

# Improved Language Skills by Students with Developmental Delays who used Fast ForWord® Products

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## ABSTRACT

**Purpose:** This study investigated the effects of the Fast ForWord products on the language skills of students with developmental delays who used the products within a school or clinic setting. **Study Design:** The design of this study was a case study using nationally normed assessments. **Participants:** Study participants were students classified with mild to moderate cognitive delays or diagnosed with an autism spectrum disorder (ASD). **Materials & Implementation:** Following staff training on the Fast ForWord products, students used the products and had their language ability assessed with the Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3) or the Test of Language Development (TOLD). Some students were also evaluated using the Goldman-Fristoe-Woodcock Test of Auditory Discrimination (GFW). **Results:** Overall, students with developmental delays improved significantly in language ability following use of the Fast ForWord products. On average, students evaluated on the Quiet and Noise subtests of the GFW showed significant gains, improving from the 6<sup>th</sup> percentile to the 27<sup>th</sup> percentile on the Quiet subtest and from the 5<sup>th</sup> percentile to the 31<sup>st</sup> percentile on the Noise subtest. Significant gains were also observed on both the receptive and expressive portions of the CELF and TOLD.

**Keywords:** observational study, cognitive delays, autism spectrum disorders (ASD), Fast ForWord Language, Fast ForWord Language to Reading, Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3), Test of Language Development (TOLD), Goldman-Fristoe-Woodcock Test of Auditory Discrimination (GFW).

## INTRODUCTION

Numerous research studies have shown that cognitive and oral language skills are under-developed in struggling readers, limiting their academic progress (Lyon, 1996). University-based research studies reported the development of a computer software product that focused on learning and cognitive skills, and provided an optimal learning environment for building the memory, attention, processing and sequencing skills critical for reading success (Merzenich et al., 1996; Tallal et al., 1996). This prototype of the Fast ForWord Language software showed that an optimal learning environment and focus on early reading and cognitive skills resulted in dramatic improvements in the auditory processing and language skills of school children who had specific language impairments (Merzenich et al., 1996; Tallal et al., 1996) or were experiencing academic reading failure (Miller et al., 1999).

Numerous school districts have carried out studies showing strong improvement in the reading skills of their students following product use. This particular study uses data from a variety of clinics and districts to evaluate the effectiveness of this optimal learning

environment with a focus on early reading and cognitive skills as a way to improve the language achievement and early reading skills of students with developmental delays. In this study, commercially available computer-based products (Fast ForWord Language and ForWord Language to Reading) were used to evaluate the effectiveness of this approach for improving the language skills of students who were classified with mild to moderate cognitive delays or diagnosed with an autism spectrum disorder (ASD).

## METHODS

### Participants

This report focuses on the results from two studies: participants in Study 1 had mild to moderate cognitive delays, and Study 2 had participants diagnosed with an autism spectrum disorder (ASD).

Study 1: Twenty-nine students participated in this study, 24 with mild cognitive delays and 5 with moderate cognitive delays. The average age of the students was 10 years, 6 months. The students' language skills were assessed using the Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3) before and after Fast ForWord participation.

Study 2: One hundred and twenty-eight students with an autism spectrum disorder (ASD) had their language abilities evaluated with the Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3) or the Test of Language Development (TOLD). Some students were also evaluated using the Goldman-Fristoe-Woodcock Test of Auditory Discrimination (GFW).

In both studies, school or clinic personnel administered the assessments and reported scores for analysis.

### Implementation

Educators and clinicians were trained in current and established neuroscience findings on how phonemic awareness and the acoustic properties of speech impact rapid development of language and reading skills; the scientific background validating the efficacy of the products; methods for assessment of potential candidates for participation; the selection of appropriate measures for testing and evaluation; effective implementation techniques; approaches for using Progress Tracker reports to monitor student performance; and techniques for measuring the gains students have achieved after they have finished using Fast ForWord products.

### Materials

The Fast ForWord products are computer-based products that combine an optimal learning environment with a focus on early reading and cognitive skills. The products used by the students, Fast ForWord Language and Fast ForWord Language to Reading, include five to seven exercises designed to build skills critical for reading and learning, such as auditory processing, memory, attention, and language comprehension. While there are differences between these products, both help develop certain critical skills as detailed in the following exercise descriptions.

*Circus Sequence<sup>1</sup> and Trog Walkers<sup>2</sup>*: Students hear a series of short, non-verbal tones. Each tone represents a different fragment of the frequency spectrum used in spoken language. Students are asked to differentiate between these tones. The exercises improve working memory, sound processing speed, and sequencing skills.

*Old MacDonald's Flying Farm<sup>1</sup>*: Students hear a single syllable that is repeated several times, and then interrupted by a different syllable. Students must

respond when they hear a change in the syllable. This exercise improves auditory processing, develops phoneme discrimination, and increases sustained and focused attention.

*Phoneme Identification<sup>1</sup>, Polar Cop<sup>2</sup>, and Treasure in the Tomb<sup>2</sup>*: Students hear a target phoneme, and then must identify the identical phoneme when it is presented later. These exercises improve auditory discrimination skills, increase sound processing speed, improve working memory, and help students identify a specific phoneme. *Polar Cop* also develops sound-letter correspondence skills. *Treasure in the Tomb* also develops grapheme recognition.

*Phonic Match<sup>1</sup> and Bug Out<sup>2</sup>*: Students choose a square on a grid and hear a sound or word. Each sound or word has a match somewhere within the grid. The goal is to find each square's match and clear the grid. The *Phonic Match* exercise develops auditory word recognition and phoneme discrimination, improves working memory, and increases sound processing speed. The *Bug Out!* exercise develops skill with sound-letter correspondences as well as working memory.

*Phonic Words<sup>1</sup>*: Students see two pictures representing words that differ only by the initial or final consonant (e.g., "face" versus "vase", or "tack" versus "tag"). When students hear one of the words, they must click the picture that matches the word. This exercise increases sound processing speed, improves auditory recognition of phonemes and words, and helps students gain an understanding of word meaning.

*Language Comprehension Builder<sup>1</sup>*: Students listen to a sentence that depicts action and complex relational themes. Students must match a picture representation with the sentence they just heard. This exercise develops oral language and listening comprehension, improves understanding of syntax and morphology, and improves rate of auditory processing.

*Block Commander<sup>1</sup>*: In Block Commander, a three-dimensional board is filled with familiar shapes that students select and manipulate. The students are asked to follow increasingly complex commands. This exercise increases listening comprehension, improves syntax, develops working memory, improves sound processing speed, and increases the ability to follow directions.

*Start-Up Stories<sup>2</sup>*: Students follow increasingly complex commands, match pictures to sentences, and answer multiple-choice questions about stories that are presented aurally.

<sup>1</sup> Exercise from the Fast ForWord Language product.

<sup>2</sup> Exercise from the Fast ForWord Language to Reading product.

**Assessments**

Before and after Fast ForWord participation, students in Study 1 were assessed with the Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3). Students in Study 2 were assessed with the Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3), the Test of Language Development (TOLD), and/or the Goldman-Fristoe-Woodcock Test of Auditory Discrimination (GFW).

**Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3):** The CELF-3 is a comprehensive language test widely used to measure a child’s ability to understand words and sentences, follow directions, recall and formulate sentences, and understand relationships between words and categories. The Institute for the Development of Educational Achievement, in accordance with the Reading First legislation, determined that the CELF-3 subtests are appropriate outcome assessments for accurately measuring improvement in the vocabulary skills of children in early elementary school. As defined by the Reading First legislation, vocabulary skills are an essential component of early reading.

Performance on this test can be reported in terms of two subtest scores or composite scores: the *Receptive Language Score*, and the *Expressive Language Score*. Alternatively, these two composites can be combined to yield the *Total Language Score*.

**Test of Language Development (TOLD):** The TOLD is a comprehensive test of language skills of children. It is designed to measure a child’s language development by assessing the ability to understand word meanings and sentences and the relationships between words. It measures a child’s listening, organizing, speaking, semantics, and syntax abilities.

**Goldman-Fristoe-Woodcock Test of Auditory Discrimination (GFW):** The GFW is a screening measure of speech sound discrimination ability for students in quiet and noisy situations. Words are presented by means of a cassette tape in the absence of any noise and also in the presence of distracting background noise. The student hears a word and then points to a picture. Similar words such as lake, make, rake, and wake are presented as foils.

**Analysis**

Scores were reported in terms of standard scores for the Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3), the Test of Language Development (TOLD), and/or the Goldman-Fristoe-Woodcock Test of Auditory Discrimination (GFW). Age equivalents were also reported for the CELF-3 and the TOLD. Standard scores were analyzed using a p-value of less than 0.05 as the criterion for identifying statistical significance.

**RESULTS**

**Assessment Results: Study 1**

**Clinical Evaluation of Language Fundamentals-Third Edition (CELF-3):** Before Fast ForWord participation, on average, 29 students with mild or moderate cognitive delays had language skills that were well below the average range. After using the

Fast ForWord products, the students, on average, made significant improvements in both their receptive and expressive language skills (Figure 1).

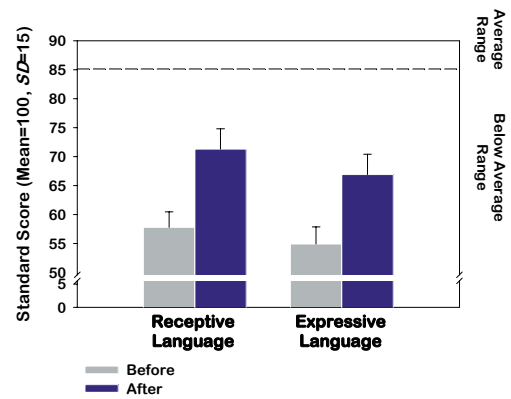


Figure 1. On average, students with mild to moderate cognitive delays significantly improved in language ability after Fast ForWord participation. Results from 29 students are shown.

**Assessment Results: Study 2**

The language skills of 128 students with ASD were evaluated using the CELF-3 or the TOLD. After using Fast ForWord products, the students demonstrated significant improvements in their language skills (Figure 2).

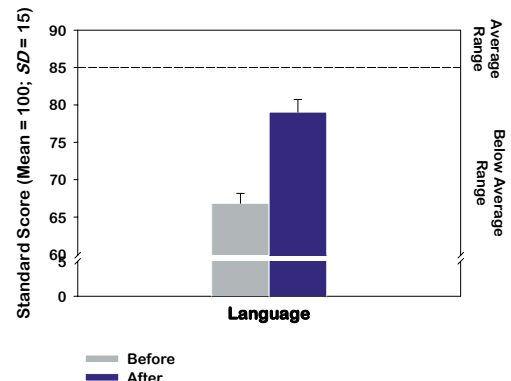


Figure 2. Language skills improved significantly for students with ASD after Fast ForWord use. Results from 128 students are shown.

The improvements were evident in both receptive and expressive language skills. Ninety-four students for whom both receptive and expressive language scores were available improved an average of two-thirds to one standard deviation with language skills improving from an initial average of the first percentile to a final level of the fifth to tenth percentile for expressive and receptive language, respectively (Figure 3).

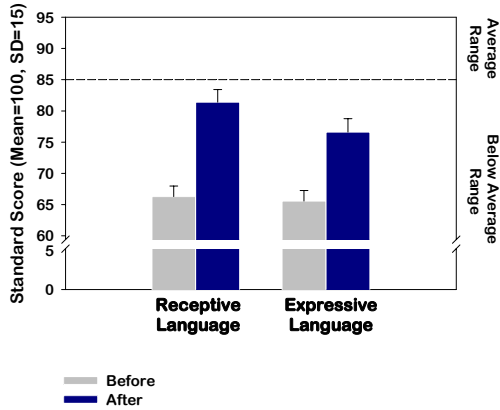


Figure 3. Students with ASD improved in both expressive and receptive language. Results from 94 students are shown.

**Goldman-Fristoe-Woodcock Test of Auditory Discrimination (GFW):** Some students with ASD were also evaluated with the Noise and Quiet subtests of the GFW. Results show that, on average, students with ASD achieved significant improvements in auditory discrimination in both noisy and quiet settings (Figure 4).

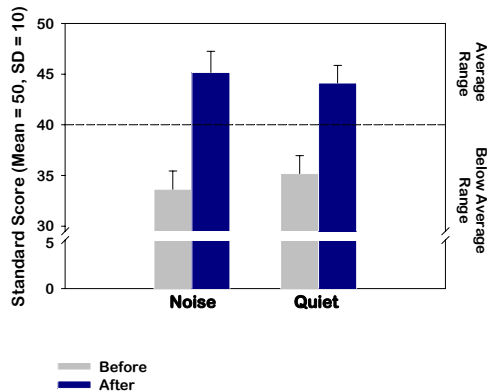


Figure 4. Following Fast ForWord participation, students with ASD reached the average range of auditory discrimination for both noisy and quiet settings. Results from 47 students are shown.

## DISCUSSION

Students classified with mild to moderate cognitive delays or autism spectrum disorders made significant gains in language ability after using Fast ForWord products. Both groups of students made significant gains in expressive and receptive language skills. Following Fast ForWord participation, students with ASD reached the average range in auditory discrimination skills and their overall language ability improved by approximately one year.

The results from the students with ASD are similar to those reported by Merzenich et al (1999). Reporting on a group of 29 students, ten of whom were diagnosed with autism and 19 of whom were diagnosed with pervasive developmental disorders-not otherwise specified (PDD-NOS)<sup>3</sup>, the study states that following Fast ForWord participation, students improved in both their receptive and their expressive language skills with average improvements of approximately one standard deviation for both receptive and expressive language (Figure 5)

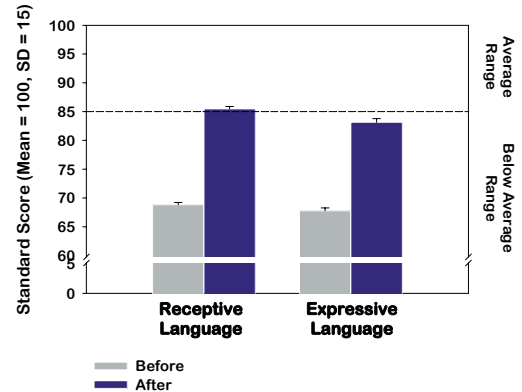


Figure 5. On average, students with autism or PDD improved in expressive and receptive language. Results from 29 students are shown.

In a discussion of the auditory processing challenges faced by children on the autism spectrum, Dr. Martha Burns (2003) describes how foundational skills learned from the field of neuroscience can be used to guide cortical plasticity – changes in the brain. These changes can be accomplished even in children with autism or Asperger’s Syndrome, despite existing processing strengths or limitations, and can help these children improve their language skills. In addition, she provides an approach for using Fast ForWord with preschool-aged children, and shows results from a group of students, half of whom were on the autism spectrum (Burns, 2007).

These findings demonstrate that an optimal learning environment coupled with a focus on cognitive and early reading skills can help students with developmental delays attain a higher level of language achievement.

<sup>3</sup> When the Merzenich et al study was initially reported, the term “Pervasive Developmental Disorders” (PDD) was used to refer to a wide variety of developmental disorders, including autism. Usually a modifier followed the diagnosis of PDD. Using contemporary terminology both of these diagnoses, autism and PDD-NOS, would now be considered on the autism spectrum.

## CONCLUSION

Language and reading skills are critical for all students, impacting their ability to benefit from instruction, follow directions, participate in class discussions, and develop into productive members of society. Strong linguistic skills also provide a critical foundation for building reading and writing skills. Numerous school districts have used the Fast ForWord products to improve the cognitive and early reading skills critical for fluent reading. Many have done studies demonstrating that the products impact the achievement of the students in their districts. This study extends those earlier findings to students who have developmental delays, specifically those with cognitive delays or autism spectrum disorders. After Fast ForWord use, students with developmental delays made significant gains in their language ability suggesting that using the Fast ForWord products strengthened the students' foundational skills and better positioned them to benefit from their classroom curriculum and function in society.

### Notes:

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