

Can Brain Research and Computers Improve Literacy: A Randomized Field Trial Fast ForWord Computer-based Language Training Program

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Program Theory

- Consonant-vowel pairs (e.g., /ba/ and /da/) differ in the first 40 ms of speech signal, but some children require hundreds of milliseconds to discriminate such speech signals.
- About 7 percent of children process rapid and successive incoming sensory information too slowly to discriminate among brief and weak acoustic cues needed to learn phonemes of language.
- This impairment impedes child's ability to understand and use spoken language, and to apply phonic reading strategies.

Program Content

- Using computer technology, mathematical algorithms change many of the features of oral language, including volume, pitch, and duration;
- Selective stretching and emphasizing of important acoustic differences in the sounds of language reveal the acoustic "signature" of each phoneme;
- Builds phonemic awareness, auditory processing speed, phonological awareness, working memory, syntax, grammar, sequencing and other component skills for reading efficacy.

Evidence Base

- Evidence from initial laboratory experiments showed large effects ($d = 0.80$ or about 17 NCEs) for children with specific language-based impairments;
- Claims of considerable success in popular media: Paula Tallal (developer) quoted in a 2000 *Newsweek* article: "...90 percent of the kids who complete the program made 1.5 to two years of progress in reading skills";
- Little rigorous research to assess effects in typical urban schools on standard local accountability tests for larger population of struggling readers.

Impact Estimates

	Fast ForWord Effect Sizes	
	Language	Reading Comprehension
	2 nd Grade Cohort	0.08
7 th Grade Cohort	0.06	0.21*

Compliance

	Days of Training		Completion Rate	
	M days (SD)	% Met Standard	M % (SD)	% Met Standard
2 nd Gr.	23.2 (3.8)	85.7	61.9 (15.7)	30.4
7 th Gr.	20.3 (5.9)	66.3	71.1 (16.7)	72.1

A Randomized Efficacy Trial in Baltimore

Hypotheses

- (1) Students in the treatment would achieve greater academic gains in language than in reading comprehension;
- (2) Students with more severe language difficulties would experience the greatest overall program benefits;
- (3) Student compliance with the treatment would vary, thus the need to distinguish intention-to-treat (ITT) effects from the effects of the treatment on the treated (TOT).

A Randomized Experiment in the Baltimore City Public Schools

- Intervention offered in a purposive sample of 8 schools: 2 elementary; 3 middle; and 3 elementary/middle schools;
- Eligible students below national norms for Total Reading on CTBS/5 Terra Nova during the previous spring;
- Randomization within each of the 11 school-by-grade-level combinations;
- Student sample included 415 children from two grade-specific cohorts: 141 second grade students; and 274 seventh graders; students had an average Total Reading percentile score of 16.1.

Treatment and Counterfactual

- Treatment consisted of 100 minutes of training per day, 5 days per week, for 4 to 8 weeks under the supervision of Fast ForWord-trained clinicians and school-based educators;
- Training implemented as a 'pull-out' regimen which supplemented regular classroom literacy instruction;
- Students in the control group also received regular classroom instruction, and no extra literacy instruction.

Analytic Strategy

- Fast ForWord Effects were analyzed on Language and Reading Comprehension outcomes using the CTBS/5 Terra Nova test.
- Multivariate (OLS) regression was used to test for a main effect of Fast ForWord treatment assignment, controlling for teachers' survey assessments of pre-program language difficulties; pre-program test scores; free lunch status; and race-ethnicity.
- We tested for pretest-by-treatment and teacher's survey-by-treatment interaction effects.
- An Instrumental Variables approach was used to assess program effects for students who complied with the treatment.

Results

- Randomization was successful, and no differential attrition across treatment and control groups;
- SECOND GRADERS:**
 - No significant ITT or TOT effects for language or reading.
- SEVENTH GRADERS**
 - Significant ITT and TOT effect for reading comprehension, but not for language.

Conclusions

- Program effect sizes did not match developer's promises, and did not conform to hypotheses (1) and (2) regarding which skills and which students the program would benefit.
- Modestly-sized benefit in reading comprehension for seventh graders linked to compliance with the treatment, but no other significant benefits.
- The intervention is not a good fit for non-clinical "at risk" student populations in school settings; it may be appropriate for students with severe language difficulties.