

**SCIENTIFICALLY BASED READING
RESEARCH AND THE *FAST FORWARD*
TRAINING PROGRAMS
IMPLICATIONS FOR EFFECTIVE LANGUAGE AND
READING INTERVENTION**

Background

The following report provides a description of the published research on the Fast ForWord training programs. The aim of the report is two fold. First, to provide this information within a framework consistent with the scientifically-based reading research as identified in the “No Child Left Behind” legislation. Second, to provide a descriptive summary of the relevant Fast ForWord research findings. As such, this process is dynamic and revisions of this framework are expected in the future. Please contact Scientific Learning Corporation for the most recent version of this document.

The No Child Left Behind Act of 2001 (P.L.107-110 (H.R.1)), Title I, Part B, Subpart 1 - Reading First, Section 1208 defines that Scientifically Based Reading Research (SBRR) is research that: 1) Applies rigorous, systematic, and objective procedures to obtain valid knowledge relevant to reading development, reading instruction, and reading difficulties;

The *Fast ForWord* training programs are based on 25 years of scientifically based research into the way the brain learns the language skills that create a strong foundation for reading and learning. The programs evolved from the work of noted neuroscience researchers: Drs. Michael Merzenich and Bill Jenkins from the University of California, San Francisco

Medical Center, and Drs. Paula Tallal and Steven Miller at Rutgers, The State University of New Jersey. Dr. Merzenich, who is a member of the National Academy of Sciences, and Dr. Jenkins, currently Senior V.P. of Product Development at Scientific Learning, are internationally known for their research in the science of brain plasticity, which is the concept that the brain changes as we learn new skills. Understanding brain plasticity has helped the development of improved learning strategies for children with language and reading problems. Drs. Tallal and Miller are experts in research on the neurological basis of language. Dr. Tallal is currently co-director of the Center for Molecular and Behavioral Neuroscience at Rutgers and an active participant on many scientific advisory boards and government committees for both developmental language disorders and learning disabilities. She has published over 150 papers on the topic of language and learning, and is the recipient of national and international honors. Dr. Miller has extensive experience in organizing clinical research studies and conducting longitudinal studies of children who have language and reading problems, and is currently Senior V.P. of Research at Scientific Learning.

The research collaboration of Drs. Merzenich, Jenkins, Tallal, and Miller resulted in a key finding: with the help of computers, phonemes and other speech sounds could be acoustically altered and successfully differentiated by children with language difficulties. Using this technology in an intensive, adaptive training program, the scientists discovered that students can develop a wide range of critical language skills including phonological awareness, phonemic awareness, fluency, vocabulary, comprehension, decoding, working memory, syntax, grammar and other skills

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necessary to learn to read or become a better reader. An optimal learning environment is based on scientifically-validated methods of learning developed by Drs. Merzenich and Jenkins, which includes motivation, intensity and frequency, and adaptivity.

2) Employs systematic empirical methods that draw on observation or experiment;

A *Controlled Randomized Clinical Trial* (1994-1995) was conducted at Rutgers University in Newark, New Jersey. The clinical results were published in the January 1996 issue of *Science*, a peer-reviewed journal (Tallal, et. al., *Science*. 271: 81-84). The early data showed rapid improvements in language skills with the research prototype of *Fast ForWord Language*, including significant gains in oral language comprehension, speech discrimination, grammar, and syntax.

A *Multi-Site Field Study* conducted in 1996 proved the results in a "real world" setting. In collaboration with over 60 independent professionals at 35 sites in the United States and Canada, after *Fast ForWord Language* training children experienced the same dramatic improvements in language as those who participated in the initial *Controlled Randomized Clinical Trial*. At each site, independent speech and language professionals or educators selected and administered *Fast ForWord Language* to students aged 4 to 14 who exhibited difficulties with either listening or language comprehension skills.

On average the 35 sites reported convincing evidence of the results that can be obtained through *Fast ForWord Language training*:

- 90% of the children experienced significant gains in one or more tested areas
- Most made significant gains in multiple areas, including phonemic awareness, listening, speaking, attention, language fundamentals, grammar, and ability to follow directions
- Gains were, on average, 1 to 2 years in the tested areas following 4 to 8 weeks of training.

A *School-Based Randomized Trial* held in the Fall of 1997 in collaboration with 19 schools in 9 districts in California, Texas, Illinois, Indiana, and Nebraska established the effectiveness of *Fast ForWord Language* in schools. The goal of this controlled study, which included over 400 students in kindergarten through 3rd grade, was to determine the effectiveness of *Fast ForWord Language* training for students who were "at-risk" for failure in reading and language skills. Classroom teachers selected the students who were at-risk and randomly assigned them to either the experimental group that trained with *Fast ForWord Language* or to the comparison group (matched to the experimental group by age and gender) that remained in the regular classroom and received non-*Fast ForWord Language* instruction. Data from the **School-Based Randomized Trial** confirmed the earlier conclusions that resulted from the initial *Controlled Randomized Clinical Trial* reported in the peer-review journal *Science* and the *Multi-Site Field Study*. Again, average gains in the **School-Based Randomized Trial** were 1 to 2 years on standardized measures of language comprehension or phoneme awareness following 4 to 6 weeks of *Fast ForWord Language training* (Miller et al., 1999).

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These consistent results indicate an enormous potential for language and reading gains across a broad population of students in many different settings.

3) Involves rigorous data analyses that are adequate to test the stated hypotheses and justify the general conclusions drawn;

For the *Multi-Site Field Study*, dependent t-tests were used to analyze differences between pre- and post-training test scores. The t-tests showed that the improvements students exhibited in the *Multi-Site Field Study* had less than a 0.1% probability of being due to chance.

For both the *Multi-Site Field Study* and the *School-Based Randomized Trial*, an *Analysis of Variance* was used to compare the different sub-groups. For example, in the *Multi-Sited Field Study*, low-achieving students with central auditory processing deficits (CAPD) or pervasive developmental disabilities (PDD) achieved benefits that were not statistically different from the benefits achieved by the rest of the students who trained. In the *School-Based Randomized Trial*, a control group was used to evaluate the results from the students who trained on *Fast ForWord Language*. On the language and phonological tests, both the control and *Fast ForWord Language* groups showed improvements, but the improvement of the *Fast ForWord Language* group was statistically larger.

4) Relies on measurements or observational methods that provide valid data across evaluators and observers and across multiple measurements and observation;

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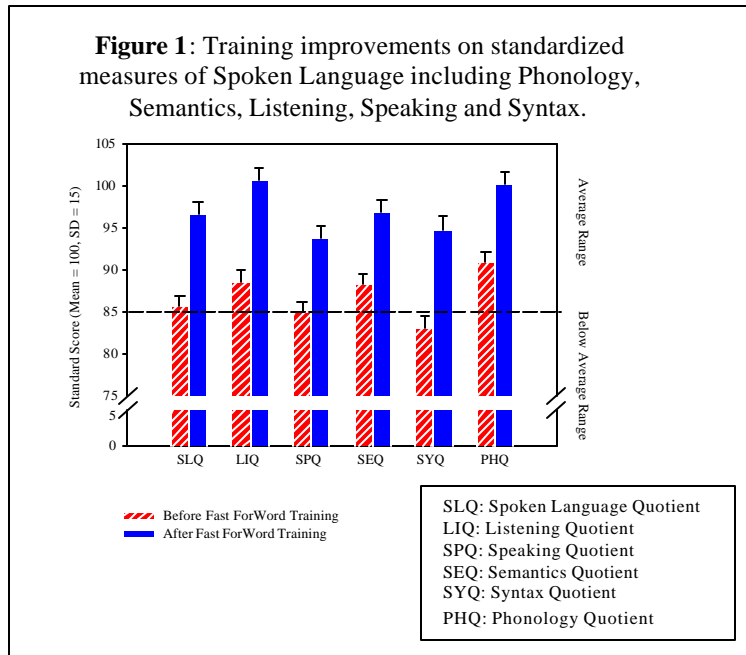
For the *Multi-Sited Field Study*, the following standardized tests were used:

- Test for Auditory Comprehension of Language-Revised (**TACL-R**),
- Clinical Evaluation of Language Fundamentals: 3, Preschool, Revised (**CELF-3, CELF-P, CELF-R**),
- Test of Language Development I:2, P:2 (**TOLD I:2, TOLD P:2**),
- Goldman Fristoe Woodcock Test of Auditory Discrimination (**GFW**),
- Token Test for Children (**TOKEN**),
- Lindamood Auditory Conceptualization Test (**LAC**),
- Test of Auditory Perceptual Skills (**TAPS**), and
- A Screening Test for Auditory Processing Disorders (**SCAN**)

An example of results:

***FAST FORWORD LANGUAGE MULTI-SITE FIELD TRIAL:
MEAN IMPROVEMENTS ON A COMPREHENSIVE BATTERY OF
LANGUAGE MEASURES (TOLD-P:2)***

Before *Fast ForWord Language* training, 77 students demonstrated below-average or low-average performance in most language areas. On average, after *Fast ForWord Language* training, the students 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. (See Figure 1)



For the *School-Based Randomized Trial*, the following standardized tests were used:

- The Test for Auditory Comprehension of Language-Revised (**TACL-R**),
- The Phonological Awareness Test (**PAT**)
- The Woodcock Johnson Revised Achievement Battery (**WJR**)

5) Has been accepted by a peer-reviewed journal or approved by a panel of independent experts through a comparably rigorous, objective, and scientific review.

This bibliography provides a listing of original research material, as well as reviews, on theory and practice relating to the *Fast ForWord* programs. It includes the work of researchers both associated and not associated with Scientific Learning. Scientific Learning supports research about the *Fast ForWord* programs through collaborations, staff support, monetary and in-kind donations. Scientific Learning encourages the publication of the research it supports; the researchers with whom Scientific Learning is associated are not required to obtain Scientific Learning's approval of their publications.

FAST FORWORD RESEARCH STUDIES

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- Note 1.** In the interest of full disclosure, this bibliography describes the relationship between Scientific Learning and the authors of each of the works listed, together with an indication of any support Scientific Learning may have provided for the study using the following notations.
- [§]Monetary donation to the laboratory conducting the research. [¶]Donation of product.
- [§]Staff support (includes recruiting study participants).
- [©]Consulting: The author provided consulting services to, and received fees for those services from, Scientific Learning at the time of the study.
- ^DDeveloper. The author played a critical role in the development of one or more of the programs studied in the article and receives payment that is directly or indirectly related to the sale of the program studied in the article (e.g., royalties).
- ^EEmployee. The author was a Scientific Learning employee at the time of the study.
- Note 2.** This bibliography includes selected references relating to the Fast ForWord training programs. The inclusion of a reference does not imply an endorsement of Scientific Learning products by the author or any affiliation between Scientific Learning and the author(s).

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