



ARIZONA DEPARTMENT OF EDUCATION

Each reading intervention program will be scored using a rubric. A response must meet **all** the criteria in each scored area to be included on the K-3 MOWR vetted reading intervention program list. Peer Review will be noted but does not disqualify overall approval.

Study: Intensive Summer Intervention Drives Linear Growth of Reading Skill in Struggling Readers Date of Study: Summer of 2016 and 2017 Grade Levels of Study: children 6-12 years of age Reading Intervention Program's Marketed Name: Lindamood-Bell Seeing Stars		
	Rating or Measure Select: Y or N	Rationale
ESSA Evidence Tier	Y	Tier 3 due to small sample size
Independent Researchers (Y/N)	Y	Patrick M. Donnelly ^{1,2 *} , Elizabeth Huber ^{1,2} and Jason D. Yeatman ^{1,2} 1 Institute for Learning and Brain Sciences, University of Washington, Seattle, WA, United States, 2 Department of Speech and Hearing Sciences, University of Washington, Seattle, WA, United States
Established Measure (Y/N)	Y	Woodcock Johnson IV Test of Achievement (WJ) and the Test of Word Reading Efficiency-2 (TOWRE). From the WJ, the subtests administered were Letter-Word Identification (LWID), Word Attack (WA), Calculation (CALC), Oral Reading (OR), Sentence Reading Fluency (SRF), and Math Facts Fluency (MFF). These measures were combined to form the composite measures for Basic Reading Skills (BRS) (LWID + WA), Reading Fluency (RF) (OR + SRF), and Math Calculation Skills (MCS) (MFF + CALC). From the TOWRE, the subtests administered were the tests of sight-word and phonemic decoding efficiency (SWE and PDE), which formed the

		TWRE Index composite score, calculated based on the tables provided by the test.
Sample Size	Y	A cohort of 31 children (6–12 years) with reading difficulties (N = 21 with dyslexia diagnosis) were enrolled in 160 h of intervention occurring over 8 weeks of summer vacation. All participants were native English speakers with normal or corrected to normal vision. 21 participants reported a clinical diagnosis of dyslexia, and the other 10 participants reported struggles with reading but no formal diagnosis. Intervention participation occurred over the course of two summers (2016 and 2017), dividing the participants in two cohorts [Cohort 1 (N = 20), Cohort 2 (N = 11)]. Those enrolled also had no history of neurological damage or psychiatric disorder. Of those enrolled, 31 participants completed the entire study protocol (five total sessions): two baseline sessions and participation in the full 160 h of intervention (three additional sessions). The sample consisted of 11 females (20 male), ranged in age from 7 to 13. Sixteen children matched on age, reading ability, and IQ were recruited to participate as a control group.
Research Design	Y	The goal of the present study is to characterize intervention-driven growth trajectories over the course of an intensive (4 h a day, 5 days a week) summer intervention program. They use dense longitudinal measurements over the course of an intensive intervention to address two research questions: (1) What is the time course of learning for struggling readers enrolled in 8 weeks of intensive, individualized intervention? And (2) Is intervention growth most parsimoniously characterized by a linear model, or are there diminishing/accelerating returns with increasing hours of intervention? Because the primary research questions focused on individual growth trajectories, and not on intervention efficacy, they did not use random assignment to intervention and control conditions (and, thus, they do not interpret the results as a randomized control trial). Instead, the control group

		was recruited in an independent period after the conclusion of the intervention periods. The control group underwent the same testing procedure but did not participate in the intervention. Two cohorts of participants were enrolled in 160 h of Seeing Stars: Symbol Imagery for Fluency, Orthography, Sight Words, and Spelling (Bell, 2007) over the course of 8 weeks of summer vacation.
Outcome	Y	They collected behavioral measures over 4 sessions assessing decoding, oral reading fluency, and comprehension. There was significant linear growth on every measure of reading skill and none of the measures showed non-linear growth trajectories. Decoding skills showed substantial growth [Cohen's $d = 0.85$ (WJ Basic Reading Skills)], with fluency and comprehension growing more gradually [$d = 0.41$ (WJ Reading Fluency)]. The intervention involved one-on-one instruction, 4 h per day, 5 days per week, for eight weeks (160 h total). The study involved five experimental sessions: ~3 months prior to the beginning of the intervention ($M = 2.9$, $SD = 1$ month), immediately before beginning intervention ($8 \text{ days} \pm 6$), after 48.5 ($SD = 8.9$) hours of instruction, 102.5 ($SD = 12.6$) hours of instruction, and after completing the 160 h of intervention. Age-normed, standardized measures of reading skills were stable or declining, during the baseline period before the beginning of the intervention and then increased systematically over the course of the intervention. The stability during the baseline period indicates that growth during the intervention period reflected the effect of participating in the intervention, rather than the effect of repeated measures or the passage of time (individual baseline). To compare the effects of the intensive intervention to changes that might be observed in a typical classroom setting (or due to repeated testing), they compared growth in the intervention participants to an age and reading skill matched control group that did not participate in the intervention. The control group did not show improvements in any of the age-normed composite reading measures across experimental sessions, confirming that growth in reading scores is not due to repeated testing. Moreover, there was a significant group (intervention versus control) by time (days) interaction for all composite measures ($ps < 0.025$)

		confirming that the growth observed in the intervention group is significantly greater than the control group. Even though there was substantial variability in initial reading scores and age, there was steady growth during the intervention. All measures of reading skills showed significant intervention-driven growth. Enrollment in 160 h of intensive, one-on-one intervention over the course of the summer led to systematic linear growth in reading skills, including real and pseudo-word decoding, reading fluency, and comprehension. This contrasted with stability or decline seen during a pre-intervention baseline period (individual baseline), and lack of change seen in a group of age- and reading skill-matched control participants. Importantly, reading skills increased linearly with each hour of intervention, carrying practical implications for decision making around intervention policy and practice.
Effect Size	Y	There was a significant negative relationship between initial BRS and growth rate, as indexed by WJ BRS and WJ RF, indicating that the intervention stimulated the greatest change in the subjects who began with the lowest initial reading scores [WJ BRS, $r(31) = -0.58$, $p < 0.001$; WJ RF, $r(310) = -0.45$, $p = 0.01$]. Using a mixed effects model to compare growth rates between the binned timed and untimed reading measures they found that untimed measures (Woodcock Johnson IV, Word Attack (WA), Letter-Word Identification (LWID)) showed more rapid growth than timed measures [TOWRE, Sight Word Efficiency (SWE), Phonemic Decoding Efficiency (PDE)] ($\beta = 1.87$, $t(60) = 4.68$, $p = 1.67 \times 10^{-5}$). The untimed measure of pseudo word decoding (WA) showed the greatest rate of growth. They found that Woodcock Johnson Math Facts Fluency (MFF), a timed measure of arithmetic skill, and Calculation (CALC), an untimed measure of quantitative skill, were stable, or declining, over the intervention period. These results indicate that students' growth in reading skills were due to the training program rather than due to the Hawthorne effect where scores increase due to repeated testing.

*MTSS Level of Support	Y	Tier II or Tier III reading intervention
*Peer Review (Y/N)	Y	Frontiers in Psychology

MOWR Committee decision:

-Will continue to stay on the MOWR Intervention Program Vetted List.