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# Synthesis of Research on the Use of the Initial Teaching Alphabet for Remediation of Dyslexia

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# Synthesis of Research on the Use of the Initial Teaching Alphabet for Remediation of Dyslexia

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Dyslexia, or specific reading disability, affects as many as 10,000,000 school children and is the most frequent reason given for dropping out of school (Satz, Taylor, Friel, & Fletcher, 1978; Lyon, 1995). Although dyslexia has been studied by medical and educational specialists for 100 years, little is known about remediation of reading disabilities. Based on the prevalent belief that lack of phonological awareness is the primary cause of reading disability, most remediation research has focused on improving auditory analysis, e.g., comparing or substituting sounds in spoken words and decoding phonetically-regular words. However, recent investigations have revealed that, while this approach results in greater word attack skills compared to alternate methods, there is little or no advantage in reading connected text (Olson & Weiss, 1997; Torgesen, 1997). Further, one-year follow up data revealed that reading fluency does not continue to grow (Olson & Weiss, 1997). The overall message is that present-day phonological awareness programs do not generalize to independent reading growth (Torgesen, 1997).

In contrast to these findings, our research using **the initial teaching alphabet (i.t.a.)** for remediation of dyslexia has demonstrated generalization to fluent reading of text (Flynn & Deering, 1993; Flynn, Rahbar, & Deering, 2000), with continued reading growth as long as seven years after remediation ends (Flynn, 1997). Further, it is equally effective for students with dyslexia and those with both dyslexia and ADD (Flynn, Deering, & Rahbar, 2000). Dyslexic students in nine months typically gain 2.5 grade levels in both instructional reading level and comprehension using i.t.a. in a language experience approach that combines phonological awareness, process writing, and repeated oral assisted reading ( Flynn & Deering, 1993; Lyon & Flynn, 1991; Flynn, Rahbar, & Deering, 2000). Average length of remediation to grade-level reading has been 2.5 years for elementary students (Flynn, 1997) and for middle school and high school students (Jerviss, Schmidt, Williams, & Flynn, 1997).

This manuscript explains how the **initial teaching alphabet** used in a phonological analysis-language experience approach helps dyslexic students master grade-level reading and spelling. It begins with a synthesis of the work of Chall (1983), Frith (1985), and Hendersen (1990) to identify the stages at which reading and spelling blockages occur in dyslexia. Next, our research on the uses of the **initial teaching alphabet** for remediation of dyslexia is reviewed. The final section explores reasons why the **initial teaching alphabet** has been successful in remediation of dyslexia.

## Stages of Literacy Development

Stage One: Reading Accuracy-Phonetic Spelling. Normally-developing readers start out with slow, non-automatic reading, soon acquiring a sight vocabulary and becoming quite accurate in decoding phonetically-regular words. By the end of first grade they read at a rate of about 55 words per minute on grade-level text (Flynn, Theede, & Hickory, 1992). At this stage their spelling reflects the sounds they hear in spoken words, beginning first with representation of the beginning and ending consonants. Soon they add vowels to their word inventions, demonstrating that they have mastered the phonological skills crucial to accurate decoding and spelling. By the end of first grade they are moving beyond the invented spelling stage by using simple phonic principles such as vowels teams (ie, i-e) to represent the long vowel sounds.

About 70% of dyslexic children experience failure at this stage because they lack the auditory analysis skills needed to decode words. Called dysphonetic dyslexics by Dr. Elena Boder (1971, 1973), they read inaccurately with frequent substitutions of words that begin and end with the same sounds, e.g.,"goat" for "gate". Their most striking misreadings are semantic substitutions e.g., "funny" for "laugh," indicating that they sometimes process the meaning of a word but cannot call up its auditory components. Their dyslexia is caused by a deficit in phonological awareness, the knowledge that spoken words are made up of sounds that can be counted, deleted, added, and substituted. They usually read quickly, as though racing to finish a painful task. They read primarily by sight word recognition or by context, neither of which are sufficient strategies for the massive amount of new and more complex words they will encounter in later grades.

Dysphonetic spelling is characterized by letter and syllable omissions ("wat" for "want", "rember" for "remember"). While normally-developing peers are learning the basic sound-symbol relationships of written language through their invented spellings, dysphonetic dyslexics either memorize the correct spellings or make bizarre, non-phonetic renditions of the words they want to write. Many give up trying to express their thoughts in writing, finding spelling too difficult. Although spell checkers are often offered as the solution for poor spellers, they are not useful tools because dysphonetic students cannot approximate the phonetic spelling of the word in order to call up the correct one.

<u>Stage Two: Reading Fluency-Phonic Spelling</u>. For normally-developing readers, decoding and word recognition is now automatic, and reading speed and expressiveness increases. By the end of second grade, they read grade level text at an average rate of 107 words per minute correct (wpmc), double their first grade rate (Flynn, Theede, & Hickory, 1992). Increasing automaticity allows normally-developing readers to focus on comprehension as text become more complex. Normal spellers intuitively master the concepts that different combinations of letters make the same sound (ay, ai, a-e, a) and that the same letters can make different sounds (c, s, g).

About 30% of children with dyslexia first experience failure at this level. They remain stuck at Stage One, continuing to rely on letter-by-letter decoding even for words encountered many times in the same passage. They can best be thought of as dysorthographic since they are unable to progress beyond the phonetic stage of reading and writing to perception of orthographic word chunks (e.g., "ous") (Flynn, Deering, Goldstein, & Rahbar, 1992). Dysorthographic dyslexics read slowly but accurately, re-decoding the same word each time it appears. They often have trouble with global comprehension but recall details of stories read. By the time they reach middle school they are often thought of as slow learners because of their slow reading rate and poor comprehension.

Dysorthographic misspellings are phonetic renditions of the target words. Spell checkers should be useful tools for them since they spell phonetically. However, because they have difficulty perceiving words as wholes they are unlikely to recognize the correct spelling of the word. Their dyslexia is rooted in an over-reliance on phonetic decoding and an inability to automatize word recognition and orthographic spelling patterns, skills that normally-developing readers perfect in Stage Two.

## Review of **i.t.a.** Dyslexia Project Findings

Funding from the Initial Teaching Alphabet Foundation supported two concomitant lines of investigation: external validation of the dysphonetic-dysorthographic subtyping system using neurophysiological recordings and investigation of different reading-written language approaches to remediation of dyslexia in elementary school children. Results of the computerized EEG studies will be briefly summarized in this paper. The major focus of this paper will be on the subtype-treatment studies for identification of the most successful remediation techniques.

Neurophysiological Studies of Dyslexic Subtypes. The electrical activity of the brain can be recorded as ongoing EEG during mental activity, e.g., during reading, and with the advent of digital methods for quantifying these indices of cognitive activity, it has been possible to investigate a biological marker for dyslexia. While the clinical EEG has not been useful in diagnosis of dyslexia, quantification of brain electrical energy has enabled statistical comparisons of subgroups of dyslexic children. Our studies provided neurophysiological evidence that dysphonetic and dysorthographic subtypes differ from normal readers during reading tasks (Flynn & Deering, 1989a, 1989b; Flynn, Deering, Goldstein, & Rahbar, 1992).

Although some researchers have found dyslexic-normal differences during passive recording conditions, we found no significant differences between dyslexic subgroups and normal readers during passive recording conditions (Eyes Closed), suggesting that dyslexia does not represent a gross cerebral dysfunction when the brain is not actively engaged in cognitive processing. However, recordings during reading and auditory analysis tasks consistently resulted in a large number of differences, supporting our theory of different cerebral organization patterns in subtypes of dyslexic children (Flynn & Deering, 1989a; 1989b; Flynn, Deering, Goldstein, & Rahbar, 1992; Ramaden, 1997).

There is some suggestion that tasks chosen to clarify the neurophysiological correlates of dyslexia need to be at a level that requires effortful, nonautomatic engagement of brain functions. To test this hypothesis, we recorded dyslexic subgroups and normal peers reading at two levels of difficulty: (1) at independent reading level, where accuracy is at least 97%, i.e., miscalling no more than 3 out of 100 words, and (2) at frustration level, where accuracy is below 90%. We found that the easy reading level did not distinguish dyslexics from normal readers; however, the frustration level task resulted in a number of significant differences in areas predicted by our theory of differential deficits associated with each subtype (Flynn & Deering, 1989a, 1989b; Flynn, Deering, Goldstein, & Rahbar, 1992).

Of particular interest was our finding that on repeat recording dysphonetic dyslexics who had been remediated as a result of participation in the i.t.a. Dyslexia Project did not differ from normal readers, but were significantly different in brain electrical activity levels and patterns compared with unremediated dysphonetic peers (Flynn & Deering, 2000). This finding was replicated in an independent analysis of our recordings using an artificial intelligence program to classify 2-second segments of EEG:

This computerized analysis method classified as normal a higher proportion of EEG segments of remediated dysphonetics compared to the segments of unremediated dysphonetics (Ramadan, 1997), suggesting that effective remediation of dyslexia results in normalization of brain function.

Remediation Research. Our early research studies investigated the question of whether type of reading disability interacted with reading program to facilitate or hamper reading and spelling growth. To ensure generalization of findings, our studies were implemented in school settings rather than the research laboratory. In our first pilot studies all second, third, and fourth grade children in two participating schools were screened for reading failure. Those identified as dyslexic were further subtyped as dysphonetic or dysorthographic and randomly assigned to a phonetically-based program ( Project Read or DISTAR) or to a language experience approach using the **initial teaching alphabet (i.t.a.).**

We hypothesized that dysphonetic students would make fastest progress in the language experience approach using the **initial teaching alphabet** to regularize spelling and reduce the phonic complexity of written orthography. It is important to note that **i.t.a.** is not a method but an alphabet that can be used with any reading approach. Using the initial teaching alphabet in a language experience approach allowed students to use their natural language and interests to create their own reading materials. The sound-symbol regularity of **i.t.a.** effectively reduced the readability of materials to that encountered by first graders, while encouraging grade-level written language. We saw this as a more dignified approach compared to requiring older dyslexics to read primer-level material in order to control phonetic complexity. The **i.t.a.**-language experience approach allowed the tutor to vary the content for each student while following the research protocol. Using **i.t.a.** students wrote daily on a self-chosen topic or story starters assigned by the tutor. To encourage phonological awareness, tutors modeled each sound in words while students repeated and marked the sounds with a dash or counter. Sounds were matched to key words pictured on the **i.t.a.** chart to encourage phonological awareness and mastery of sound-symbol correspondences. Compositions were edited and published in newsletters or student-generated magazines for use as reading materials. In addition to using the student's writing for reading materials, the Early-to- Read **i.t.a.** readers (Initial Teaching Alphabet Foundation, 1983) were used to build accuracy and fluency. Repeated Oral Assisted Reading (ROAR) (Flynn, 1994) was used to improve accuracy and rate of reading.

We hypothesized that DISTAR (Englemann & Bereiter, 1985) a synthetic phonics program that uses some modified orthography, e.g., printing the final e in long-vowel words smaller to indicate its silent nature, would best facilitate reading growth for dysorthographic students. DISTAR lessons are scripted, directing the teacher what to say, how to say it, and what nonverbal cues to use. Students are taught to recognize and produce the sound of single letters, then to blend letters to form words, and finally to "say it fast." Reading sentences and writing letters and words are also featured in the DISTAR program.

Project Read (Greene & Enfield, 1985) is based on multi-sensory learning techniques and systematic, analytic phonics instruction using principles proposed by Samuel Orton and Anna Gillingham. We believed that this approach would hamper reading development in dysphonetic students who are phonologically impaired while facilitating literacy development for dysorthographic readers and spellers. As specified by the Project Read manual, the SRA Linguistic Series basal readers were used for reading reinforcement.

Three years of pilot studies investigated the relative usefulness of **i.t.a.**-language experience, DISTAR, and Project Read. In each study, the children received remediation in addition to their classroom reading program. Remediation lasted for 33 weeks, 4.5 hours per week, for a total of 149 hours of instruction in groups of two or three. Tutors were unaware of subtype membership or expected response to treatment. During the first study, remediation tutors exchanged groups at mid-year in order to control for teacher variables. Pre and post-tests consisted of curriculum-based, standardized, and informal reading inventories written in traditional orthography. There were no significant differences between groups on preintervention variables of age, grade placement, IQ, or reading and spelling performance.

In three consecutive studies, students in the **i.t.a. treatment** made significantly greater gains than their peers in either DISTAR or Project Read (Flynn & Deering, 1993; Flynn, 1994). These gains were especially impressive in light of the fact that all instruction was in the **initial teaching alphabet** while testing used traditional orthography. In the first study, three dysphonetic and three dysorthographic children participated in the **i.t.a. treatment,** while five dysphonetics and two dyorthographics were assigned to the DISTAR condition. As expected, dysphonetics in the **i.t.a. treatment** scored significantly higher than dysphonetic peers in DISTAR when tested with curriculum-based reading tests ($p$.=.02). Unexpectedly, dysorthographics in the **i.t.a. treatment** scored significantly higher than dysorthographic peers assigned to DISTAR on ability to read accurately ($p$.=.004). We had expected that emphasis on phonetic skills would hamper reading acquisition by dysphonetic children while facilitating progress for dysorthographics, but the response of both subgroups to the **i.t.a. treatment** failed to support that hyposthesis. The small number of children in each condition prompted us to continue treatment studies before considering possible explanations for these findings.

In the second study, eleven dysphonetics and three dysorthographics were assigned to the **i.t.a.** treatment, while three dysphonetics and three dysorthographics participated in the Project Read condition. Dysphonetics in **i.t.a.** demonstrated statistically significant gains in reading fluency compared with dysphonetics in the phonetically-based Orton-Gillingham program ($p$.=.03). There were no significant dysorthographic differences by treatment condition. Again, small numbers of subjects in each treatment precluded drawing of conclusions.

In order to increase sample size and the confidence with which conclusions could be drawn, three years of data were compiled by subtype and treatment condition. This yielded 22 children who had received **i.t.a.** itervention, 10 who had been assigned to Project Read and 12 who had received DISTAR instruction. There were no significant group differences on preintervention comparisons of chronological age, grade placement, receptive vocabulary, and reading measures used as outcome variables.

Program comparisons revealed that children in the **i.t.a. treatment,** regardless of subtype, made greater gains than peers in either Project Read (analytic phonics) or in DISTAR (synthetic phonics). These results were especially interesting in light of the testing and treatment design. All pre and post tests required children to read and spell in regular orthography while the **i.t.a.** condition had featured use of the **initial teaching alphabet** for all reading and writing instruction. Table One summarizes the significant differences in gains by program.

Table One: Average Gains by Program from Pretest to Post-Test

| Program | NUMBER | Increase in Accuracy (Percent of words read correctly) | Increase in Good Phonetic Equivalents | Increase in Words Per Minute Read Correctly |
|---|---|---|---|---|
| **i.t.a.** | 22 | 8 | 4 | 28 |
| Project Read | 10 | 2 | .4 | 9 |
| DISTAR | 12 | 4 | 2 | 7 |

These data reveal that while **i.t.a.**-instructed children increased on average by 8 percentage points in reading accuracy, those in Project Read were on average only 2 percentage points more accurate at the end of the year, and those in DISTAR increased by 4 percentage points generally. The increase of four more Good Phonetic Equivalents in nine months of **i.t.a.** instruction speaks to the effectiveness of the initial teaching alphabet for correction of phonological deficits in dysphonetic children. The gains for fluency were especially impressive: Although all children were tested with materials written in traditional orthography, those who had received remediation in the **i.t.a. treatment** read on average 28 more words per minute correct compared to their pretest levels. Other groups averaged only 9 and 7 more words per minute read correctly. Ten words per minute increases are considered average for normally-developing readers.

Although too few dysorthographic children participated in these studies to draw subtype-treatment conclusions, the data supported the hypothesis that children with dysphonetic dyslexia respond differently to treatments emphasizing different processes. Post-treatment comparisons for dysphonetics revealed significantly greater gains for those in the **i.t.a. treatment** compared with peers in DISTAR on untimed word reading (WRAT-R Reading, p.=.02) and spelling (WRAT-R Spelling, p.=.02). In addition, examination of teacher logs and student data charts suggested that children in the **i.t.a. treatment** responded to different lesson presentations in ways supporting our subtype-treatment interaction hypotheses (Flynn & Deering, 1993).

Based on these observations and results, our research challenge was to design a study to quantify and measure responses to individual components of reading programs rather than responses to global reading programs containing many elements. Our most recent study utilized a multiple-baseline, repeated measures design (n=42) with each child exposed to four different reading-spelling treatments in order to investigate the specific components of the **i.t.a. Treatment** that result in optimal progress for children with different kinds of dyslexia, at different levels (elementary or middle school), and with varying severity of reading disability. This design, in which each child served as his own control, increases the confidence with which subtype-treatment interaction results can be interpreted due to the large number of children available for analysis and to the control of teacher, child, and history influences on outcome. Preliminary analyses suggest that the **initial teaching alphabet** used as a phonemic analysis tool in writing not only improves decoding and spelling, but facilitates development of underlying phonological awareness. Further, **i.t.a.-repeated readings-process writing treatment** results in similar gains for both younger (grades 2-4) and older (grades 5-7) students with dyslexia. Finally, it appears that while both dysphonetic and dysorthographic readers benefit from this approach, different subtypes of children respond in different ways. Dysphonetic readers increased their decoding attempts from pre-test to post-test while dysorthographics decreased the number of times they resorted to sounding out words. These are both desirable outcomes for each subtype. In addition, while both groups significantly increased their words per minute read correctly, dysorthographic readers made greater gains. The conclusion is that the **i.t.a. repeated reading process writing treatment** induced normalization of reading function in both subgroups of dyslexic readers (Flynn, Rahbar, & Deering, 2000).

## Discussion

What have we learned from this research? The overall conclusion is that the **initial teaching alphabet (i.t.a.)** is a valuable tool for remediation of dyslexia in diverse groups and at different ages. We believe this is due to a number of important factors:

1. The sound-symbol regularity of the alphabet facilitates systematic instruction in phonological analysis using complex, student-generated words. Students are not restricted to phonetically-regular words used in most remediation programs. Each studentís natural language and interests form the basis of remediation rather than phonetically-controlled text that are often perceived as demeaning by the students. Using **i.t.a.** to produce age-appropriate compositions and reading materials puts students in charge of their own learning. For example, one high school English teacher had all students write runes in **i.t.a.** after reading The Hobbit. Students in the **i.t.a. program** were able to tutor their classmates, a situation that had never before occurred in their school careers due to their reading-written language delays.

2. The **initial teaching alphabet** is a "secret code," a new system that students have not failed in. Grace Fernald, a pioneer in the field of dyslexia, understood the importance of psychologically preparing students to break the cycle of failure by explaining that they would be learning to read by a new system, one they had not failed in. Students take pride in knowing a system that their friends in the regular reading program do not. One project capitalizes on this by first instructing below grade-level readers in **i.t.a.**, then introducing a linguistic unit using **i.t.a.** in the regular classroom, with the **i.t.a.** students helping the others learn the new code.

3. For those with dysphonetic dyslexia, using **i.t.a.** as a phonemic writing system helps them "crack the code" of written English, taking them back to the phonetic stage where their reading and spelling first broke down. They gain confidence in their ability to decode unfamiliar words in reading and to write unknown words phonetically so that spell checkers and dictionaries become useful tools.

4. For dysorthographic students material written in **i.t.a.** allows them to increase their reading rate while keeping processing demands low. They often need a much longer time with the **i.t.a.** readers than dysphonetic students to build reading fluency.

On the other hand, writing in **i.t.a.** comes easily for them because the alphabet fits their natural tendency to associate sounds to consistent symbols. More importantly, the **i.t.a.** symbols provide a cognitive bridge to spelling patterns. For example, the **i.t.a.** symbol æ provides a visual map to the various spellings of the long /a/ sound, allowing dysorthographic students to move beyond letter-by-letter decoding to perception of spelling-sound patterns.

5. For both dysphonetic and dysorthographic students spelling finally makes sense as they proceed from the one sound-one symbol regularity of the **initial teaching alphabet** to a systematic study of orthographic spelling patterns, relating phonic generalizations back to the original sound-symbol. They learn to "walk through words" (Henderson, 1990) rather than memorize isolated lists of words.

The use of the **initial teaching alphabet** with reading fluency and phonemic writing procedures has resulted in confident students who can read and write at or above grade level. They now enjoy reading, and classroom teachers report that they are excellent writers. In contrast to extant phonological awareness projects that have failed to facilitate continued growth, students who have been in the **i.t.a.**-language experience program continue to increase reading, spelling and composition skills as long as seven years after remediation ends (Flynn, 1997). We believe this is due to the fact that **i.t.a.** allowed them to go back to the stage at which their literacy skills arrested, to master important phonological and orthographic skills using their natural language, and to master reading fluency. From there, a newly-acquired enjoyment in reading and writing has led to continued growth and school success.

Notes:

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