A Synthesis of Research on Reading from the National Institute of Child Health and Human Development

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The National Institute of Child Health and Development (NICHD) educational research program, initiated in 1965, began to focus more on reading difficulties as it became clear how extensive the reading problem was in the general population. Reid Lyon led the new charge by closely coordinating the work of over 100 researchers in medicine, psychology, and education in approximately 14 different research centers.

A major problem with reading research in the past was that findings often did not replicate. One researcher would get one result, another researcher would get the opposite result. Lyon and colleagues identified that the key problem in obtaining replicability was that researchers were studying different samples of children. Consequently, the NICHD research program has produced a growing body of highly replicable findings in the area of early reading acquisition and reading disabilities that have been reported in over 2,000 referenced journal articles since 1965.

True Scientific Model

- The NICHD studies do not embrace any prior theory, but test all theories against one another at different points in time. In a true scientific paradigm, theories are tested by doing everything to try to prove the theory incorrect.

This contrasts with the usual nature of research in education, where untested hypotheses are often presented as proved theories before any testing has occurred.

- Children who are poor readers make greater use of two of the three cueing systems, syntax and semantics (context), than good readers. Good readers make greater use of the graphophonic cueing system, as indicated by the fact that they read fluently and accurately without rereading. Readers who get words right are better comprehenders than readers who guess using context to figure out words.

Developing a New Understanding of Reading Difficulties

Using modern neuroimaging technology, medical researchers have identified a unique signature on the brain scans of persons with reading problems. **These unique brain scans seem to reflect an inability to work with phonemes in the language. This lack of phonemic awareness seems to be a major obstacle to reading acquisition. Children who are not phonemically aware are not able to segment words and syllables into phonemes. Consequently, they do not develop the ability to decode single words accurately and fluently, an inability that is the distinguishing characteristic of persons with reading disabilities.**

- **About 40% of the population have reading problems severe enough to hinder their enjoyment of reading.** Because the percentage is so large, an arbitrary cutoff point of 20% was selected for the purpose of labeling children as disabled in basic reading skills. **The difference between a child who has a learning disability in reading and a child who is simply a poor reader is only a difference in the severity of the problem.**

- The most reliable indicator of a reading disability is an inability to decode single words *Lyon, 1995a*.

- Phonological processing is the primary ability area where children with reading disabilities differ from other children. Phonological processing encompasses at least three different components. Of these three major phonological processing skills, phonological awareness appears to be the most prevalent linguistic deficit in disabled readers.

Research on Treatment for Reading Difficulties

Treatment intervention research has shown that appropriate early direct instruction seems to be the best medicine for reading problems. Reading is not developmental or natural, but is learned.

- Reading disabilities reflect a persistent deficit, rather than a developmental lag in linguistic (phonological) skills and basic reading skills. Children who fall behind at an early age (K and grade 1) fall further and further behind over time. Longitudinal studies show that of the children who are diagnosed as reading disabled in third grade, 74% remain disabled in ninth grade. Adults with reading problems exhibit the same characteristics that are exhibited by children with reading problems.

- **These contradict the prevalent notion that children will begin to learn to read when they are "ready."**

Early Identification and Treatment

- Converging evidence from all the research centers show that deficits in phonemic awareness reflect the core deficit in reading disabilities. These deficits are characterized by difficulties in segmenting syllables and words into constituent sound units called phonemes—in short, there is a difficulty in turning spelling into sounds.

- Lack of phonemic awareness seems to be a major obstacle for learning to read. About 2 in 5 children have some level of difficulty with phonemic awareness. For about 1 in 5 children phonemic awareness does not develop or improve over time.

- Instruction using the following types of phonemic awareness tasks has had a positive effect on reading acquisition and spelling for nonreaders:

    - rhyming
    - auditorily discriminating sounds that are different
    - blending spoken sounds into words
    - word-to-word matching, isolating sounds in words
    - counting phonemes
    - segmenting spoken words into sounds
    - deleting sounds from words.

- **Explicit instruction in how segmentation and blending are involved in the reading process was superior to instruction that did not explicitly teach the children to apply phonemic awareness to reading.**

- Kindergarten children with explicit instruction in phonemic awareness did better than a group of first graders who had no instruction, indicating that this crucial preskill for reading can be taught at least by age 5 and is not developmental.

- **Seven weeks of explicit instruction in phonemic awareness combined with explicit instruction in sound-spelling correspondences for kindergarten children was more powerful than instruction in sound-spelling.**

Prevention

In a study, 260 children were randomly assigned to a revised kindergarten curriculum. The revised curriculum sought to prevent reading disabilities by teaching phonemic awareness for 15 minutes a day using the Lundberg, Frost, and Petersen (1988) curriculum from Sweden and Denmark. Children in the revised curriculum made significant gains in phonemic awareness over the year. *Foorman et al* found that the greatest gains occurred when the explicit instruction moved into teaching the sound-spelling relationships concurrently with the instruction in phonemic awareness.

Explicit, Systematic Instruction in sound-spelling Correspondences

- Phonemic awareness alone is not sufficient for many children. Explicit, systematic instruction in common sound-spelling correspondences is also necessary. *Foorman, Francis, Novy & Liberman 1991* found that the more intensive instruction in sound-spelling relationships during reading (45 minutes per day) was more effective than less daily instruction in sound-spelling relationships (sound-spelling instruction occurring only during spelling and not during reading). *Torgesen et al in press* also found that explicitly teaching the sound-spelling relationships was superior to teaching explicitly using word families and word analogies and superior to an implicit approach.

Foorman et al found that explicit systematic instruction in sound-spelling relationships in the classroom was **more effective** in reducing reading disabilities than **a print-rich environment characterized by interesting stories, even with children who had benefited form phonemic awareness instruction in kindergarten.**

- "Explicit, systematic instruction in sound-spelling relationships brought economically disadvantaged, low achieving first and second graders close to the national average in reading on the Woodcock-Johnson-R, whereas whole language instruction placed these [Title} 1 students near the 25th percentile. Children scoring below the 25th percentile are often identified as reading disabled under traditional diagnostic criteria. **These results suggest that "explicit, systematic instruction" in sound-spelling patterns in first and second grade classrooms can prevent reading difficulties in a population of children at-risk of reading failure.**" *Foorman et al, in press*

- **Conclusion**

- The systematic, explicit phonic approach included phonemic awareness instruction, explicit instruction in sound-spelling relationships, and extensive practice in decodable text. Details of the explicit, systematic approach are described in the next section.

- *Foorman et al* also found that changing instruction from whole language to explicit, systematic phonics at the classroom level was more effective in reducing the occurrence of reading problems than any of three types of one-on-one tutorial programs that were evaluated.

Foorman and her colleagues concluded that in order to avoid reading failure, the focus should be on prevention, not intervention.

"It was the classroom curriculum effect. These curriculum effects have important implications for urban school districts with large numbers of students at risk for reading failure. The morbidity of reading failure and subsequent placement in special education can possibly be reduced with explicit, systematic phonics in the alphabetic code during first grade."

- Research quite clearly shows that overemphasizing prediction from context for word recognition can be counterproductive, possibly delaying reading acquisition.

- "Emphasis on the role of contextual guessing actually represents a classic case of mistaken analogy in science and has been recognized as such for over 2 decades. It is often incorrectly assumed that predicting upcoming words in sentences is a relatively easy and highly accurate activity. Recent eye movement research indicates that good readers do not sample the text and predict to recognize words efficiently, but rather see every single letter on the page.

Major Implications for Early Reading Instruction

- Begin teaching phonemic awareness directly at an early age (kindergarten). Children who are able to recognize individual sounds in words are phonemically aware. Phonemic awareness can be taught with listening and oral reproduction tasks similar to those listed below.
- Examples of phonemic awareness tasks
    - Phoneme deletion
    - Blending
    - Sound isolation
    - Phoneme segmentation
    - Phoneme counting
    - Deleting phonemes
- Teach each sound-spelling correspondence explicity. Explicit instruction means that a phoneme is isolated for the children.
- Teach frequent, highly regular sound-spelling relationships systematically. To teach systematically means to coordinate the introduction of the sound-spellings with the material the children are asked to read.
- Show children exactly how to sound out words.
- Use connected, decodable text. Any controlled connected text, whether it is controlled for decodability or for vocabulary, will not be able to provide entire coherent stories in the early stages of vocabulary, will not be able to provide entire coherent stories in the early stages of reading acquisition. During this early stage of reading acquisition, the children can still benefit from stories that the teacher reads to them. These teacher-read stories can play an important role in building the children's oral language comprehension, which ultimately affects their reading comprehension. These story-based activities should be structured to build comprehension skills, not decoding skills.
- **The comprehension instruction and the decoding instruction are separate from each other while children are learning to decode, but both types of instructional activities should occur. In other words, comprehension and decoding instruction should be balanced.**
- The text material used to build children's comprehension should be geared to their oral language comprehension level. The material used to build their decoding should be geared to their decoding skills, with attention to meaning. Though decodable text can be meaningful and engaging, it will not build children's comprehension skills.