A Scientific Learning White Paper

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Access to Reading: The Language to Literacy Link

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Introduction

The National Institute of Child Health and Human Development (NICHD) has been studying normal reading development and reading difficulties for more than 45 years. Researchers have studied more than 10,000 children nationwide and followed some children for as long as 15 years. Their results indicated that up to 50 percent of our nation's children find reading a formidable challenge.[1] The NICHD, along with many other researchers, have concluded that broad based language skills, in particular, grammar and listening comprehension, are consistently strong predictors of later reading difficulty.[2]

Why are oral language and reading disorders so closely linked?

Historically, reading disorders have been diagnosed and treated as categorically separate and distinct from other learning disabilities.[3] Theorists have long speculated different etiologies for reading impairment, based on developmental or genetic factors. However, despite the differences in etiologic theory, researchers, educators, and therapists have long recognized the strong correlation between reading and language disorders.[4] This relationship is evident not only in children with reading disorders, but also in adults who, because of strokes or other forms of brain damage, lose their ability to understand and use language along with their ability to read. In fact, a conventional diagnostic term for reading disability in children, dyslexia, is derived from the term for adult reading disorder, alexia, a disorder caused by known brain damage. Knowledge of how the human brain is organized for language and reading processes helps to explain the oral language and reading link.

For most of us, language is a primarily left hemisphere function. Regions of the left hemisphere's frontal and temporal lobes—plus the fiber tracts that link the two areas together—are active in most complex language activities. When any of these areas is damaged, language disorder (aphasia) results. Not surprisingly, most adults who suffer a left hemispheric stroke or other aphasia-causing brain damage also experience problems with reading (alexia).[5] Stated another way, damage to the brain that causes language problems most often also causes reading disorders. The simple explanation for this phenomenon, and one that has been accepted among neuropsychologists and speech-language pathologists for decades, is that reading ability is superimposed on language; the same brain regions that we use to learn and use language are also those we use when we later learn to read. Reading is, after all, written language. It comes as no surprise that children who have trouble learning language (as compared with their same-age peers), regardless of what the cause might be, also have trouble learning to read.

Building blocks of oral language development and reading

When a child enters the human world at birth, he or she is immediately bombarded with sound, much of which is oral language. The environment of an infant is filled with adults and other children who are constantly talking to him or her, talking about him or her, and talking about his or her world. The infant quickly learns to categorize these speech sounds into familiar units and patterns that recur frequently. By doing this, the infant figures out which sounds seem to signal differences in meaning (phonemes). At around six months of age the child begins to babble; he or she is practicing producing those sounds he or she has heard. Gradually the child learns how the sounds are combined into meaningful groups. By one year of age, most children have figured out several sound groupings well enough that they begin to produce single words like "Mama" and "Dada." Although these first word approximations are usually not perfect imitations of the words the child has heard, the child has been able to extract enough of the elements signaling meaning that adults fully understand what the child is trying to say. Gradually the child learns how sounds combine to form new words and how words combine to form different meanings (semantics). Later still, the child learns how to combine words and word endings into phrases and sentences (syntax), and how to use language to communicate needs, make requests, get information, and so on (pragmatics). By the time a child is two, early combinations of two words are used to serve a variety of functions, and by three years of age the child is using short grammatical sentences. For many children, the ability to acquire these building blocks of language is natural and

effortless, and all four areas—phonology, semantics, syntax, and pragmatics— combine to make the child a successful communicator on entering school at age five. For children who have acquired language effortlessly, their solid foundation of language prepares them well for their next challenge, learning to read.

For most children, learning to read is not as effortless and natural as learning to talk. For one thing, unlike oral language, reading usually has to be taught. Children raised in cultures without access to formal education usually do not learn to read and remain illiterate through adulthood.[6] Reading also involves higher-level language and thinking skills (metalinguistic skills). Literally, the term "metalinguistic" means "thinking about language." These metalinguistic skills include the ability to understand that words can be broken down into smaller parts, like syllables, as well as the ability to understand that words have sound patterns that match other words, such as beginning sounds (peas, porridge in the pot) and rhymes (the cat in the hat). For alphabetic languages like English, preschool helps children develop phonological awareness, which forms the foundation of phonemic awareness (the understanding that words are made up of sequences of phonemes that correspond to letters and letter combinations). Phonemic awareness is the key to understanding the alphabetic principle: that letters represent the sounds of words. Using these metalinguistic skills, the child is taught phonics (instructional practices that stress sound-letter relationships) and thereby learns to decode—or sound out—words.

Although phonemic awareness is critical to learning to decode words, a child must also learn to comprehend the words he reads. This ability requires accurate decoding as well as a solid vocabulary and understanding of grammar. Phonemic awareness alone is not enough to support reading comprehension. Research points to the importance of both oral vocabulary[7,8] and high-level language skills[9] in building reading comprehension. It follows logically, when all of these language capacities are considered, that effective reading accuracy, speed, and comprehension—at any age—require a solid oral language foundation. Regardless of the cause, a child who tries to superimpose reading on a limited or immature language base, whether due to phonological, semantic, or syntactic limitations, will experience some degree of failure.

What types of remediation work?

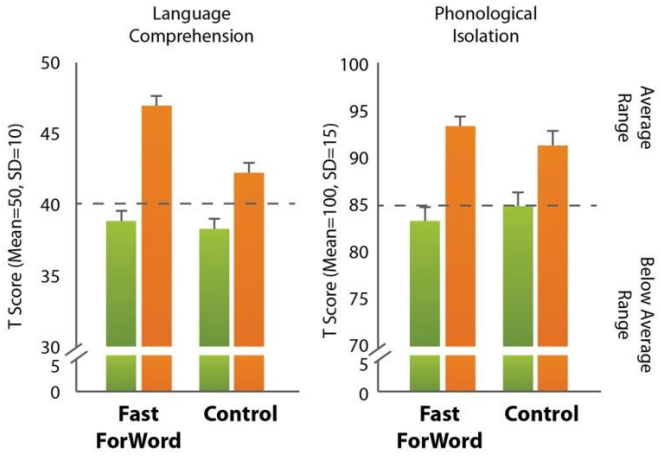
In theory, if there is a strong correlation between the many children with a weak language foundation and those with reading difficulties, we could prevent many reading problems with adequate language models provided at an early age. Unfortunately, the answer does not appear to be that simple. So far, traditional speech-language therapy and other classroom interventions that provide a rich language environment have not been shown to reduce the risk of reading difficulty.[10,11] Although the reasons are unclear, it may be that these methods are too limited in scope and effect to cover all of the prerequisite language abilities needed to support reading success. Similarly, there is evidence that phonological awareness training alone, although useful for increasing decoding skills in young children, is insufficient for increasing reading-comprehension skills among children at risk for reading failure.[12] Reading research repeatedly points to the importance of a broad range of language skills—phonologic, semantic, syntactic, and metalinguistic, as well as good verbal working memory—as a foundation for successful reading.

The Fast ForWord family of products, produced by Scientific Learning Corporation, is one broad-based, intensive program that incorporates the known language bases required for successful reading. These programs are based on years of psychoacoustic and brain-plasticity research at two major American universities. To date, research on thousands of children nationwide has confirmed the value of these training programs in treating a broad range of phonologic and language impairments and well as in enhancing both phonological awareness skills and the language comprehension skills so critical to reading success.

Summary of research findings with the Fast ForWord program

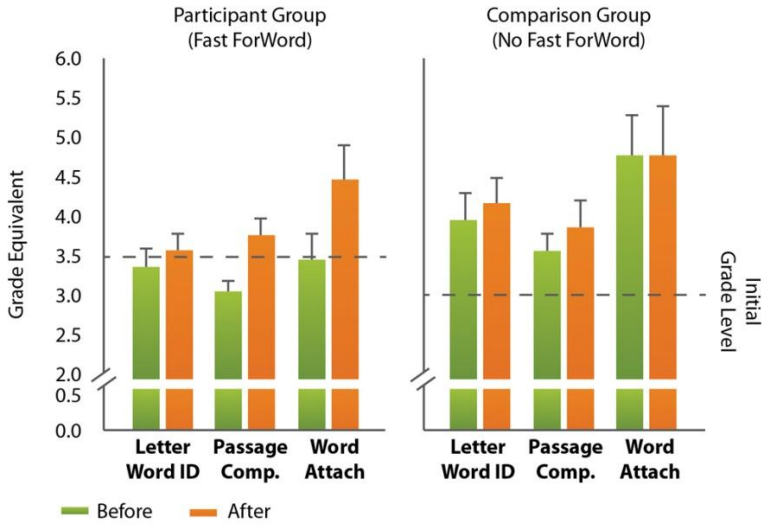
The Fast ForWord products have been demonstrated to be highly efficacious broad-based remediation programs that significantly enhance the language abilities that underlie reading skills. Data have shown a potential 1- to 2-year average language and reading gain across diagnostic categories, remediation environments, and research designs. Studies in which control groups have been compared to Fast ForWord have shown that the program is significantly more effective in increasing receptive language abilities than a regular academic curriculum. Furthermore, Fast ForWord products have been shown to enhance phonological awareness skills, generally regarded as the best predictor of reading achievement. In addition, Fast ForWord use has resulted in increases in reading comprehension, letter and word reading, and word-attack skills. Findings have been replicated in independent investigations as well. There is a wealth of research available on SciLEARN.com in the Results section.

1. ***Phonological Awareness and Language Comprehension***
   452 children in classrooms at 9 U.S. elementary school districts were identified by their teachers as being “at-risk” for failure in reading and language arts. Standardized testing revealed that these children scored well below age expected levels of performance and lower in language comprehension and phonological awareness than in word reading ability. Fast ForWord products were administered with 288 of them; 164 children served as controls. The treatment group worked at training exercises for 100 minutes/day for an average of about 30 school days. There were statistically significant changes for the Fast ForWord group over the control group in language comprehension and phonological isolation, both skills required for early reading. More than 70% of the group that used Fast ForWord showed a significant improvement in language comprehension, with an average 1.8 years in language-age advancement over their pre-training performance.



2. ***Passage Comprehension, Word Attack, Phonological Memory***
   Fifty-four students participated in this study and had pre- and post-participation data available for analysis. Fifteen of the study participants did not use the Fast ForWord products and served as a comparison group. Students used the products for 50 minutes per day, 5 days a week for eight to twelve weeks. Overall, students who used Fast ForWord products achieved significant improvements on their cognitive and early reading skills. Before using the products, students in the participant group were, on average, performing at a mid-third grade level. Three months later, they were performing at a low-fourth grade level. Post hoc analyses were used to evaluate individual subtests. These analyses showed that students who used the Fast ForWord products made significant improvements on three of the four subtests (Passage Comprehension, Word Attack, and Phonological Memory), while the comparison group only achieved significant improvements in Phonological Memory.

Improved Early Reading Skills



Standard scores from before and after participation on the Fast ForWord products show that, on average, students made significant improvements in their early reading skills.

References

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