned repeated contrasts were used to examine changes in performance for each segment of time: the control period (i.e., semester prior to intervention) and treatment period (i.e., first semester of intervention) revealed a non-significant increase in phonological awareness skill in the semester prior to receiving the Build intervention, $F(1,11) = 3.91$, $p = .07$, $\eta_p^2 = .26$. However, over the first semester of intervention, phonological awareness ability increased significantly, $F(1,11) = 5.01$, $p < .05$, $\eta_p^2 = .31$.

A similar pattern of findings was observed for oral reading fluency, which improved significantly over the course of two semesters, $F(2,26) = 20.12$, $p < .001$, $\eta_p^2 = .61$. Planned contrasts revealed that fluency scores did not change over the control period, $F(1,13) = 1.97$, $p = .18$, $\eta_p^2 = .13$, but increased significantly over the treatment period, $F(1,13) = 35.94$, $p < .001$, $\eta_p^2 = .73$.

Conclusions

The current study investigated growth in literacy skills for a sample of early elementary students receiving instruction in the Build program within a routine public-school intervention setting. Prior to the intervention, students demonstrated literacy profiles characteristic of dyslexia, with weaknesses in reading skills relative to average cognitive abilities and oral language skills. This pattern of findings confirms a characteristic profile of dyslexia for the current sample. However, many students with dyslexia also experience deficiencies in their grasp of the underlying sound structure of the language, which is often reflected in below-average performance on measures of phonological awareness. Although a characteristic of dyslexia, phonological processing deficits are not requisite for diagnosis, and are often described as “necessary but not sufficient”. Furthermore, phonological processing is a highly malleable skill, with many studies demonstrating robust effects of targeted treatment (Castles et al., 2018). Although data on the types of pre-intervention instruction received by students in this sample are not available, phonological awareness is often a focus of instruction in early grades as students build foundational literacy skills. Thus, the relative strength in phonological awareness for the current sample may reflect successful classroom instruction and/or tiered support for these students in developing phonological awareness skills. Importantly, the sample demonstrates significant deficiencies across written language skills despite average-level phonological awareness, further supporting a specific weakness in written language abilities such as that are commonly found in those with dyslexia. Furthermore, deficits such as these which are evident in early elementary grades may indicate a more severely impaired profile of dyslexia which will require additional support and services (Middleton et al., 2022). An analysis of the baseline literacy skills for students in this sample provide further evidence that dyslexia can and should be identified in early elementary grades, and that phonological awareness should not be solely relied upon to determine individual risk for reading difficulties.

Dyslexia is a specific learning disorder characterized by deficits in word-level reading and spelling abilities. These word-level difficulties often give way to secondary consequences including weaknesses in reading fluency, comprehension, and written expression. To assess baseline and post-intervention performance on word- and passage-level reading, standard score performance was examined for phonological decoding, word reading, and passage comprehension. Significant and large effects of time were found for both phonological decoding and word reading skills over the course of the intervention. The age-based standard scores utilized in these analyses represent relative performance in comparison to other individuals of the same age. Therefore, an increase in

standard score reflects an accelerated pace of development compared to age-equivalent peers. On average, student performance in this sample improved approximately 11 and 8 percentile points for phonological decoding and word reading, respectively, demonstrating statistically and educationally meaningful growth in these skills.

Reading comprehension is a higher-order skill which involves the orchestration of many lower-order skills (e.g., word-level reading, vocabulary, background knowledge). Once considered secondary to word-level reading skills, deficits in higher-order skills are common in dyslexia and often require targeted intervention to improve performance. Weak word-level reading can cause a bottleneck in the development of reading comprehension. Therefore, early literacy interventions are often focused on developing accurate foundational literacy and word-level skills. The *Build* intervention is a multi-componential reading intervention, and systematically introduces comprehension activities throughout the instructional sequence, allowing students to apply evidence-based comprehension activities in a scaffolded setting. In the current study, passage comprehension significantly improved over the course of intervention, bringing the sample mean just below the average range at the conclusion of the program. These findings demonstrate significant improvements in literacy skills for early elementary students with dyslexia who received *Build* instruction.

Analyses of progress data also provide evidence for treatment-related growth in literacy skills. The comparison of change rates across a pre-intervention control period compared to those achieved during the treatment period provides evidence for treatment-related effects. For both measured skills (phonemic awareness and reading fluency), changes in mCLASS performance prior to the onset of treatment were not statistically significant. Conversely, significant and robust improvements were found for both phonological awareness and fluency skills during the treatment period. These findings suggest that participation in the *Build* intervention accelerates growth in these skills relative to the standard instruction provided to these students prior to the intervention.

Together, the findings provide preliminary support for the use of the *Build* intervention program in developing a range of both lower- and higher-order reading skills in early elementary students with dyslexia. Students receiving *Build* instruction demonstrated both statistically and clinically meaningful improvements in phonemic awareness, decoding, word reading, fluency, and comprehension.

REFERENCES

- Castles, A., Rastle, K., & Nation, K. (2018). "Ending the Reading Wars: Reading Acquisition from Novice to Expert." *Psychological Science in the Public Interest* 19: 5-51.
- Ehri, L. C., Nunes, S. R., Stahl, S. A., & Willows, D. M. (2001). Systematic phonics instruction helps students learn to read: Evidence from the National Reading Panel's meta-analysis. *Review of educational research*, 71(3), 393-447.
- Fletcher, J. M., Lyon, G. R., Fuchs, L. S., & Barnes, M. A. (2018). *Learning disabilities: From identification to intervention* (Second). Guilford Press.
- Foorman, B., Dombek, J., & Smith, K. (2016). Seven Elements Important to Successful Implementation of Early Literacy Intervention. *New Directions for Child and Adolescent Development*, 2016 (154): 49-65.

- Harris, P., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., Conde JG. (2009). Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support, *J Biomed Inform.* 2009 Apr;42(2):377-81.
- Harris, P., Taylor, R., Minor, BL., Elliott, V., Fernandez, M., O’Neal, L., McLeod, L., Delacqua, G., Delacqua, F., Kirby, J., Duda, SN., (2019). REDCap Consortium, The REDCap consortium: Building an international community of software partners, *J Biomed Inform.* 2019 May 9 [doi: 10.1016/j.jbi.2019.103208]
- Hatcher, P. J., Hulme, C., & Ellis, A. W. (1994). Ameliorating Early Reading Failure by Integrating the Teaching of Reading and Phonological Skills: The Phonological Linkage Hypothesis. *Child Development* 65(1): 41-57.
- Lovett, M. W., Steinbach, K. A., & Frijters, J. C. (2000). Remediating the core deficits of developmental reading disability: A double-deficit perspective. *Journal of learning disabilities*, 33(4), 334-358.
- McArthur, G., Castles, A., Kohonen, S., Larsen, L., Jones, K., Anandakumar, T., & Banales, E. (2015). Sight word and phonics training in children with dyslexia. *Journal of Learning Disabilities*, 48(4), 391–407.
- Middleton, A. E., Farris, E. A., Ring, J. J., & Odegard, T. N. (2022). Predicting and evaluating treatment response: Evidence toward protracted response patterns for severely impacted students with dyslexia. *Journal of learning disabilities*, 55(4), 272-291.
- National Reading Panel, National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implication for reading instructions.* U.S. Government Printing Office.
- Ozernov-Palchik, O., & Gaab, N. (2016). Tackling the ‘dyslexia paradox’: Reading brain and behavior for early markers of developmental dyslexia. *Wiley Interdisciplinary Reviews: Cognitive Science*, 7(2), 156-176.
- Torgesen, J.K., Alexander, A.W., Wagner, R.K., Rashotte, C.A., Voeller, K., & Conway, T. (2001). Intensive remedial instruction for children with severe reading disabilities: Immediate and long-term outcomes from two instructional approaches. *Journal of Learning Disabilities*, 34, 33–58.
- Wagner, R.K., Torgesen, J.K., Rashotte, C.A., & Pearson, N.A. (2013). *Comprehensive Test of Phonological Processing*, Second Edition. Austin, TX: Pro-ed, Inc.
- 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(3): 551-576.
- Woodcock, R.W. (2011). *Woodcock Reading Mastery Test*, Third Edition. San Antonio TX: Pearson Assessments.
- University of Oregon (2018-2020). 8th Edition of Dynamic Indicators of Basic Early Literacy Skills (DIBELS®): Technical Manual. Eugene, OR: University of Oregon. Available: <https://dibels.uoregon.edu>