

Improved English Language and Perceptual Skills by German Secondary School Students who used Fast ForWord[®] Products

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ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord Middle & High School product on the auditory-perceptual, attentional, and cognitive skills of students who used the product as a supplement to their standard curriculum in a school setting. **Study Design:** The design was an experimental study using random assignment of participants to experimental and control groups. **Participants:** Study participants were secondary school students attending a school in Planegg, Germany that had a science and math bias. All participants were native German speakers learning English as a foreign language within the curriculum, and all were struggling with language skills despite being above average in other academic areas. **Materials & Implementation:** Before and after the experimental group used Fast ForWord Middle & High School, all participants were evaluated with a test battery comprising the Integrated Visual & Auditory Continuous Performance Test (IVA-CPT), the Prüfungssystem für Schul-und Bildungsberatung (PSB; “Test system for training and education consultation”), and the Test of Auditory-Perceptual Skills: Revised or Upper Level (TAPS-R, TAPS-UL). **Results:** At the start of the study, students in both groups showed deficits only in the skills measured by the Test of Auditory-Perceptual Skills: Revised or Upper Level, with average scores below the first percentile. By the end of the study, the group of students who used Fast ForWord Middle & High School showed significant gains, moving up to the ninth percentile; by the end, the group that used Fast ForWord Middle & High School significantly outperformed the comparison group on this measure.

Keywords: Fast ForWord Middle & High School, middle school, international, Germany, experimental study, Test of Auditory-Perceptual Skills (TAPS), Prüfungssystem für Schul-und Bildungsberatung (PSB), Integrated Visual & Auditory Continuous Performance Test (IVA-CPT).

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).

Staff at a middle school in Planegg, Germany, were interested in evaluating the effectiveness of an optimal learning environment with a focus on language and cognitive skills as a way to improve the German and

English skills of students in a school setting. In this study, a commercially available computer-based product (Fast ForWord Middle & High School) was used to evaluate the effectiveness of this approach at improving the attention, auditory processing, and general cognitive skills of students with poor language skills.

METHODS

Participants

The middle school using the products was a college preparatory school in the German town of Planegg (near Munich). To gain admission to the school, students demonstrated above average performance during their primary school years. The school is known as a school with a science and mathematics bias.

This study included 22 students, 14 boys and 8 girls, ranging in age from 11-0 to 13-11. LifeLong Learning, Europe, which focuses on helping student improve their learning skills, recruited students to participate on a volunteer basis. Recruitment was targeted toward students who were struggling in both English and

German. All participants were screened for neurological problems or hearing loss. Prior to beginning the initial round of assessments, the 22 students were randomly assigned to either the experimental or the control group. All of the experimental students completed the study and seven control students did so – the other four dropped out of the study before post-testing was completed.

Implementation

Educators 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.

The study period extended from June 20th to July 26th, 2005, which included the last four weeks of the school term and one week of summer vacation. Students in the experimental group used Fast ForWord Middle & High School for approximately 45 minutes per day, during their lunch hour.

All instruction related to the study was given in German. Students in both the control and experimental groups continued to participate in their normal English classes. The students in the experimental group did not receive any additional help with their English skills during the study period.

Materials

Fast ForWord Middle & High School is a computer-based product that combines an optimal learning environment with a focus on basic reading and cognitive skills. The product includes six exercises designed to build skills critical for reading and learning, such as auditory processing, memory, attention, and language comprehension.

Sweeps: 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: 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.

IDs: 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.

Matches: 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. This exercise develops auditory word recognition and phoneme discrimination, improves working memory, and increases sound processing speed.

Cards: 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.

Stories: Students follow increasingly complex commands, match pictures to sentences, and answer multiple-choice questions about stories that are presented aurally.

Assessments

All of the students were given three standardized tests at the beginning and end of the study, corresponding to before and after Fast ForWord participation. Their attentiveness was assessed with the Integrated Visual & Auditory Continuous Performance Test (IVA-CPT), IQ scores and scores for specific cognitive factors were obtained with the Prüfsystem für Schul-und Bildungsberatung (PSB), and their auditory perception skills were measured with the Test of Auditory-Perceptual Skills: Revised or Upper Level (TAPS-R, TAPS-UL).

Integrated Visual & Auditory Continuous Performance Test (IVA-CPT): The IVA-CPT, which was administered in German, is a test of attention which measures responses to 500 inter-mixed visual and auditory stimuli spaced 1.5 seconds apart. The individual taking the test must be able to discriminate and switch between sensory modalities while maintaining attention for 13 minutes. The test is designed to evaluate and compare the speed and accuracy of auditory and visual attention. It is also considered a reliable indicator of the absence or presence of hyperactivity.

Prüfsystem für Schul-und Bildungsberatung (PSB; title translates as: “Test system for training and education consultation”): The PSB is administered in German and is a test for evaluating behavioral aspects of intelligence. It comprises nine subtests (Word Finding, General Knowledge, Semantic Categorization, Logical Sequencing-Alphabetic, Logical Sequencing-Numerical, Logical Sequencing-Symbolic, Spatial Orientation and Manipulation, Number Addition, and Number Comparison). The results are reported in terms of Verbal, Reasoning, and Concentration factors and a global score, which is a measure of IQ.

Test of Auditory-Perceptual Skills: Revised (TAPS-R) or Test of Auditory-Perceptual Skills, Upper Level (TAPS-UL): The TAPS-R is designed for children aged 4-12. The TAPS-UL is designed for adolescents aged 12-17. Both tests are administered in English and measure a student’s ability to understand and follow directions; recall words, sentences, and numbers from memory; use reason to solve verbally presented problems; and discriminate word sounds. The TAPS-UL was only used for students who were too old to take the TAPS-R.

The tests were administered by qualified examiners. The German psychological tests were given by a psychologist who is a native German speaker. The English language tests were given by a speech pathologist who is a native English speaker. All tests were given strictly according to the authors’ instructions, and were scored based on norms for native language speakers. The pre-test and post-test protocols for the students were marked and scored randomly at the end of the project. The students’ language levels at pre-testing were not known to the staff administering the project.

Analysis

Scores for all tests were reported in terms of Standard Scores, with a mean of 100 and a Standard Deviation of 15. Data were analyzed using the repeated measures multivariate analysis of variance (MANOVA). All analyses used a p-value of less than 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 (attendance and participation level). The recommended protocols for the Fast ForWord Middle & High School product are 48 minutes per day (8 minutes per exercise), 5 days a week, for 8 to 12 weeks, or 90 minutes per day (15 minutes per exercise), 5 days a week, for 4 to 8 weeks.

In this study, due to the version of the product that was used, the 48-Minute Protocol was not available. Instead, students were directed to work for 45 minutes per day (15 minutes per exercise on 3 assigned exercises), 5 days a week, for a period of approximately 5 weeks. Overall, adherence to this alternate protocol was fair, with students rarely missing days, but frequently working shorter or longer than the specified number of minutes per day.

Average daily progress through the exercises in Fast ForWord Middle & High School products for all students is shown in Figure 1. The final day shown in the graph is the last day that all students participated; however, some students participated for up to 27 days. Product use details are shown in Table 1.

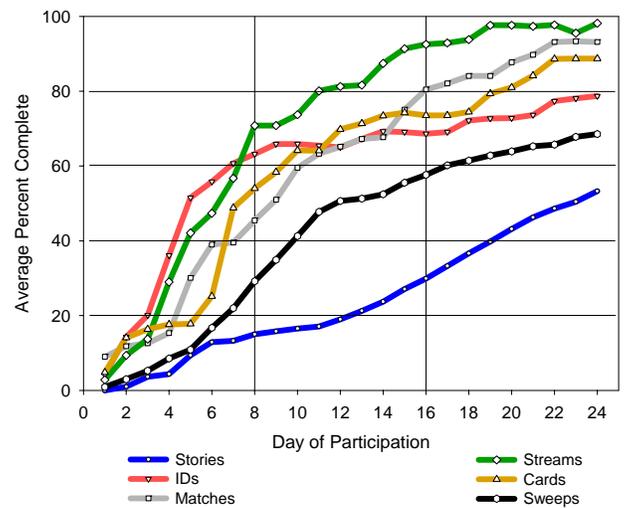


Figure 1. Average daily progress through the Fast ForWord Middle & High School exercises. Results from 11 students are shown.

Product	Number of Students	Number of Days	Calendar Days	Percent Complete
Fast ForWord Middle & High School	11	26	35	83

Table 1. Usage data showing the number of students who used the Fast ForWord Middle & High School product along with group averages for the number of days of product use, calendar days between start and finish, and percentage of content completed.

Assessment Results

Integrated Visual & Auditory Continuous Performance Test (IVA-CPT):

The following scores from the IVA-CPT were reported for analysis: Combined Attention Quotient, Auditory Attention Quotient, Visual Attention Quotient, Speed of Visual Response and Speed of Auditory Response.

At the pre-test time point, both groups had means within the average range for the reported IVA-CPT scores. A MANOVA indicated that both groups performed similarly over time, with neither group demonstrating significant changes in score.

Prüfsystem für Schul-und Bildungsberatung (PSB):

The following scores from the PSB were reported for analysis: Verbal Factor, Reasoning Factor, and Concentration Factor and Global Intelligence Quotient.

At the pre-test time point, both groups had means within the average range for the reported PSB scores. A MANOVA showed a significant interaction of test by time by group. To explain this interaction, separate MANOVAs were conducted for each factor score. This analysis revealed that there were not significant differences between the groups in the Reasoning Factor or the Verbal Factor. However, there was a significant time by group effect in the Concentration Factor ($F=6.66$ $df=16$, $p=0.02$). Inspection of group averages at the pre- and post-test time points revealed that the experimental group scored higher than the control group at pre-test, yet both groups had similar scores at post-test. Overall, both groups showed a drop in score at post-test, with the experimental group showing a larger drop.

Test of Auditory-Perceptual Skills-Revised (or Upper Level):

For all students, the following scores from the TAPS-R or TAPS-UL were reported for analysis: Auditory Number Memory-Forward, Auditory Number Memory-Reversed, Auditory Sentence Memory, Auditory Word Memory, Auditory Interpretation of Directions, Auditory Word Discrimination, and Auditory Processing (Thinking and Reasoning).

At the time of pre-test, both groups had mean scores ranging from the low end of the average range to well below the average range on the TAPS-R or TAPS-UL subtests. A MANOVA (table 2) showed a significant difference by time and by subtest. This analysis also showed a significant time by group interaction,

indicating that the students who used Fast ForWord Middle & High School made significantly greater improvements over time than the students in the comparison group. Figure 2 illustrates the difference between the two groups by showing the change in the TAPS composite, the Auditory Perceptual Quotient.

	MANOVA	
	df	F
time	6, 11	58.47*
subtest	6, 11	60.12*
time X group	6, 11	46.32*
subtest X time X group	6, 11	5.30*

Table 2. A MANOVA showed that students who used the Fast ForWord Middle & High School product had significantly greater improvements on the Test of Auditory-Perceptual Skills-Revised (or Upper Level) than a comparison group. * $p<0.01$.

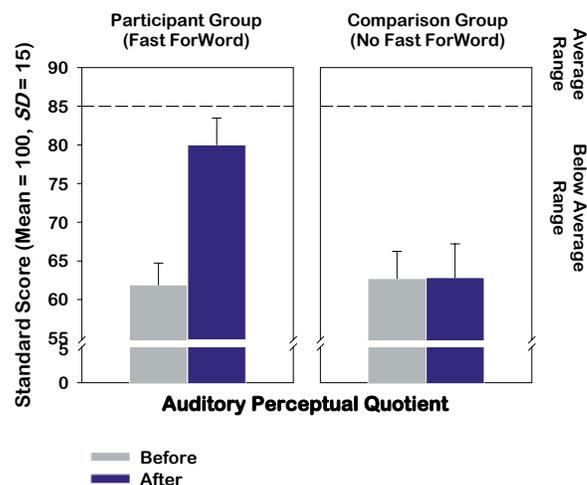


Figure 2. Fast ForWord participants significantly outperformed a comparison group in English language and perceptual skills after using the Fast ForWord Middle & High School product.

Because the initial MANOVA showed that there was a significant difference by time by group by subtest, additional MANOVAs were conducted on each subtest. These analyses indicated that the Fast ForWord group made significantly greater gains than the control group on Auditory Sentence Memory ($F=8.29$, $df=16$, $p=0.01$), Word Discrimination ($F=19.69$, $df=16$, $p<0.001$), and Auditory Processing - Thinking and Reasoning ($F=7.33$ $df=16$, $p=0.02$). The results for all TAPS-R or TAPS-UL subtests are reported in table 3.

Group	Subtest	n	Before		After		Gain	
			Mean	SE	Mean	SE	Mean	SE
FFWD	Auditory Number Memory - Forward	11	82.2	3.2	89.8	4.2	7.6	3.8
	Auditory Number Memory - Reversed	11	89.5	2.9	98.7	3.0	9.3	2.7
	Auditory Sentence Memory *	11	71.6	2.2	81.2	3.0	9.5	1.4
	Auditory Word Memory	11	83.6	4.1	92.8	3.9	9.2	3.3
	Auditory Word Discrimination *	11	72.6	5.3	101.6	2.3	29.1	5.3
	Auditory Interpretation of Directions	11	78.3	2.3	87.5	3.0	9.2	2.0
	Auditory Processing - Thinking and Reasoning *	11	56.5	1.1	68.6	4.6	12.1	3.9
Control	Auditory Number Memory – Forward	7	83.7	4.7	83.7	3.2	0.0	3.6
	Auditory Number Memory - Reversed	7	90.7	2.9	92.1	2.6	1.4	3.3
	Auditory Sentence Memory	7	77.0	2.3	77.4	3.0	0.4	3.3
	Auditory Word Memory	7	78.4	3.0	79.1	3.9	0.7	4.6
	Auditory Word Discrimination	7	93.9	4.2	89.1	2.7	-4.7	4.6
	Auditory Interpretation of Directions	7	75.3	2.3	84.1	2.8	8.9	2.4
	Auditory Processing - Thinking and Reasoning	7	58.3	3.3	56.6	1.6	-1.7	1.7

Table 3. Students who used Fast ForWord Middle & High School made greater gains on the Test of Auditory-Processing of Language-Revised (or Upper Level). Specific subtests on which the FFWD group made significantly greater gains are marked with a *. $p < 0.05$.

DISCUSSION

During the summer of 2005, a group of 11 German college-prep secondary students with poor language skills used the Fast ForWord Middle & High School product. Overall, after Fast ForWord participation, these students made significant improvements in auditory perceptual skills critical to language and reading development, and significantly outperformed a comparison group of their peers who did not use the product. On the TAPS, students in the experimental group improved significantly more than students in the comparison group on three subtests. Visual inspection shows a trend toward the experimental group outperforming the control group on all but one of these subtests suggesting that with a larger study, other effects might become apparent.

The results on the PSB were curious and unexpected. The variation in scores, for both the experimental and the comparison groups, is unusual and invites further investigation.

Overall, the findings demonstrate that, for a group of German secondary school students with weak language skills in both their native tongue and in English as a foreign language, an optimal learning environment coupled with a focus on cognitive and language skills can help them attain a higher level of auditory perceptual skills.

CONCLUSION

Auditory perception skills are critical for all students who use spoken language, impacting their ability to benefit from instruction, follow directions, and participate in class discussions. Strong perceptual and linguistic skills also provide a critical foundation for building reading and writing skills. After Fast ForWord Middle & High School use, students with poor language skills in Planegg, Germany demonstrated improved auditory perceptual skills, making significantly greater gains than similar students who received their standard curriculum only. This suggests that using Fast ForWord Middle & High School strengthened the students' foundational skills and prepared them to benefit more from their classroom curriculum.

Notes:

1. To cite this report: Scientific Learning Corporation. (2006). Improved English Language and Perceptual Skills by German Secondary School Students who used Fast ForWord Products, MAPS for Learning: Educator Reports, 10(4): 1-6.

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