Improved Language Skills by Adolescents with Emotional or Behavioral Difficulties who used Fast ForWord® Products

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ABSTRACT

Purpose: This study investigated the effects of Fast ForWord products on the language skills of adolescents with emotional or behavioral difficulties. **Study Design:** The design of the study was a single-school case study using nationally normed tests. Analysis of variance (ANOVA) procedures and dependent t-tests were used to evaluate changes in student test performance. **Participants:** Study participants were 11 to 21 year old students attending a special education program in Western New York state and receiving services from Buffalo Hearing and Speech Center (BHSC). **Materials & Implementation:** Following staff training on the Fast ForWord products, all of the students used Fast ForWord Middle & High School. A few also used Fast ForWord Language to Reading. Before and after Fast ForWord participation, students' language skills were evaluated with the Clinical Evaluation of Language Fundamentals, Third Edition (CELF-3). **Results:** On average, after Fast ForWord use, students made significant improvements on both the Receptive and Expressive Language composites of the CELF-3. Their age-equivalent scores indicated an average improvement in total language skills of 2 years, 7 months.

Keywords: New York, private school, suburban district, adolescents, emotional and behavioral difficulties, observational study, Fast ForWord Middle & High School, Fast ForWord Language to Reading, Clinical Evaluation of Language Fundamentals, Third Edition (CELF-3).

INTRODUCTION

Early laboratory tests of a prototype of a computer-based product combined an optimal learning environment with a focus on early reading and cognitive skills. The results were dramatic improvements in the auditory processing and language skills of elementary school children who had specific language impairments (Merzenich et al., 1996; Tallal et al., 1996) or were at-risk for academic failure (Miller et al., 1999). Buffalo Hearing and Speech Center (BHSC) was interested in evaluating the effectiveness of this approach for improving remediation of language skills for students with special needs. In this study, commercially available computer-based products (Fast ForWord Middle & High School and Fast ForWord Language to Reading) were used to evaluate the effectiveness of this approach for improving the oral language skills of adolescents with emotional/behavioral difficulties.

METHODS

Participants

Buffalo Hearing & Speech Center (BHSC), is a comprehensive diagnostic and treatment center for children and adults with speech-language and hearing problems. BHSC is a not-for-profit organization, which employs more than 300 staff members, including full and part time Speech-Language Pathologists and Audiologists. Many private schools in Western New York state engage clinicians from Buffalo Hearing & Speech Center to provide specialized services for their students.

Twenty-six students took part in this study. The students, aged 11 to 21, were attending a special education program designed to provide a structured educational environment for students with emotional and behavioral difficulties. Teachers referred all of the participants for speech-language services, which were provided by BHSC.

The participants had limited reading skills, as well as difficulty paying attention and following directions. In addition, some of them had been diagnosed with central auditory processing disorders. Initial test scores indicated that the participants ranged from within the average range to well below the average range in language skills (language age-equivalents ranged from 5 years, 0 months to 15 years, 0 months).

Implementation

The Fast ForWord products were administered at the clinic site by a BHSC speech-language pathologist who was also a certified Fast ForWord provider. This clinician was responsible for setting up and administering the products and coaching the students. As part of the provider certification, training was provided in current and established findings on the neuroscience of 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 product candidates; the selection of appropriate measures for

testing and evaluation; effective implementation techniques; approaches for monitoring student performance; and techniques for measuring the gains students have achieved after they have finished using the product.

Materials

The products used in this study were Fast ForWord Middle & High School and Fast ForWord Language to Reading. Both of these are computer-based products that combine an optimal learning environment with a focus on early reading and cognitive skills. The products include five to six 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.

Sweeps[1] *and Trog Walkers*[2]*:* 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.

Streams[1]*:* Students hear a single syllable that is repeated several times, and then interrupted by a different syllable. The 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.

IDs[1]*, Polar Cop*[2]*, and Treasure in the Tomb*[2]*:* 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.

Matches[1] *and Bug Out*[2]*:* 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 *Matches* 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.

Cards[1]*:* 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 matching picture. This exercise increases sound processing speed, improves auditory recognition of phonemes and words, and helps students gain an understanding of word meaning.

Stories[1] *and Start-Up Stories*[2]: Students follow increasingly complex commands, match pictures to sentences, and answer multiple-choice questions about stories that are presented aurally.

Assessments

The students' language skills were assessed using the Clinical Evaluation of Language Fundamentals, Third Edition (CELF-3), before and after they used Fast ForWord products. The speech-language pathologist administered the assessment, and reported both Standard Scores and Age-equivalents for analysis.

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.

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

Analysis

Standard Scores were used for all analyses. Age-equivalents were used only for descriptive purposes. Student scores were compared using an analysis of variance (ANOVA) with two within-subjects factors (time x composite), to determine whether the Receptive Language Score and the Expressive Language Score were differentially affected. Post hoc analyses were performed to compare before and after scores for each composite. All analyses used a p-value of 0.05 as the criterion for identifying statistical significance.

RESULTS

Participation level

Research conducted by Scientific Learning shows a relationship between product use and the benefits of the product. Product use is composed of content completed, days of use, and adherence to the chosen protocol (participation level). The protocol used in this study called for students to use the product for 90 minutes a day, five days a week, for four to eight weeks.

During the spring and summer of 2002, 26 students used Fast ForWord Middle & High School under the supervision of a BHSC speech-language pathologist.

[1] Exercise from Fast ForWord Middle & High School product.

[2] Exercise from Fast ForWord Language to Reading product.

On average, these students used the product for 30 days over a period of 60 calendar days, achieving a participation level of 48%, and completing 51% of the product content (Table 1). Three of these students proceeded to use Fast ForWord Language to Reading. Average daily progress through the Fast ForWord Middle & High School exercises for the first 25 days of use was charted for all students (Figure 1). (For students who used the product fewer than 25 days, percent complete is maintained at the level achieved on their final day of use.)

Product	Number of Students	Average Days of Product Use	Average Number of Calendar Days	Average Participation Level	Average Overall Percent Complete
Fast ForWord Middle & High School	26	30	60	48%	51%

Table 1. Usage data showing the number of students who used the Fast ForWord Middle & High School and Fast ForWord Language to Reading products in the spring and summer of 2002 along with group averages for the number of days of use, calendar days between start and finish, percentage of content covered, and participation level (the percentage of 90 minutes per day, five days per week, that the students actually used the Fast ForWord products). Data is not presented for groups with fewer than 5 students.

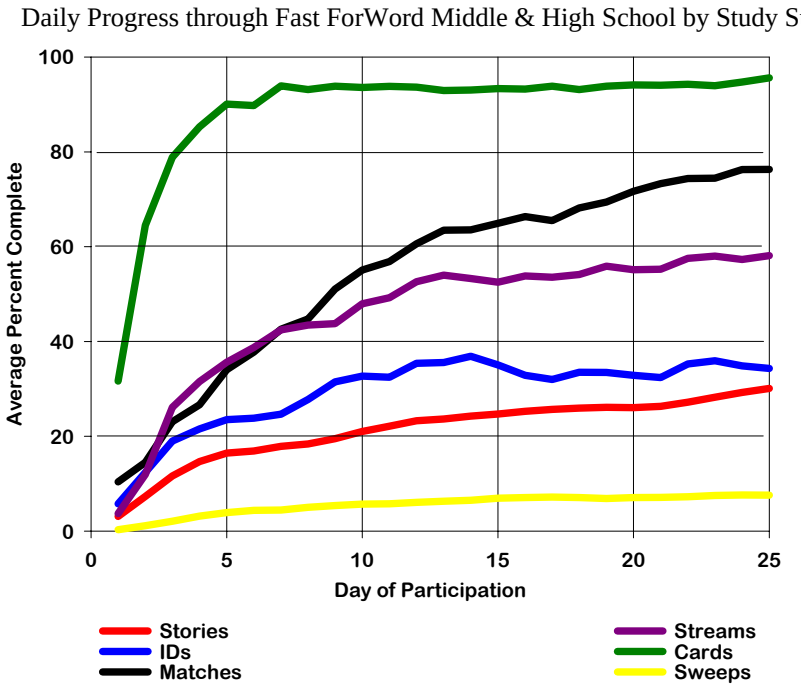

Figure 1. Average daily progress over the first 25 days of use of Fast ForWord Middle & High School for the 26 students in this study.

Assessment Results

Clinical Evaluation of Language Fundamentals – Third Edition:

CELF-3 Standard Scores for Receptive Language, Expressive Language, and Total Language were reported for all study students, along with Language Age-Equivalents. The results of an ANOVA (Table 2) revealed main effects for both time and composite, with an interaction between the two, indicating a statistically significant difference between the Receptive and Expressive Language composite scores, as well as between the improvements in the two composites.

On average, before using Fast ForWord products, the students demonstrated a similar level of deficit in their Receptive and Expressive Language performance. Afterwards, the students demonstrated different levels

of performance on the two composites. Because of this discrepancy, the Receptive Language Score and the Expressive Language Score were analyzed independently by conducting post hoc t-tests.

These analyses showed that, on average, participating students made significant gains in both Receptive and Expressive Language after using Fast ForWord products (Table 3, Figure 2), and that the gains were significantly greater for the Expressive Language composite.

CELF-3	*df*	ANOVA F
Time	25	50.71*
Composite	25	8.59*
Time x Composite Score	25	6.27*

*Table 2. An ANOVA showed that the students in this study performed differently on the Receptive and Expressive Language portions of the CELF-3, and that the changes on the two tests, with time, were different. *p < 0.05.*

CELF-3		Before		After		
	n	Mean	SE	Mean	SE	t-score
Receptive Language	26	68.7	3.4	77.9	3.5	3.56*
Expressive Language	26	70.0	3.4	86.7	4.0	8.09*
t-score		0.54		4.37*		

*Table 3. On average, 26 adolescents with special needs who used Fast ForWord products made significant gains in both receptive and expressive language skills, as measured by the CELF-3. *p < 0.05.*

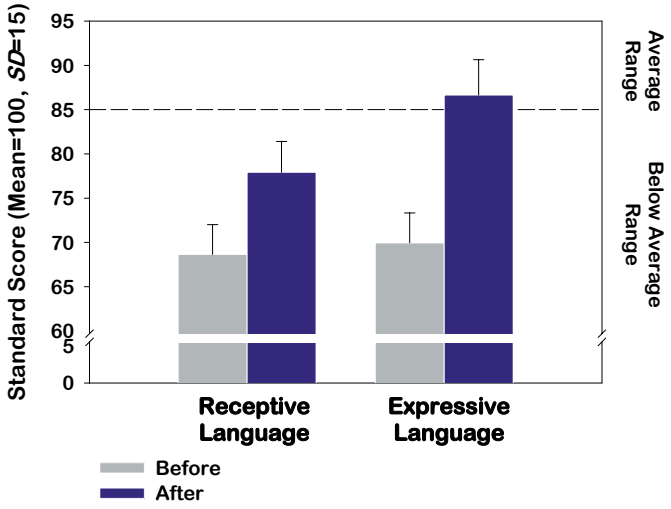

Figure 2. On average, 26 adolescents with special needs demonstrated significant gains in receptive and expressive language skills after they used one or more Fast ForWord products.

DISCUSSION

While the analysis of Standard Scores establishes that using Fast ForWord products benefited the study students, this analysis may underestimate their actual gains. Some of the students were performing at very low levels compared to norms for adolescents and young adults. The gains made by these students may have been obscured by "floor effects," caused by test scores that were below the bottom of the Standard Score scale. Full-scale scores for the CELF-3 can also be reported in terms of Age-Equivalents, which may be more meaningful for measuring progress when students are performing at a very different level from their peers. Age-Equivalents are reported here to provide additional, descriptive information about the gains of the study students. Prior to product use, the average language age for the group was 8 years, 9 months (*SE* =7.0 months). After using one or more Fast ForWord products (approximately 2 months later, on average), the group's average language age was 11 years, 4 months (*SE* =7.5 months).

The BHSC speech-language pathologist who implemented the Fast ForWord products provided additional qualitative information. She noted that many of the students needed extra support to stay motivated as they worked with the products. Some of the strategies she employed for keeping the students engaged were giving extra breaks, medals, and snacks, as well as awarding graduation "diplomas" to those who completed a product. Some teachers at the center reported seeing improvements in the classroom after students completed a Fast ForWord product, including increases in grade point average, decreases in behavioral problems, and differences in decoding approaches when reading.

CONCLUSION

Receptive and expressive language skills are critical for all students, impacting their ability to benefit from instruction, follow instructions, and participate in class discussions. Strong linguistic skills also provide a critical foundation for building reading and writing skills. On average, the students who participated in this study made significant gains on both the Receptive and Expressive Language composites of the CELF-3. These findings demonstrate that an optimal learning environment coupled with a focus on cognitive skills and the linguistic foundations of reading can help adolescent students with special needs make significant improvements in language skills.

The results found in this study confirm the original studies on improved language skills, and demonstrate that using Fast ForWord products also benefits adolescent students with emotional/behavioral problems.

Notes:

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