What is the Science of Reading?

Quick Answer: It's an ever-expanding collection of information provided by researchers in the field outlining how we should teach students to read.

Longer Answer: The science of reading is a theoretical model which encompasses a comprehensive collection of research completed over many years by experts in the fields of education, psychology, neuroscience, language development, and more.

The collective body of evidence from the research, the science of reading, helps us to understand how the brain develops literacy skills, where breakdowns in language and literacy development may occur, and how best to support students using approaches validated by the research.

The SMARTER approach and curriculum are aligned with three key scientific models.

01 5 Core Components of Reading

Emphasis of instruction across the five core components of literacy provided by the National Reading Panel Report, 2000.

02 The Literacy Processing Triangle

The connection of phonology, orthography, and semantics to support development of reciprocal reading and writing processes (Plaut, D. C. 2005 & Seidenberg, M. S. 2020).

03 "Active-View" of Reading

The “simple-view of reading” model requires building both linguistic comprehension and decoding skills to support reading comprehension (Gough & Tunmer, 1986). The "active-view" builds off of this framework accounting for advances in the field

What are the 5 Core Components of Reading?

And why should they be included in literacy instruction?

The National Reading Panel, a group of scientific experts, conducted a comprehensive meta-analysis that determined these skills were critical to ensuring success for ALL students. By providing direct and explicit instruction in each of these key areas you can support students across a range of diverse learning profiles.

1. Phonological Awareness
2. Phonics
3. Vocabulary
4. Reading Fluency
5. Reading Comprehension

IMPORTANT NOTE!

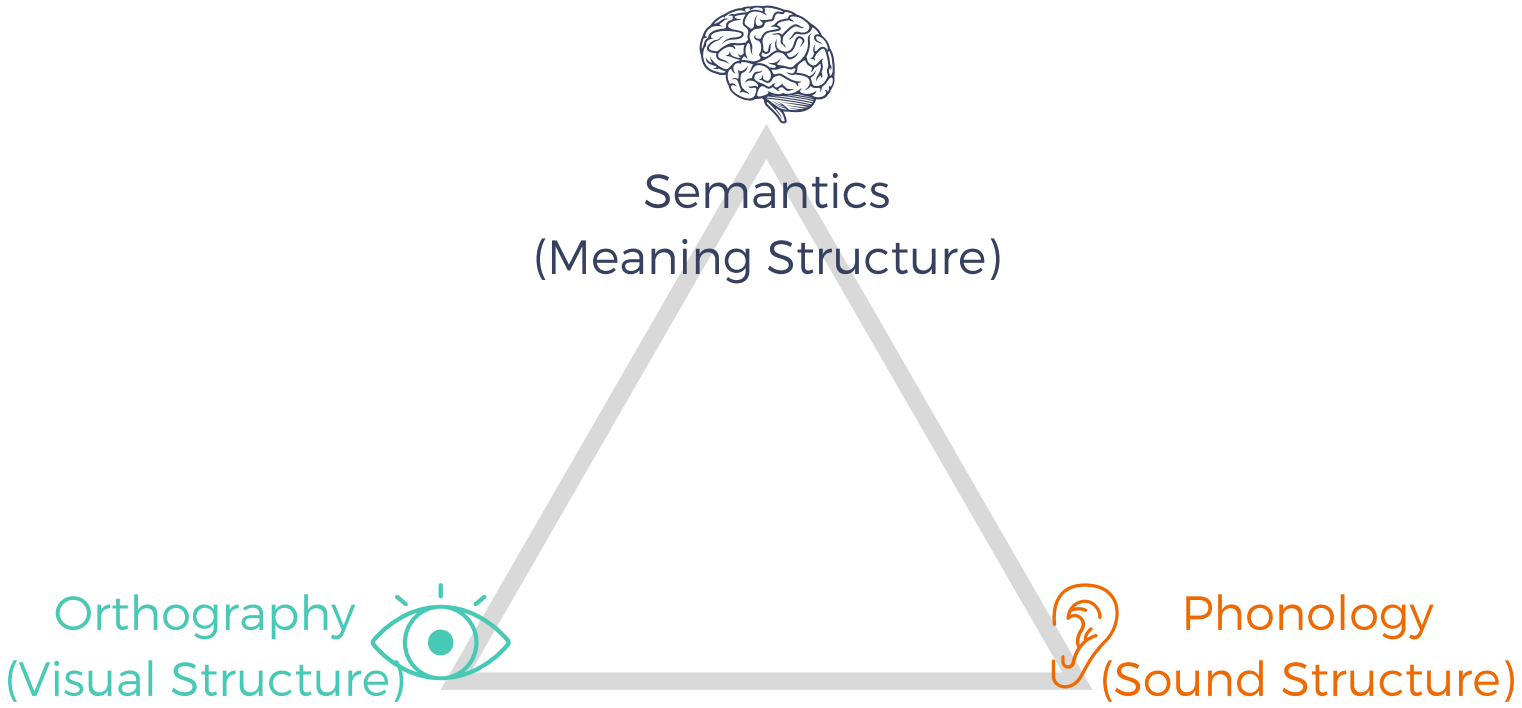
It is critical that ALL of these skills are taught to students across the continuum of instruction beginning in Kindergarten and progressing through upper-grade levels!

What is the Literacy Processing Triangle?

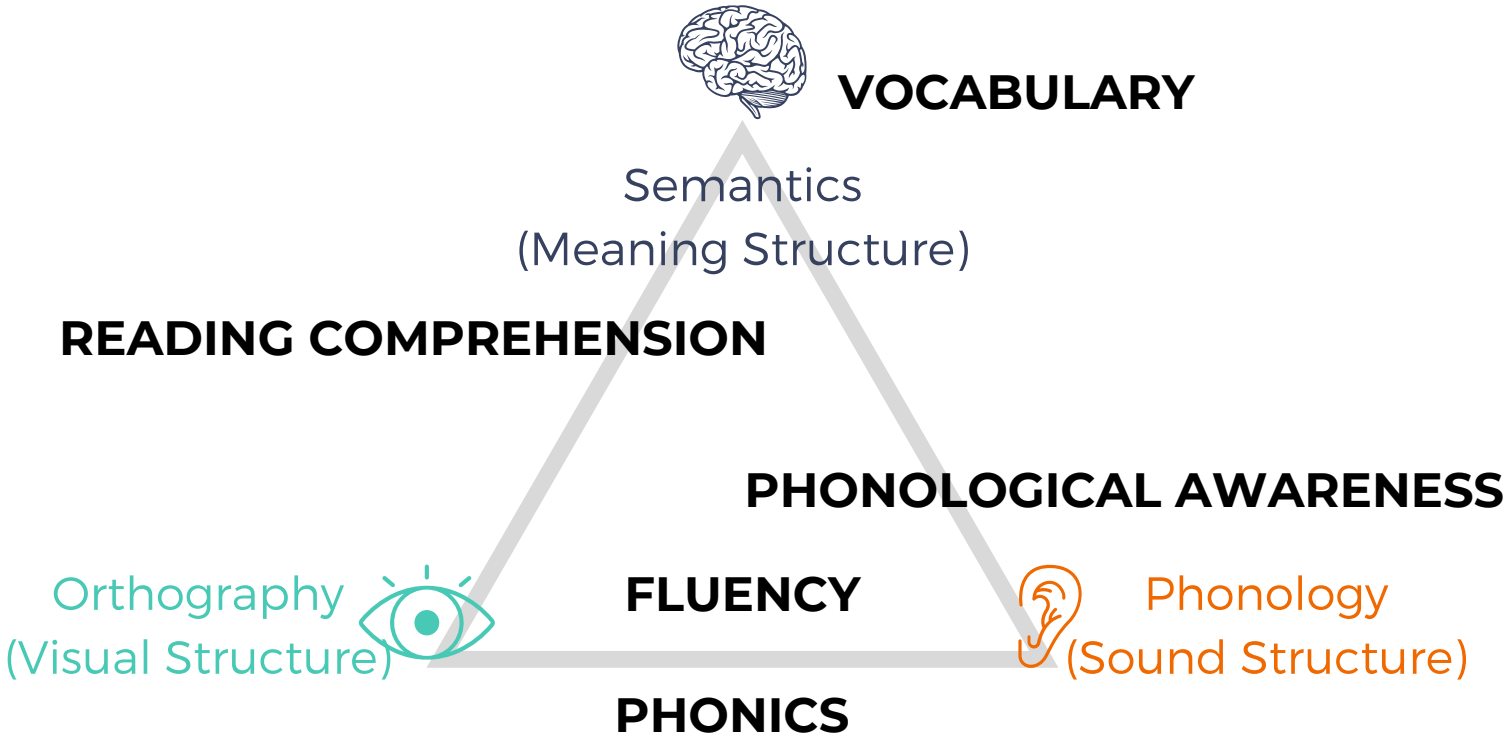
And why does it matter?

The Literacy Processing Triangle, also called the "Eternal Triangle" by researcher and author Mark Seidenberg, helps to conceptualize the neural pathways and connections required for efficient reading and writing. Three core neural processes were identified as critical components of effective literacy development. When breakdowns occur, they are likely to occur in one of these three areas. Knowing where breakdowns may occur helps us target instruction to meet the needs of ALL students effectively.

1. Phonology
2. Orthography
3. Semantics



How do the 5 Core Components fit into the Literacy Processing Triangle?



1. **Phonological awareness** instruction develops phonology.
2. **Phonics** creates the connection between phonology and orthography.
3. **Vocabulary** and language instruction develops semantics.
4. **Reading fluency** is created by the efficient connection of the triangle.
5. **Reading comprehension** is the connection of orthography to semantics.

What is the Simple View of Reading?

The “simple-view of reading” model (Gough & Tunmer, 1986) is well supported by significant bodies of research. Essentially, research indicates that reading comprehension is a product of decoding ability and linguistic (language-based) skills. In order to be able to comprehend what we read, we must be able to decode (sound out) the words and we must be able to understand the vocabulary, draw key points, make connections, and create inferences.
The end goal of reading is always comprehension.

DECODING ABILITY

LANGUAGE ABILITY

READING COMPREHENSION

How do the 5 Core Components fit into the Simple View of Reading?

DECODING SKILLS

- Phonological Awareness Skills
- Phonics Skills
- Decoding Fluency

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LANGUAGE SKILLS

- Vocabulary
- Connections & Context
- Syntax
- Semantic Fluency

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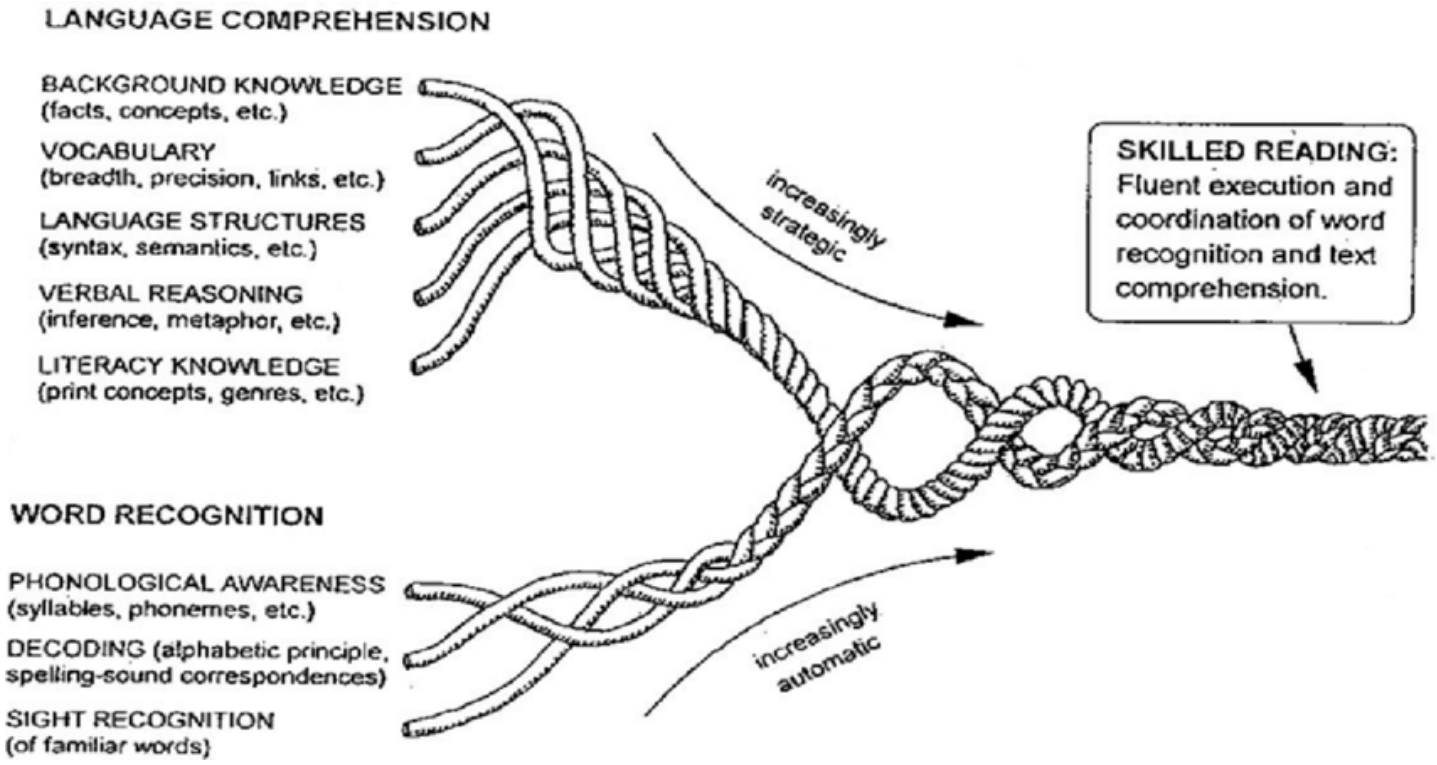
READING COMPREHENSION

1. **Phonological awareness** supports decoding skill development.
2. **Phonics** knowledge supports decoding skill development.
3. **Vocabulary** supports language skill development.
4. **Reading fluency** is the automaticity of decoding and language skills.
5. **Reading comprehension** is the end product.

Another way to tie the concepts together...

Another way to look at the "Simple View of Reading" is through the lens of Scarborough's Rope. As our language skills become increasingly stategic and our word recognition skills and our word recognition skills become automatic we develop skilled reading including development of fluency and comprehension.

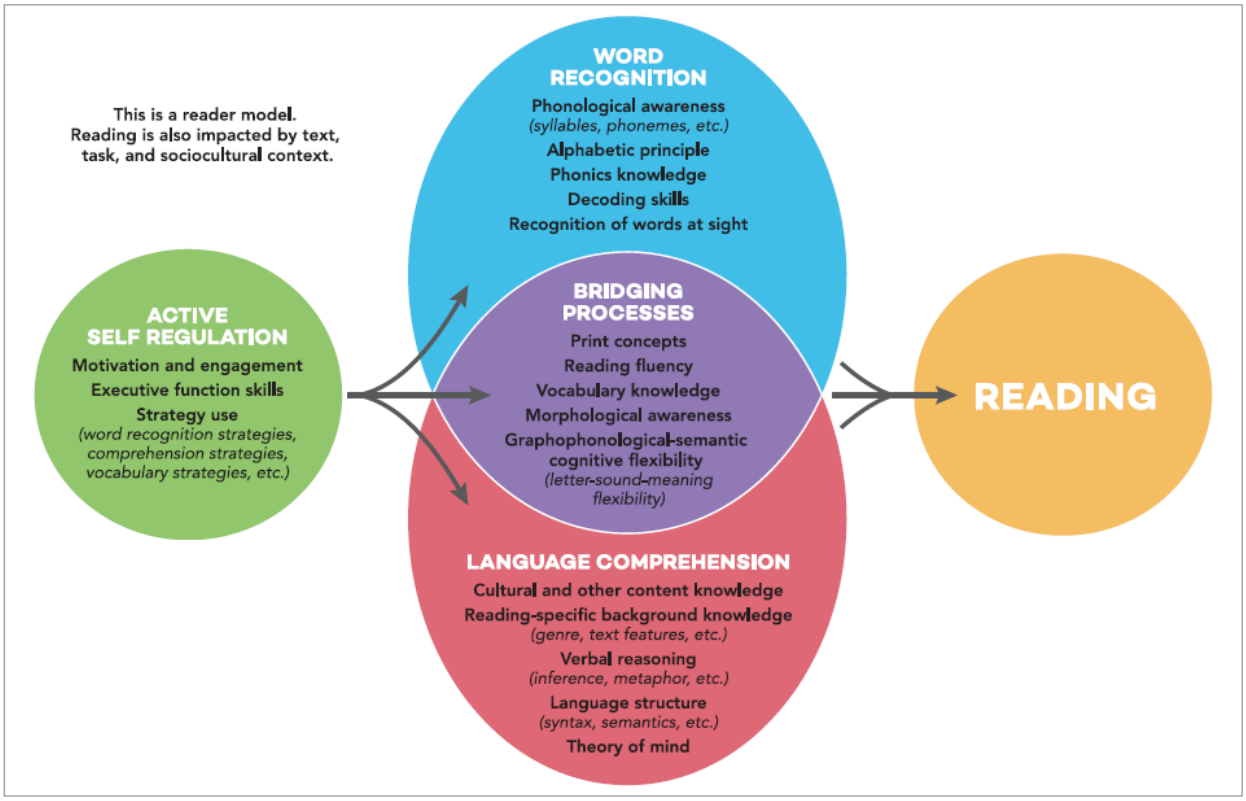


IMPORTANT NOTE!

As students progress in age, the amount in which decoding skills play into this equation can begin to decrease. While it is critical that we still develop phonetic decoding skills, it will become increasingly more important to develop the language comprehension skills at upper-grade levels.

Advancement into the "Active View" of Reading

Recent research has provided a new and advancing model building from the previous decades of research providing the recognition of "bridging processes" that occur between language comprehension and word recognition and also the necessary self-regulation skills.



Note. Several wordings in this model are adapted from Scarborough (2001).

The Science of Reading Progresses: Communicating Advances Beyond the Simple View of Reading

IMPORTANT NOTE!

Each of the models provided is built from the same body of scientific research that comprises the "Science of Reading" and these models continue to expand and develop. The SMARTER Reading & Writing program and training are designed to align with the Science of Reading.

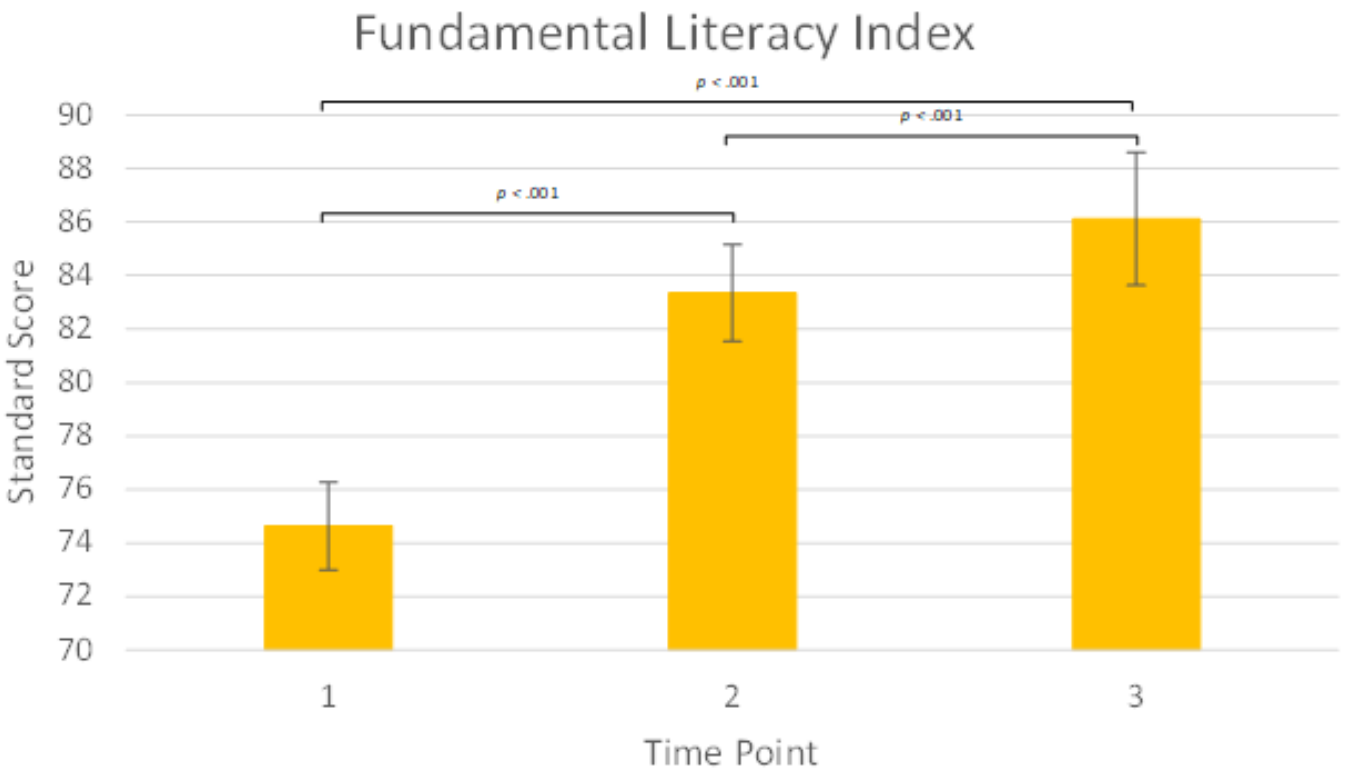
The Program Research

The following analysis was done by the University of Denver for Ascend Smarter Intervention in order to evaluate the efficacy of the SMARTER Reading & Writing program using data collected in the Ascend Learning & Educational Consulting student clinic. Outcome variables were the Word Identification and Spelling Test (WIST) Fundamental Literacy Index (FLI) and the Gray Oral Reading Test, Fifth Edition (GORT-5) Oral Reading Index (ORI). The WIST Fundamental Literacy Index (FLI) is a combined measure of Word Identification and Spelling. The GORT-5 Oral Reading Index (ORI) is a combined measure of Fluency (Accuracy & Rate) and Comprehension. Tests were administered at three time points. Time 1 was at the initiation of intervention, Time 2 was approximately six months later (mean months for FLI = 6.74, standard deviation = 2.94; mean months for ORI = 9.95, standard deviation = 6.91), and Time 3 was an additional six months after that (mean days for FLI = 6.09, standard deviation = 2.0; mean months for ORI = 7.50, standard deviation = 2.11).

The sample consisted of children who were 6 to 18 years old at Time 1. The average age was 9 years old (M = 9.49 years old, SD = 2.07). Only children who received at least six months of the intervention, and thus had data for at least Time 1 and Time 2 for either the Fundamental Literacy Index (FLI) or the Oral Reading Index (ORI), were included in the analysis. In total, 81 children were included in the analysis. There was an expected drop-off for the FLI from Time 1 (N = 76) to Time 2 (N = 74) and Time 3 (N = 41). The same trend can be seen for the ORI from Time 1 (N = 56) to Time 2 (N = 50) and Time 3 (N = 30). Of the 81 children included, 63 (78%) had a dyslexia diagnosis, 12 (15%) had a dysgraphia diagnosis, 4 (5%) had a dyscalculia diagnosis, 4 (5%) had a reading comprehension diagnosis, and 11 (14%) had no primary diagnosis. Several children had a secondary diagnosis, including 10 (12%) with an ADHD diagnosis, and 6 (7%) with a mental health diagnosis.

Word Identification & Spelling Test

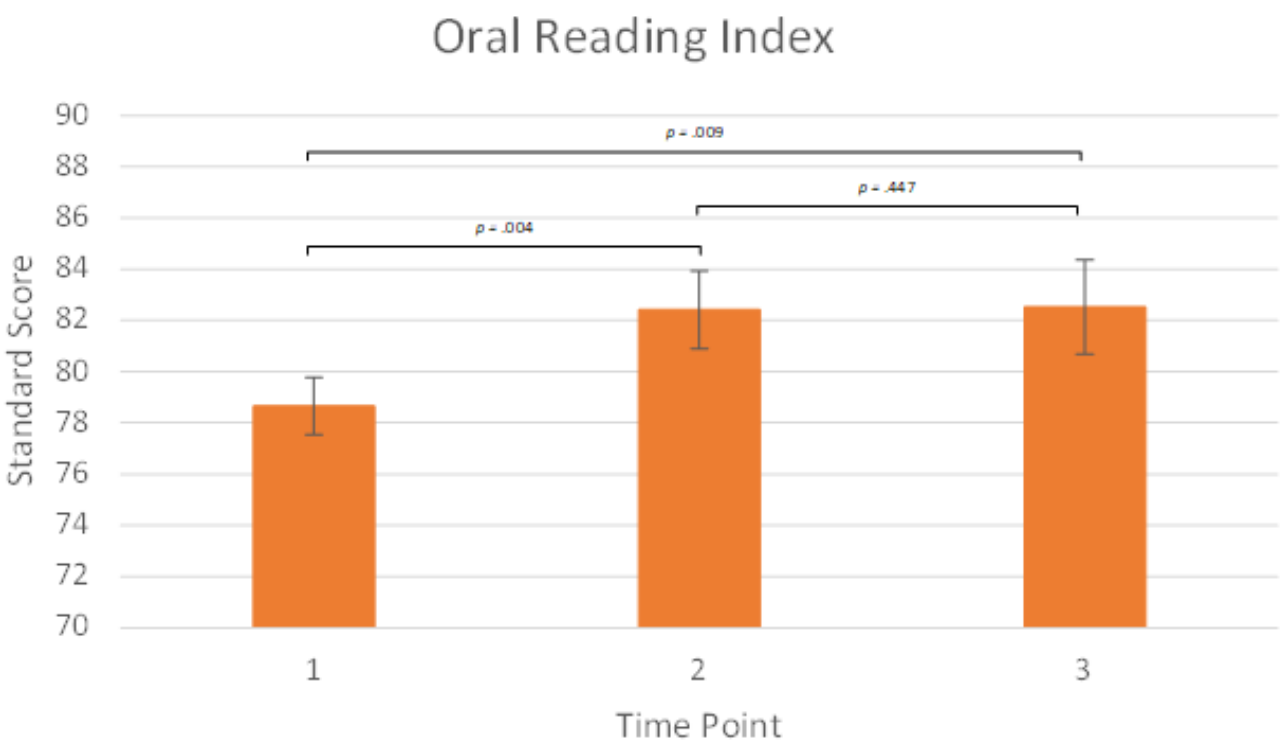
Analyses were conducted using paired-samples t-tests with standard scores on the Fundamental Literacy Index (FLI) and Oral Reading Index (ORI) as the outcome variables. A paired-samples t-test was conducted to compare WIST FLI Standard Scores at Time 1 vs. Time 2. There was a significant improvement in the scores from Time 1 (M = 74.69, SD = 14.50) to Time 2 (M = 82.65, SD = 15.42); $t(70) = -8.51$, $p < .001$, Cohen's $d = 1.01$. Another paired-samples t-test was conducted to compare WIST FLI scores at Time 2 to FLI scores six months later at Time 3. There was a significant improvement in the scores from Time 2 (M = 82.17, SD = 16.17) to Time 3 (M = 86.12, SD = 15.91 at PM2); $t(40) = -4.07$, $p < .001$, Cohen's $d = 0.642$. In summary, these analyses indicate a large improvement from Time 1 to Time 2 in the first 6 months of the intervention, followed by a more moderate, but significant, improvement from Time 2 to Time 3.



Graph 1: This graph displays average growth on the Fundamental Literacy Index of the Word Identification & Spelling Test (WIST). The time points on the x-axis indicate the periods at which students were provided the WIST, with time point 1 being initial testing, time point 2 being at an average of 6.74 months after receiving intervention, and time point 3 being at an average of 6.09 months after receiving intervention. The Standard Scores on the y-axis indicate average student growth in Standard Score points for time points 1, 2, and 3.

Gray Oral Reading Test - Fifth Edition

The same analyses were used to evaluate students GORT-5 ORI Standard Scores. There was a significant improvement in the scores from Time 1 (M = 78.66, SD = 8.30) to Time 2 (M = 82.42, SD = 10.69); t(49) = -3.76, p = .004, Cohen's d = 0.423. Another paired-samples t-test was conducted to compare GORT-5 ORI scores at Time 2 to scores six months later at Time 3. There was not a significant difference in the scores for Time 2 (M = 81.57, SD = 9.19) and Time 3 (M = 82.53, SD = 10.07); t(29) = -.77, p = .447, Cohen's d = 0.140. In these analyses, we see an initially significant and moderate improvement from Time 1 to Time 2 but then a leveling off of growth from Time 2 to Time 3. It is not known at this time whether children who continued in the intervention beyond a year would make further growth in the ORI standard scores.



Graph 1: This graph displays average growth on the Oral Reading Index of the Gray Oral Reading Test - Fifth Edition (GORT-5). The time points on the x-axis indicate the periods at which students were provided the GORT-5, with time point 1 being initial testing, time point 2 being at an average of 9.95 months after receiving intervention, and time point 3 being at an average of 7.50 months after receiving intervention. The Standard Scores on the y-axis indicate average student growth in Standard Score points for time points 1, 2, and 3.

These results should be interpreted with a few important contextual factors in mind. Oftentimes students who are experiencing growth will stop the intervention after they have achieved a sufficient amount of growth. This fact will introduce a conservative bias into these results because we cannot know what the growth of these children would have been if they had continued in intervention. These results should also be interpreted with the understanding that any increase in Standard Score (SS) is representative of a child making more growth than their peers, also known as “catch-up” growth. Since the Standard Scores for the WIST and GORT-5 are normed by age, we would expect a child with typical development with a SS = 100 to score around a SS = 100 six months later, and again six months after that. A child who has a SS = 90 who achieves a SS = 100 six months later has therefore achieved more growth than their age-matched peers. For many children with learning differences, continuing with a stable standard score means they made the expected amount of growth compared to their peers and that is a notable achievement for many children who struggle with learning to read. Thus, the fact that catch-up growth was observed for all time periods on the WIST Fundamental Literacy Index and for the first time period on the GORT-5 Oral Reading Index is a notable finding.

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