Results of Fast ForWord Training
for Children with Language and Reading Problems

National Field Trial Results
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## The National Field Trial Results

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Introduction

Of the more than 50 million children enrolled in the nation's public and private elementary and secondary schools, the National Institute of Health estimates that between 20 and 40% experience significant difficulty with language or reading.

The National Field Trial Results described herein offer detailed evidence that Fast ForWord, a CD-ROM and Internet-based training program, can help children rapidly and effectively improve language skills necessary for learning to read or becoming a better reader.

The results of this field trial offer external scientific evidence that Fast ForWord not only improves language skills, but also positively impacts broader skills fundamental to academic success.
**Background**

Scientific Learning Corporation (SLc) was founded in 1996 to develop scientifically validated programs and services to improve human learning and performance. Basing its efforts on over 25 years of neuroscience research by its principal scientists, Scientific Learning has developed integrated technologies to create advanced training programs for individuals with language and reading problems.

Scientific Learning’s pioneering Fast ForWord family of training programs, introduced in 1997 and offered primarily to children ages 4 to 14, employs patented methods and systems and has been used by thousands of individuals with language and reading problems. On average, children with language and reading problems make language gains of 1.5 to 2 years after 4 to 8 weeks of Fast ForWord training. Hundreds of public and private schools have used Fast ForWord training, with its scientifically validated results, daily monitoring and feedback on each child’s progress.

In 1994 and 1995, founding SLc scientists from the University of California San Francisco (UCSF) and Rutgers University conducted initial controlled studies to measure the effectiveness of the technology, methods and applications that formed the basis of Fast ForWord. Their clinical results, published in the January, 1996 issue of the prestigious peer-reviewed journal *Science*, demonstrated rapidly improved language skills, including auditory processing speed, speech discrimination, phonemic and phonological awareness, grammatical and syntactic comprehension, overall language comprehension and other receptive and expressive language skills.
The National Field Trial
Fast ForWord underwent further external evaluation when the National Field Trial was conducted in 1996 by SLC in collaboration with over 60 independent professionals at 35 sites across the United States and Canada. An important objective of the study was to confirm that Fast ForWord would be successful in broader, real-world settings. The results from the Field Trial confirmed the results of the joint UCSF-Rutgers studies but with a much larger sample, including hundreds of children. At each site, independent speech and language professionals and other educational professionals selected students, 4 to 14 years old, who exhibited difficulties with either listening or language comprehension skills. These professionals administered the Fast ForWord program to the children in a conventional clinic, private practice, school, or home setting.

In addition to the National Field Trial, Scientific Learning conducted a study using a randomized control group. The study included over 400 students in 19 public schools in the fall of 1997. Data from that study also confirmed the earlier conclusions resulting from the research studies reported in Science and the National Field Trial results reported here.

In all, almost 1,000 children have received Fast ForWord training in research settings, with independent pre- and post-assessment testing. To our knowledge, Fast ForWord has been subjected to the most extensive testing and scientific examination of any language program in the field of education. As a result, many other researchers are using Fast ForWord in their own studies.
The Findings
In the National Field Trial, each of the 35 sites reported conclusive validation of Fast ForWord’s effectiveness. Of the children who participated in the Field Trial, 90% achieved significant gains in one or more tested areas. Most made statistically significant gains in multiple tested areas, including improvements in auditory word discrimination, the ability to follow spoken directions, listening and speaking fundamentals, auditory processing speed, speech discrimination, language processing, grammatical comprehension and overall language comprehension. These results indicate an enormous potential for benefits across a broad population of children with language and reading problems.

Fast ForWord: Language Gains and Reading
In Learning to Read: A Call from Research to Action, G. Reid Lyon, Ph.D., Chief, Child Development and Behavior Branch and Director, Research Programs in Learning Disabilities, Language Disorders, Disorders of Attention, and Developmental Neuroimaging, National Institute of Child Health and Human Development, National Institutes of Health, published findings that support the link between fundamental language skills and reading:

"A child who does not recognize and process word sounds accurately will not be able to make the right associations between letter representations and spoken language. Understanding sounds as they are represented in written form — called decoding — is an essential reading skill. To learn to read English, children must associate the 44 sounds of spoken English that can change meaning (phonemes) with the 26 letters of the alphabet. This requires a child to understand that words can be broken down into small sounds, or phonemes (phonemic awareness), and that the minute sounds are represented by letters. If a child cannot identify these sounds in spoken words, if he cannot hear the “at” in “cat” or “bat,” and hear that the difference lies in the first sound, he will have difficulty with decoding and thus reading.”

(Lyon, 1998)
Phonemic awareness is part of a broader skill set called phonological awareness, which is the ability to recognize and use all sizes of sound units, such as words, syllables and phonemes. A student is said to have a phonological processing problem when he or she has difficulty perceiving, decoding, remembering, organizing and retrieving verbal information — these key areas, examined by the National Field Trial, are where skill levels of students with reading difficulties may differ from those of other students.

In the recent study conducted by The National Research Council (NRC), *Preventing Reading Difficulties in Young Children*, National Research Council, National Academy of Sciences, Committee on the Prevention of Reading Difficulties in Young Children; Snow et al., 1998), well-known experts in the fields of language and reading define phonemic and phonological awareness as necessary skills for learning to read:

"On average, phonological awareness has been as strong a predictor of future reading as memory for sentences and stories, confrontation naming, and general language measures... the theoretical and practical importance of phonological awareness for the beginning reader relies not only on logic, but also on the results of decades of empirical research. Early studies showed a strong association between a child's ability to read and the ability to segment words into phonemes (Liberman et al., 1974). Dozens of subsequent studies have confirmed that there is a close relationship between phonemic awareness and reading ability, not just in the early grades but throughout school years... furthermore, even prior to formal reading instruction, the performance of kindergartners on tests of phonological awareness is a strong predictor of their further reading achievement." (Snow et al., 1998)

The correlation between phonemic awareness and reading is further supported by the National Research Council:

"Because phonemes are the units of sound that are represented by the letters of an alphabet, an awareness of phonemes is key to understanding the logic of the alphabetic principle. Unless and until children have a basic awareness of the phonemic structure of language, asking them for the first sound in the word 'boy', or expecting them to understand that 'cap' has three sounds while 'camp' has four, is to little avail." (Snow et al., 1998)
The National Field Trial results show gains in phonemic awareness and phonological awareness, indicating that children with language and reading problems can significantly improve their reading skills by training with Fast ForWord.

It is widely recognized in the reading research community that oral language comprehension is critical for learning to read and that competent reading is essential for all learning. According to the NRC study, Preventing Reading Difficulties in Young Children, reading is closely associated with academic success.

“The academic success, as defined by high school graduation, can be predicted with reasonable accuracy by knowing someone’s reading skill at the end of grade 3. A person who is not at least a modestly skilled reader by the end of third grade is quite unlikely to graduate from high school... when teachers are asked about the most important goal for education, over half of elementary school teachers chose ‘building basic literacy skills’.” (Snow et al., 1998)

Language skills are simply fundamental to a child’s academic and social growth. Along with oral language gains, educators find that after Fast ForWord training, students have significantly improved the foundation skills needed to learn to read or become a better reader. Parents and teachers report that after Fast ForWord, children show new self-confidence and higher self-esteem in non-academic settings; attention skills improve, and behavior problems are often reduced.

Not surprisingly, the National Research Council has recommended that:

“...public authorities and education professionals provide research-derived guidelines for parents, pediatrics, and pre-school professionals so that children who have a hearing or language impairment or who lack age-appropriate skills in literacy-related cognitive-linguistic processing are identified as early as possible and given intervention to support language and literacy development.” (Snow et al., 1998)

Fast ForWord can be a powerful intervention method for many children with language and reading problems. The benefits span a broad range of functional areas, as evidenced by the following test-by-test results.
National Field Trial Test Results

Auditory Word Discrimination: Improvements in Average Performance

The Goldman Fristoe Woodcock Test of Auditory Discrimination (GFW) measures a child's ability to distinguish words that sound alike (such as "rake" and "lake" or "cat" and "cap") in both quiet and noisy situations. Performance on this test, designed for ages 3 years 8 months and older, indicates a child's ability to distinguish between similar-sounding words. 130 children completed the GFW Quiet Test, and 105 children completed the GFW Noise Test, before and after Fast ForWord.

Overall, children in the study demonstrated significant gains in the ability to discriminate between similar sounding words in both quiet and noisy situations following Fast ForWord training. Their auditory word discrimination skills improved from well-below-average to average ranges, demonstrating that the Fast ForWord exercises have a significant impact on a child's ability to distinguish between similar-sounding words -- a key skill lacking in many children with language and reading problems.

![Fast ForWord National Field Trial](image.png)

Mean Improvements on the GFW Test of Auditory Discrimination

- **Quiet**
- **Noise**

---

**Average**

**Below Average**
Auditory Word Discrimination:
Improvements Compared to Normal Distribution

Prior to Fast ForWord training, the auditory word discrimination skills of children who participated in the study resembled those of a below-average population. Only 7% of the children scored at or above the level expected for their age on the Goldman Fristoe Woodcock Quiet Test. After Fast ForWord training, 39% of the children scored at or above the level expected for their age, placing their performance well within the normal distribution. Children who participated in the study, as a group, now exhibit auditory word discrimination skills that are more likely to lead to success in learning to read or becoming a better reader.
Auditory Word Discrimination: The Link to Reading

The National Institute of Child Health and Human Development (NICHD) emphasizes that:

"Auditory word discrimination skills are necessary to help children with language and reading problems recognize distinctions among similar word sounds and understand why their representations in letters are different." (Lyon, 1998)

Dr. Lyon states in Learning to Read: A Call from Research to Action:

"Our NICHD research has taught us that in order for a beginning reader to learn how to connect or translate printed symbols (letters and letter patterns) into sound, the would-be reader must understand that our speech can be segmented, or broken into small sounds (phoneme awareness), and that the segmented units of speech can be represented by printed forms (phonics). This understanding is absolutely necessary for the development of accurate and rapid word reading skills. Children are not born with this insight, nor does it develop naturally without instruction." (Lyon, 1998)

Improvement on the GFW suggests that, among other skills, phonemic awareness is improved after Fast ForWord training. This result increases the probability that non-readers can acquire the skills needed to begin reading, or that poor readers can make significant improvements in their reading.
**Following Directions:**

*Improvements in Average Performance*

The Token Test for Children measures a child's ability to follow spoken directions. The directions range from simple commands ("Touch the red circle") to more complex procedures involving multiple steps ("Put the white square behind the yellow circle"). Performance on this test, designed for ages 3 years to 12 years 5 months, indicates a child's ability to comprehend, remember and execute directions. 329 children completed the Token Test before and after Fast ForWord.

Prior to Fast ForWord training, the children's ability to follow spoken directions was well below average -- almost two standard deviations below the mean for the test. After Fast ForWord training, the children's ability to follow spoken directions moved from below average to average, with an average gain of over one standard deviation on the Token Test. Improved ability to follow spoken directions indicates gains in skills such as working memory, event-sequencing, syntax, grammar and listening comprehension.

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**Average**

**Below Average**

*Before Training*  
*After Training*
Prior to Fast ForWord training, the Token Test scores of children who participated in the study were clustered below normal ranges, with only 13% of the children scoring at or above the standard mean as shown by the black bell-shaped curve. After Fast ForWord training, the children's overall performance was well within the normal distribution. Of these children, 45% scored at or above the standard mean or average for their age, showing improvements in processing speed, syntax and semantics, among other skills.

These results demonstrate that the Fast ForWord exercises have a measurable impact on receptive language skills, including working memory, event sequencing, and oral language comprehension.
Following Directions:
The Link to Reading

Many of the skills measured by the Token Test, such as working memory, syntax, grammar, language comprehension and attention, are intrinsic to reading. Findings from the National Research Council reinforce the impact of working memory and structural relations such as syntax and grammar on reading:

"...many early research reports called attention to the differences between good and poor readers in their comprehension and production of structural relations within spoken sentences." (Snow et al., 1998)

and-

"The ability to retain verbal information in working memory is essential for reading and learning, so it might be expected that verbal memory measures would be effective predictors of future reading achievement" (Snow et al., 1998)

The gains on the Token Test, therefore, suggest that Fast ForWord training increases the probability that non-readers can acquire the skills needed to begin reading, or that poor readers can make significant improvements in their reading.
**Overall Language Development:**

**Improvements in Language Fundamentals**

The Clinical Evaluation of Language Fundamentals (CELF-3) is a comprehensive test that measures a wide range of receptive and expressive language skills, including a child's ability to understand spoken words and sentences, follow directions, recall and formulate sentences, and understand relationships between words and categories. Performance on this test, designed for ages 6 to 21, indicates a child's abilities in everyday listening and speaking. Of the children tested with the CELF-3, 90 completed the CELF-3 receptive tests, and 77 children completed the CELF-3 expressive tests, before and after Fast ForWord.

On average, children in the study demonstrated significant gains in language fundamentals after Fast ForWord training. Both their listening and speaking skills improved and moved into or near the average range. 18 younger children who took a different version of the test, the CELF-P, showed similar gains.

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**Fast ForWord National Field Trial**

Mean Improvements on the CELF-3 Receptive and Expressive Tests

![Chart showing mean improvements on CELF-3 tests](chart.png)
Overall Language Development:
Improvements Compared to Normal Distribution

Prior to FastForWord training, the language skills of children who participated in the study were clustered below normal ranges. Only 5% of the children who completed the CELF-3 expressive tests and only 7% of the children who completed the CELF-3 receptive tests scored at or above the standard mean. After Fast ForWord training, the language skills of these children moved closer to the normal distribution of scores. Of the children tested, 20% scored at or above the standard mean on the CELF-3 expressive tests and 27% on the CELF-3 receptive tests.

These results demonstrate that Fast ForWord has a broad, positive impact on working memory, grammar, semantics, phonological awareness and syntax, all of which are critical for learning to read or becoming a better reader.
Overall Language Development: Improvements in Average Performance

The Test of Language Development, Primary (TOLD-P:2) is a comprehensive test that measures a child's ability to combine sentences, understand word meanings and sentence structures, and make generalizations. Performance on this test indicates a child's listening and speaking skills, as well as syntax, semantics, and phonological processing skills. 77 children completed the TOLD-P:2 test, before and after Fast ForWord.

Children in the study demonstrated significant improvements in multiple aspects of overall language development. Their listening, speaking, semantics, syntax, and phonological skills progressed into the average range.

Prior to Fast ForWord training, the children demonstrated below-average or low-average performance in most language areas. After Fast ForWord training, the children showed strong improvements in every language area. 55 older children who took a different version of the test (the TOLD I:2), showed similar gains.

![Fast ForWord National Field Trial](chart.png)

**Fast ForWord National Field Trial**
Mean Improvements on the TOLD-P:2 Test

![Bar chart showing improvements](chart.png)
Overall Language Development: Improvements Compared to Normal Distribution

Prior to Fast ForWord training, the language skills of children who participated in the study were clustered below normal ranges. Only 15% of the children who completed the TOLD scored at or above the standard mean. After Fast ForWord training, the language skills of these children more closely resembled the normal distribution of scores. Of the children tested, 42% scored at or above the standard mean or average performance level for their age.

These results demonstrate that Fast ForWord impacts multiple aspects of children's language skills: listening, speaking, syntax, and semantics.

Gains in measured skills within the TOLD tests, including phonological processing and sentence comprehension, further reinforce the association between improved language skills following Fast ForWord, and future success with reading.

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**Fast ForWord National Field Trial**

Improvements on the TOLD (combined scores)

The normal distribution is indicated by the bell-shaped curve.
Overall Language Development: 
Improvements by Children with Different Classifications

In addition to language difficulties, many of the children who participated in the Field Trial had other developmental problems or classifications. Examples include Pervasive Developmental Disorder (PDD), Attention Deficit Disorder (ADD), and Central Auditory Processing Disorder (CAPD).

Children with a classification of PDD, ADD, or CAPD were able to achieve significant gains in language with Fast ForWord training.

Prior to Fast ForWord training, the children with PDD, ADD, and CAPD had varying levels of language ability as demonstrated by language scores on the CELF and TOLD. The children with PDD, and a mean language score of 70, demonstrated the lowest level of ability, while the children with CAPD demonstrated the highest.

After Fast ForWord training, each group demonstrated significant improvements in language skills.
Overall Language Development: The Link to Reading

The results from the CELF (receptive and expressive) and the TOLD tests, including children with different classifications, demonstrate that Fast ForWord can have a substantial, positive impact on the language and reading skills of many children with varying language and reading problems, including those who may be struggling with multiple learning problems.

In Preventing Reading Difficulties in Young Children, the National Research Council emphasizes that working memory, grammar, semantics, phonological awareness and syntax are all fundamental to reading:

"Spoken Language and reading have much in common. If the printed words can be effectively recognized, comprehension of connected text depends heavily on the reader's oral-language abilities, particularly with regard to understanding the meanings of words that have been identified and the syntactic and semantic relationships among them." (Snow et. al., 1998)

According to the National Research Council:

"...Receptive language measures (sentence comprehension) that emphasize the understanding of complex syntactic and morphological forms have been more successful predictors than other (or unspecified) kinds of receptive measures." (Snow et. al., 1998)
Conclusions:
The results of the National Field Trial demonstrate that by using optimal learning techniques developed through decades of neuroscience research on how the brain learns, Fast ForWord training can help children with language and reading problems improve oral language skills necessary for learning to read or becoming a better reader. Substantial research findings from leaders in the reading and language community confirm that these oral language skills are critical for competent reading, and it is widely accepted that reading is essential for broader academic success.

References:


Citation of a reference does not imply any endorsement of the Fast ForWord program.

Note:
The number of children assessed by each test varies considerably because each professional assessed students on a pre- and post-training basis using their preferred measures from a selection of nationally-used standardized tests.