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ABSTRACT

This paper considers reading research carried out by the National Institute of Child Health and Human Development (NICHD). The paper presents a synthesis of this research on reading. It begins with a note about the NICHD research program and a discussion of how the program is different from other studies of reading. It then discusses a new understanding of reading based on identifying the nature of reading difficulties and their causes. The next section discusses research on treatment for reading difficulties, arguing for early identification and treatment; explicit, systematic instruction in sound-spelling correspondences; and that prediction from context is not a useful strategy for word recognition. The next section presents seven key research-based principles of effective reading instruction: (1) begin teaching phonemic awareness directly at an early age; (2) teach each sound-spelling correspondence explicitly; (3) teach frequent, highly regular sound-spelling relationships systematically; (4) show children exactly how to sound out words; (5) use connected, decodable text for children to practice the sound-spelling relationships they learn; (6) use interesting stories to develop language comprehension; and (7) balance use of interesting stories with decoding instruction, but do not mix comprehension instruction and decoding instruction. The paper concludes with a brief description of other important research questions and findings, as well as future directions of NICHD research. Contains 49 references, one figure, and two tables of data. (RS)

THE CENTER FOR THE FUTURE OF TEACHING & LEARNING

PACIFIC BELL Foundation

30 Years of Research: What We Now Know About How Children Learn to Read

A synthesis of research on reading from the National Institute of Child Health and Human Development commissioned by The Center for the Future of Teaching and Learning with funding support from the Pacific Bell Foundation.

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What You Will Find In This Report

A Note about the NICHD Research Program

The National Institute of Child Health and Human Development (NICHD) educational research program initiated in 1965 began to focus on reading difficulties as it became clear how extensive the reading problem was in the general population. The 1985 Health Research Extension Act resulted in a new charge to the NICHD to improve the quality of reading research by conducting long-term, prospective, longitudinal, and multidisciplinary research. Reid Lyon led the new charge by closely coordinating the work of more than 100 researchers in medicine, psychology, and education in approximately 14 different research centers. (Numbers vary from year to year.)

A major problem with education research in the past was that findings often were not replicated in subsequent studies. One researcher would get one result, but another researcher would get the opposite result. Lyon and colleagues identified the key problem in obtaining replicability - researchers were studying different samples of children. Lyon established detailed sampling requirements for NICHD research and increased scientific rigor in other areas. Consequently, the NICHD research program has produced a growing body of highly replicable findings in the area of early reading acquisition.

How the NICHD Research Program is Different

To appreciate fully the significance of the NICHD findings, it helps to understand the level of scientific rigor used to guide the formation of conclusions from the research. Reid Lyon coordinates the parallel investigation of similar questions across several centers. Under Lyon's leadership, the researchers determine that the questions have been answered only when the findings replicate across researchers and settings. Findings with a high degree of replicability are finally considered incontrovertible findings and then form the basis for additional research questions. Funding is awarded the research centers through a competitive peer review process. A panel of researchers who are not competing for the research funds award the funds after evaluating competing proposals according to specific criteria. Each research study within the NICHD network must follow the most rigorous scientific procedures.

True scientific model - The NICHD studies do not embrace any *a priori* 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.

Long-term duration - The average length of a study has been eight years, with a range of 3 years to 31 years. In the decades-long studies, the growth of children from preschool through adulthood has been evaluated. Currently, several large-scale, 5-year longitudinal treatment intervention studies are underway. This longer-term design allows evaluation of the effects of different instructional variables on later reading performance.

Sampling procedure - The sampling procedures ensure that all subgroups in the population (all ethnic groups, a full range of IQ levels, and so on) are included in sufficient numbers to provide a window to the population as a whole and provide information regarding the relationship of reading disabilities to other variability among individuals such as IQ. To evaluate the relationship between IQ and reading disabilities, for example, the research subjects must proportionately represent different IQ bands. Most studies involve around 200 subjects representing variation within specified dimensions. Children who do not speak English at all have been excluded from the NICHD research samples to this point. After basic reading instruction issues have been resolved for teaching children with some knowledge of English, including bilingual children, the research questions will turn to treatment for children who do not know English and are beginning to learn it as a second language.

Contrast with other educational research - The NICHD research program differs from much of the earlier research in its scientific rigor. Table 1 illustrates the contrast by summarizing several studies that reported conclusions that conflict with those of the NICHD. The studies in Table 1 are laudable for attempting to evaluate competing theories; some were even two years in duration, quite long as educational studies go. Yet the studies are still too short to be able to evaluate the effects of the different treatments on the children's actual ability to read with joy and understanding. In nearly all of the studies in Table 1, the children never progressed far enough in their reading that researchers could use a measure of independent reading comprehension to evaluate their learning. The important question of

how different approaches to beginning reading instruction ultimately impact authentic reading remains unanswered in these studies.

Many of the measures used to evaluate the children's learning had no established validity as predictors of reading comprehension. For example, children who used multiple cueing systems or who said they valued understanding more than getting the words right, were given higher scores in many of the studies in Table 1. Whether or not these variables would correlate with later reading performance was not established at the time of the research.

With the NICHD research, we now know that the values given the responses on these measures should have been reversed. What was considered desirable performance on miscue analyses actually indicates a poor comprehender, rather than a good comprehender. 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 re-reading. Readers who get words right are better comprehenders than readers who guess using context to figure out words. Most likely the children who scored highest on these measures would become the poorest readers, based on NICHD studies of good and poor readers.

Even when the skills measured do predict better reading later, such as knowing the names of the letters, teaching children these skills does not necessarily guarantee that these children will be better readers later on. Though many of the studies in Table 1 were more than two years in duration, the timeframe was still too short to see the nature of the impact of the instruction on reading comprehension.

Table 1. Research supporting conclusions that conflict with NICHD research findings.

Date	Researchers	Population Sampled	N in whole language group	N in skills-based group	Duration	Reading comprehension measure included?
1985	Ribowsky	2 K classes in parochial school	26	27	1 yr	No
1989	Kasten, Clark, & Nations	2 Preschool & 2 K classes	54	66	1 yr	No
1990	Stice & Bertrand	At-risk 1st & 2nd graders in 10 classes	25 (5 from each class)	25 (5 from each class)	2 yrs	The SAT was administered, but no significant difference found.
1991	Freppon	Four 1st grade classes, wealthy, white	12	12	4 mths	No
1993	McIntyre	1st grade, varied	1 (also 1 in Reading Recovery)	1	2 yrs	No
1994	McIntyre & Freppon	low SES groups	3	3	2 yrs	No
1995	Dahl & Freppon	4 classes	12 focal Ss 21 on some measures	7 focal Ss 12 on some measures	8 mths	No

***N=number of subjects (Ss) in each treatment group.**

In contrast, the NICHD longitudinal treatment studies now in progress are five years induration and have already used reading comprehension measures to evaluate instructional variables in the second year of the studies. In addition, the sample sizes are much larger in the NICHD research studies. For example, a kindergarten study by Foorman and her colleagues (in press) involved 260 kindergarten children. Their first-and second-grade study in eight Title I schools involved 375 subjects. Their special education study of children in the

lower 25% involved 113 children with reading disabilities. A study of children in the lower 10% at the Florida Treatment Center involved 180 children (Torgesen et al., in press). The larger samples in the NICHD research included a full range of IQ levels, ethnic groups, and included lower income children. As Table 1 shows, the largest study reporting contradictory conclusions included only 100 subjects. Most of the studies involved much smaller samples.

Developing a New Understanding of Reading

Much of the recent NICHD research has focused on identifying the nature of reading difficulties and their causes. 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. These problems are generally not developmental and do not diminish over time; without appropriate interventions they into adulthood. 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 difficulty is an inability to decode single words. Lyon (1994, 1995a) suggests that the best way to determine if this inability is "unexpected" is to compare the performance of a child with that of other children his or her age and/or compare reading ability to academic performance in other domains (e.g., listening comprehension, verbal expression, mathematics, written expression). The definition suggests that traditional methods for identifying a reading difficulty, such as looking for an IQ-achievement discrepancy, are not as reliable (Lyon, 1994, 1995a).

Phonological processing is the primary ability area where children with reading difficulties differ from other children. It does not seem to matter whether the children have an IQ-achievement discrepancy in reading or not. Phonological processing encompasses at least three different components. Each component and a sample assessment are described in Table 2.

Table 2. Three important components of phonological processing and sample assessments.

Component Skill	Assessment
Phonological awareness	E.g., say cat without the /t/ sound.
Phonological recoding in lexical access (Rapid naming)	Name objects, letters, colors quickly.
Phonological recoding in working memory	Repeat sentences, words, or digits accurately.

Of these three major phonological processing skills, phonological awareness appears to be the mostprevalent linguistic deficit in disabled readers.

Research on Treatment for Reading Difficulties

What is Developmentally Appropriate?

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 difficulties 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 (Fletcher, et al., 1994; Shaywitz, Escobar, Shaywitz, Fletcher, & Makuch, 1992; Stanovich & Siegel, 1994). Adults with reading problems exhibit the same characteristics that are exhibited by children with reading problems.

These findings contradict the prevalent notion that children will begin to learn to read when they are "ready." **The concept "developmentally appropriate" should not suggest delaying intervention, but using appropriate instructional strategies at an early age - especially in kindergarten.** Although we now have the ability to identify children who are at-risk for reading failure, and we now understand some of the instructional conditions that must be considered for teaching, the majority of reading disabilities are not identified until the third grade.

Early Identification and Treatment

The best predictor in K or 1st grade of a future reading difficulty in grade 3 is performance on a combination of measures of phonemic awareness, rapid naming of letters, numbers, and objects, and print awareness. Phonemic awareness is the ability to segment words and syllables into constituent sounds units, or phonemes. Converging evidence from all the research centers shows that deficits in phonemic awareness reflect the core deficit in reading difficulties. 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 to learning to read (Vellutino & Scanlon, 1987a; Wagner & Torgeson, 1987). This is true for any language, even Chinese. About two in five children have some level of difficulty with phonemic awareness. For about one in five children phonemic awareness does not develop or improve over time. These children never catch up, but fall further and further behind in reading and in all academic subjects (Fletcher, et al., 1994; Shaywitz, Escobar, Shaywitz, Fletcher, & Makuch, 1992; Stanovich, 1986; Stanovich & Siegel,1994).

Instruction using the following types of phonemic awareness tasks has had a positive effect on reading acquisition and spelling for pre-readers: 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 (Ball & Blachman, 1991; Byrne & Fielding-Barnsley, 1990; Cunningham, 1990; Foorman, Francis, Beeler, Winikates, & Fletcher, in press; Lie, 1991; Lundberg, Frost, & Petersen, 1988; Vellutino & Scanlon, 1987b; Yopp, 1988).

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 (Cunningham, 1990). Kindergarten children with explicit instruction in phonemic awareness did better than a group of first graders who had no instruction, indicating that this crucial pre-skill for reading can be taught at least by age five and is not developmental (Cunningham, 1990).

In a study by Ball and Blachman (1991), 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 correspondences alone and more powerful than language activities in improving reading skills.

In a study by Foorman, Francis, Beerly, Winikates, & Fletcher (in press), 260 children were randomly assigned to a revised kindergarten curriculum (n=80) and a standard curriculum (n=160) consisting of developmentally appropriate practices described by the state of Texas' essential elements for kindergarten. 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. Explicit, systematic instruction in common sound-spelling correspondences is also necessary for many children (Adams, 1988; Ball & Blachman, 1991; Byrne & Fielding-Barnsley, 1990; Foorman et al., in press; Mann, 1993; Rack, Snowling, & Olson, 1992; Snowling, 1991; Spector, 1995; Stanovich, 1986; Torgesen et al., in press; Vellutino, 1991; Vellutino & Scanlon, 1987a). Foorman, Francis, Novy, & Liberman (1991) found that intensive instruction in sound-spelling relationships during reading (45 minutes per day) was more effective than sound-spelling instruction occurring only during spelling and not during reading.

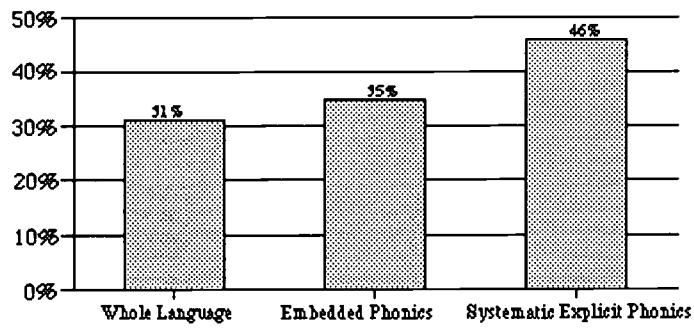
Instruction in specific sound-spelling relationships was more effective than teaching students a strategy for using analogous word parts on transfer to new words and on standardized reading measures (Lovett, Borden, DeLuca, Lacerenza, Benson, & Brackstone, 1994). Torgesen et al. (in press) also found that explicitly teaching the sound-spelling relationships was superior to teaching word families and word analogies and superior to an implicit approach.

Foorman, Francis, Beerly, Winikates, and Fletcher (in press) 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 from phonemic awareness instruction in kindergarten.

> **"...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)**

Figure 1 graphically displays the effects on reading comprehension for the three treatments Foorman et al. compared. The whole language treatment offered children a print-rich environment with interesting stories. The embedded phonics treatment included a more structured approach to phonics in a print-rich environment. 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.

Figure 1. Percentile scores on Woodcock-Johnson Broad measure of Reading Comprehension



Foorman, Francis, Beeler, Winikates, and Fletcher, in press

Foorman et al. (in press) also found that changing instruction to explicit, systematic phonics at the classroom level was more effective in reducing the occurrence of reading problems than any of the 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.

> **"...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." (p. 16)

Prediction From Context is not a Useful Strategy for Word Recognition

Research quite clearly shows that overemphasizing prediction from context for word recognition can be counterproductive, possibly delaying reading acquisition. Stanovich and Stanovich (1995) recently summarized the research findings regarding the predictability of authentic text:

"...It is often incorrectly assumed that predicting upcoming words in sentences is a relatively easy and highly accurate activity. Actually, many different empirical studies have indicated that naturalistic text is not that predictable. Alford (1980) found that for a set of moderately long expository passages of text, subjects needed an average of more than four guesses to correctly anticipate upcoming words in the passage (the method of scoring actually makes this a considerable underestimate). Across a variety of subject populations and texts, a reader's probability of predicting the next word in a passage is usually between .20 and .35 (Aborn, Rubenstein, & Sterling, 1959; Gough, 1983; Miller & Coleman, 1967; Perfetti, Goldman, & Hogaboam, 1979; Rubenstein & Aborn, 1958). Indeed, as Gough (1983) has shown, the figure is highest for function words, and is often quite low for the very words in the passage that carry the most information content." (p. 90)

Stanovich and Stanovich (1995) also summarize the findings regarding the role of context in reading acquisition. Of the three cueing systems frequently mentioned in reading (semantic, syntactic, and graphophonemic cues), the semantic and syntactic cueing systems seem to play a minor role. 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.

"...the word recognition skills of the good reader are so rapid, automatic, and efficient that the skilled reader need not rely on contextual information. In fact, it is poor readers who guess from context--out of necessity because their decoding skills are so weak." (p. 92)

In the NICHD interventions studies (Foorman, et al., in press; Torgesen et al., in press) teaching children to use context and prediction as strategies for word recognition resulted in greater numbers of reading disabilities than instruction that taught children to use their sound-spelling knowledge as the primary strategy for word recognition.

Major Implications for Early Reading Instruction

Below are the seven key principles of effective reading instruction identified in the research along with concrete examples of what these principles mean. The examples are taken directly from the research studies. The research findings indicate that to prevent reading problems

classroom teachers should do the following:

1. 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. When concurrent instruction in sound-spelling relationships occurs, growth in the development of phonemic awareness seems to accelerate. Teachers should initiate instruction in phonemic awareness before beginning instruction in sound-spelling relationships and continue phonemic awareness activities while teaching the sound-spelling relationships.

Examples of phonemic awareness tasks

Phoneme deletion: What word would be left if the /k/ sound were taken away from cat?
Word to word matching: Do *pen* and *pipe* begin with the same sound?
Blending: What word would we have if you put these sounds together: /s/, /a/, /t/?
Sound isolation: What is the first sound in *rose*?
Phoneme counting: How many sound do you hear in the word *cake*?
Deleting phonemes: What sound do you hear in *meat* that is missing in *eat*?
Odd word out: What word starts with a different sound: *bag*, *nine*, *beach*, *bike*?
Sound to word matching: Is therea /k/ in *bike*?

There is little correlation between developmental stages and phonemic awareness. Every school child is ready for some instruction in phonemic awareness. In fact, if the children who fall behind do not begin receiving explicit teacher-initiated instruction, they are very likely to continue falling further and further behind. Phonemic awareness and other important reading skills are learned and do not develop naturally. The earliest direct interventions have been initiated in kindergarten with very positive results. How preschoolers respond to instruction is a question currently under investigation.

2. Teach each sound-spelling correspondence explicitly.

Not all phonic instructional methods are equally effective. Telling the children explicitly what single sound a given letter or letter combination makes is more effective in preventing reading problems than encouraging the child to figure out the sounds for the letters by giving clues. Many children have difficulty figuring out the individual sound-spelling correspondences if they hear them only in the context of words and word parts. Phonemes must be separated from words for instruction.

Explicit instruction means that a phoneme is isolated for the children. For example, the teacher shows the children the letter m and says, "This letter says /mmm/." In this way a new phoneme is introduced. A new phoneme and other phonemes the children have learned should be briefly practiced each day, not in the context of words, but in isolation. These practice sessions need only be about 5 minutes long. The rest of the lesson involves using these same phonemes in the context of words and stories that are composed of only the letter-phoneme relationships the children know at that point.

Telling the children explicitly what single sound a given letter or letter combination makes is more effective in preventing reading problems than encouraging the child to figure out the sounds for the letters by giving clues.

3. Teach frequent, highly regular sound-spelling relationships systematically.

Only a few sound-spelling relationships are necessary to read. The most effective instructional programs teach children to read successfully with only 40 to 50 sound-spelling relationships. (Writing can require a few more, about 70 sound-spelling relationships.) The chart below is not taken from any particular program but represents the 48 most regular letter-phoneme relationships. (The given sounds for each of the letters and letter groups are either the most frequent sound or occur at least 75% of the time.)

The 48 most regular sound-letter relationships

a as in fat	g as in goat	v
m	l	e
t	h	u-e as in use
s	u	p
I as in sit	c as in cat	w "woo" as in well
f	b	j
a-e as in cake	n	I-e as in pipe
d	k	y "yee" as in yuk
r	o-e as in pole	z
ch as in chip	ou as in cloud	kn as in know
ea beat	oy toy	oa boat
ee need	ph phone	oi boil
er fern	qu quick	ai maid
ay hay	sh shop	ar car
igh high	th thank	au haul
ew shrewd	ir first	aw lawn

To teach systematically means to coordinate the introduction of the sound-spellings with the material the children are asked to read. The words and stories the children read are composed of only the sound-spelling relationships the children have learned, so all the children must be taught using the same sequence. The order of the introduction of sound-spelling relationships should be planned to allow reading material composed of meaningful words and stories as soon as possible. For example, if the first three sound-spelling relationships the children learn are a, b, c, the only real word the children could read would be *cab*. However, if the first three sound-spelling relationships were m, a , s, the children could read *am, Sam, mass, ma'am*.

4. Show children exactly how to sound out words.

After children have learned two or three sound-spelling correspondences, begin teaching them how to blend the sounds into words. Show them how to move sequentially from left to right through spellings as they "sound out," or say the sound for each spelling. Practice blending words composed of only the sound-spelling relationships the children have learned every day.

5. Use connected, decodable text for children to practice the sound-spelling relationships they learn.

The findings of the NICHD research emphasize that children need extensive practice applying their knowledge of sound-spelling relationships to the task of reading as they are learning them. This integration of phonics and reading can only occur with the use of decodable text. Decodable text is composed of words that use the sound-spelling correspondences that children have learned to that point and a limited number of sight words that have been systematically taught. As the children learn more sound-spelling correspondences, the texts become more sophisticated in meaning, but initially they are very limited. Only decodable text provides children the opportunity to practice their new knowledge of sound-letter relationships in the context of connected reading.

Texts that are less decodable do not allow the integration of the phonological knowledge the children gain with actual reading. For example, the first sentence children read in a meaning-based program that added an unintegrated phonic component was: "The dog is up." The sound-letter relationships the children had learned up to this point were: d, m, s, r, and t. This is how much of the sentence the children could read by applying what they had learned in the phonic component: "___ d__ __ __". In this case, it is impossible for the children to use their phonics knowledge to read.

Here is a different example:

> "Sam sees a big fist." The sounds the children have learned to this point are: a, s, m, b, t, ee, f, g, and I. This is how much of the sentence the children can read using the sound-spelling relationships they have learned: "Sam sees a big fist."

This sentence is 100% decodable. Here the children can apply the sound-spelling relationships they have learned to their reading of this sentence, so the phonics component is integrated into the child's real reading. Only decodable text provides children a context for using their new knowledge of sound-spelling relationships in the context of real reading.

Decodable text is composed of words that use the sound-spelling correspondencies that children have learned to that point and a limited number of sight words that have been systematically taught.

Text that is less decodable requires the children to use prediction or context to figure out words. Much research has evaluated the effectiveness of prediction as a strategy for word recognition. Though prediction is valuable in comprehension for predicting the next *event* or predicting an *outcome*, the research indicates that it is not useful in word recognition. The following passage is a sample of authentic text (from Jack London). The parts of the text that are omitted are the part that a child was unable to decode accurately. The child was able to decode approximately 80% of the text. If prediction is a useful strategy, a good reader should be able to read this easily with understanding:

> He had never seen dogs fight as these w__ish c__ f__t, and his first ex____ t____t him an unf_____able l_____n. It is true, it was a vi___ ex_____, else he would not have lived to pr__it by it. Curly was the v____. They were camped near the log store, where she, in her friend_ way, made ad_____ to a husky dog

> the size of a full-____ wolf, th____ not half so large as _he. __ere was no w__ing, only a leap in like a flash, a met__ clip of teeth, a leap out equal_ swift, and Curly's face was ripped open from eye to jaw.
>
> It was the wolf manner of fight__, to st___ and leap away; but here was more to it than this. Th____ or forty huskies ran -o the spot and not com___d that s____t circle. But did not com____d that s____t in_____, not the e___ way with which they were licking their chops. Curly rushed her ant_____,who struck again and leaped aside. He met her next rush with his chest, in a p_____ fash___ that tum___ed her off her feet. She never re____ed them. This was __at the on____ing huskies had w_____ for.

The use of predictable text, rather than this authentic text, might allow children to use prediction to figure out a passage. However, this strategy would not transfer to real reading, as the above passage demonstrates. Predictable text gives children false success. While this false success may be motivating for many children, ultimately they will not be successful readers if they rely on text predictability to read.

6. Use interesting stories to develop language comprehension.

The use of interesting authentic stories to develop language comprehension is not ruled out by this research. Only the use of these stories *as reading material* for nonreaders is ruled out. 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 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.

7. Balance, but don't mix.

The sixth feature, using interesting stories to develop comprehension, should be balanced with the decoding instruction described in the first five features. The comprehension instruction and the decoding instruction should be 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 use of interesting authentic stories to develop language comprehension is not ruled out by this research . . . using real stories to develop comprehension should be balanced with decoding instruction . . . In other words, comprehension and decoding instruction should be balanced.

A common misconception regarding the balance that is called for by the research is that the teacher should teach sound-spelling relationships in the context of real stories. This mixture of decoding and comprehension instruction in the same instructional activity is clearly less effective, even when the decoding instruction is fairly structured. The inferiority of instructional activities with mixed goals (embedded phonics)

has been demonstrated in several studies (Foorman et al., in press; Foorman, Francis, Novy, & Liberman, 1991; Torgesen et al., in press).

During the early stages of reading acquisition, children's oral language comprehension level is much higher than their reading comprehension level. The text material used to build children's comprehension should be geared to raise their oral language comprehension level. The material used to build their decoding should be geared to their decoding skills, with attention to meaning. While decodable text can be meaningful and engaging, it will not build children's comprehension skills nor teach them new vocabulary to the extent that might be needed. Comprehension strategies and new vocabulary should be taught using stories more sophisticated than the early decodable text. The teacher should read this text to the children and discuss the meaning with them. After the children become fluent decoders, the children can apply these comprehension strategies to their own reading.

Other Important Research Questions and Findings

The scope of the NICHD research program has much broader application than identifying effective methods for treating reading difficulties. Some of these research questions and the findings that have application in everyday classroom use are briefly described below:

Question: Are there medical reasons to explain why 20 to 40% of the populationdo not naturally develop phonemic awareness?

> **Finding: Yes, sophisticated modern brain research using neuroimaging and other technologies shows a different brain signature for many, but not all, children without phonemic awareness. This neuroimaging research is being conducted at several NICHD sites, thus providing the opportunity for replication.**

Question: Are reading difficulties inherited?

> **Finding: Twin studies have found strong evidence for genetic etiology of reading difficulties, with deficits in phonemic awareness reflecting the greatest degree of heritability. There is also behavioral genetic evidence for degrees of heritability for letter processing.**

Question: How does ADD relate to learning difficulties?

> **Finding: Disorder of attention and reading disability often coexist, but the two disorders appear distinct and separable with respect to the effects of attention-deficit disorder (ADD) on cognitive tasks. For example, it has been found that ADD children perform poorly on rote verbal learning and memory tasks, but relatively well on naming and phonemic awareness tasks. The converse appears to be the case for children with reading disabilities.**

Question: Do more boys than girls have reading difficulties?

> **Finding: Despite the widely held belief that boys are more likely to have**

reading difficulties than girls, research has shown that as many girls as boys have difficulty learning to read. More boys are identified by teachers in school because of their tendency to be more rowdy and active than girls.

Future Directions

The NICHD research program has made a great deal of progress in the investigation of reading difficulties. Because about 40% of the population have reading problems severe enough to hinder enjoyment of reading, these findings are potentially of great benefit to most children as they develop basic reading skills. However, the work is not finished and not all the issues are resolved. Some children continue to have reading difficulties despite participating in the interventions described above, interventions that were successful for most students. Further, future research will investigate effective treatments for teaching children who have no knowledge of English to read English. The on-going longitudinal intervention studies sponsored by the NICHD will bring important new knowledge to the field in the continuing effort to make every child a competent reader at an early age.

References

The NICHD Research Sites

Location	Director(s)	Affiliates
University of Colorado	John DeFreis	University of Denver, University of California, Irvine Harvard University
Bowman-Gray School of Medicine, North Carolina	Frank Wood	
Haskins Laboratories	Carol Fowler	
Yale University	Bennett and Sally Shaywitz	Keith Stanovich's team at the Ontario Institute for Studies in Education
University of Miami	Herbert Lubs	
Beth Israel Hospital/Harvard University	Albert Galburda	
University of Houston	Jack Fletcher	
University of Washington, Seattle	Virginia Berninger	
Harvard University/ The Children's Hospital, Boston	Deborah Waber	
Johns Hopkins University	Martha Denckla	Vellutino and Scanlon's team at the State University of New York
Florida State University	Joseph Torgeson	
University of Houston	Barbara Foorman	
Georgia State University	Robin Morris	Maureen Lovett's team at the University of Toronto; Maryanne Wolfe's at Tufts University in Boston.

Bibliography

Alford, J. (1980, May). *Predicting predictability: Identification of sources of contextual constraint on words in test.* Paper presented at the meeting of the Midwestern Psychological Association, St. Louis.

Aborn, M., Rubenstein, H., & Sterling, F. (1959). Sources of contextual constraint upon words in sentences. *Journal of Experimental Psychology, 57,* 171-180.

Adams, M. (1990). *Beginning to read: Thinking and learning about print.* Cambridge, MA: MIT Press.

Ball, E. W., & Blachman, B. A. (1991). Does phoneme awareness training in kindergarten make a difference in early word recognition and developmental spelling? *Reading Research Quarterly, 26*(1), 49-66.

Byrne, B., & Fielding-Barnsley, R. (1990). Acquiring the alphabetic principle: A case for teaching recognition of phoneme identity. *Journal of Education Psychology, 83,* 451-455.

Cunningham, A. E. (1990). Explicit versus implicit instruction in phonological awareness. *Journal of Experimental Child Psychology, 50,* 429-444.

Dahl, K.L., & Freppon, P. (1995). A comparison of inner-city children's interpretations of reading and writing instruction in the early grades in skill-based and whole language classrooms. *Reading Research Quarterly, 30,* 50-74.

Fletcher, J., Shaywitz, S., Shakweiler, D., Katz, L., Liberman, I., Stuebing, K., Francis, D., Fowler, A., & Shaywitz, B. (1994). Cognitive profiles of reading disability: Comparisons of discrepancy and low achievement definitions. *Journal of Educational Psychology, 86*(1), 6-23.

Foorman, B., Francis, D., Beeler, T., Winikates, D., & Fletcher, J. (in press). Early interventions for children with reading problems: Study designs and preliminary findings. *Learning Disabilities: A Multi-disciplinary Journal.*

Foorman, B., Francis, D., Novy, D. & Liberman, D. (1991). How letter-sound instruction mediates progress in first-grade reading and spelling. *Journal of Educational Psychology, 83*(4), 456-469.

Francis, D., Shaywitz, S., Stuebing, K., Shaywitz, B., & Fletcher, J. (1996). Developmental lag versus deficit models of reading disability: A longitudinal, individual growth curves analysis. *Journal of Educational Psychology, 88*(1), 3-17.

Freppon, P. A. (1991). Children's concepts of the nature and purpose of reading in different instructional settings. *Journal of Reading Behavior, 23*(2), 139-163.

Gough, P. (1983). Context, form, and interaction. In K. Rayner (Ed.), *Eye movements in reading,* 331-358. Cambridge, MA: MIT Press.

Hiebert, E.H., Colt, J.M., Catto, S.L., & Gary, E.C. (1992). Reading and writing of

first-grade students in a restructured Chapter 1 program. *American Educational Research Journal, 29*, 545-572.

Iversen, S., & Tunmer, W. (1993). Phonological Processing Skills and the Reading Recovery Program. *Journal of Educational Psychology, 85*(1), 112-126.

Kasten, W.C., & Clarke, B.K. (1989). Reading/writing readiness for preschool and kindergarten children: A whole language approach. Sansibel: Florida Educational Research and Development Council (ED 312 041).

Kaufman, A.S., & Kaufman, N.L. (1985). *Kaufman Test of Educational Achievement*. Circle Pines, MN: American Guidance Service.

Lie, A. (1991). Effects of a training program for stimulating skills in word analysis in first-grade children. *Reading Research Quarterly, 26*(3), 234-250.

Lovett, M., Borden, L., DeLuca, T., Lacerenza, L., Benson, N., & Brackstone, D. (1994). Treating core deficits of developmental dyslexia: Evidence of transfer of learning after phonologically- and strategy-based reading training programs. *Developmental Psychology, 30*(6), 805-822.

Lundberg, I., Frost, J., & Petersen, O. (1988). Effects of an extensive program for stimulating phonological awareness in preschool children. *Reading Research Quarterly, 23*, 263-284.

Lyon, R., & Alexander, D. (1996). NICHD research program in learning disabilities. In S. Horowitz (Ed.), *Their World*, p. 13-15. New York, NY: National Center for Learning Disabilities.

Lyon, G.R., & Chhabra, V. (1996). The current state of the science and the future of specific reading disability. *Mental Retardation and Developmental Disabilities Research Reviews, 2*, 2-9.

Lyon, G.R. (1993). *Treatment effectiveness for the learning disabled.* Request for Applications (93-009). Bethesda, MD: The National Institute of Child Health and Human Development.

Lyon, G.R. (1994). *Frames of reference for the assessment of learning disabilities: New views on measurement issues.* Baltimore, MD: Paul H. Brookes.

Lyon, G.R. (1995a). Toward a definition of dyslexia. *Annals of Dyslexia, 45*, 3-27.

Lyon, G.R. (1995b). Research initiatives in learning disabilities: Contributions from scientists supported by the National Institute of Child Health and Human Development. *Journal of Child Neurology, 10*, 120-126.

Lyon, G.R., Gray, D., Kavanagh, J., Krasnegor, N. (Eds.) (1993). *Better understanding learning disabilities: New views from research and their implications for education and public policies.* Baltimore, MD: Paul H. Brookes.

Mann, V.A. (1993). Phoneme awareness and future reading ability. *Journal of Learning Disabilities, 26*(4), 259-269.

McIntyre, E., & Freppon, P. (1994). A comparison of children's development of alphabetic knowledge in a skill-based and whole language classroom. *Research in the teaching of English, 28,* 391-417.

Miller, G., & Coleman, E. (1967). A set of thirty-six prose passages calibrated for complexity. *Journal of Verbal Learning and Verbal Behavior,* 851-854.

Perfetti, C.A., Goldman, S., & Hogaboam, T. (1979). Reading skill and the identification of words in discourse context. *Memory and Cognition, 7,* 273-282.

Rack, J.P., Snowling, M.J., & Olsen, R.K. (1992). The nonword reading deficit in developmental dyslexia: A review. *Reading Research Quarterly, 27*(1), 29-53.

Ribowsky, H. (1985). The effects of a code emphasis approach and whole language approach upon emergent literacy of kindergarten children. Alexandria, VA: Educational Document Reproduction Service (ED 269 720).

Rubenstein, H., & Aborn, M. (1958). Learning, prediction, and readability. *Journal of Applied Psychology, 42,* 28-32.

Shaywitz, S., Escobar, M., Shaywitz, B., Fletcher, J., & Makuch, R. (1992). Evidence that dyslexia may represent the lower tail of a normal distribution of reading disability. *New England Journal of Medicine, 326*(3), 145-150.

Snowling, M. (1991). *Dyslexia: A cognitive developmental perspective*. Oxford: Basil Blackwell.

Spector, J.E. (1995). Phonemic awareness training: Application of principles of direct instruction. *Reading & Writing Quarterly, II,* 37-51.

Stanovich, K., & Siegel, L. (1994). Phenotypic performance profile of children with reading disabilities: A regression-based test of the phonological-core variable-difference model. *Journal of Educational Psychology, 86*(1), 24-53.

Stanovich, K. (1993). The construct validity of discrepancy definitions of reading disability. In G.R. Lyon, D. Gray, J. Kavanagh, N. Krasnegor (Eds.) (1993). *Better understanding learning disabilities: New views from research and their implications for education and public policies.* Baltimore, MD: Paul H. Brookes.

Stanovich, K. (1994). Romance and reality. *The Reading Teacher, 47*(4), 280-291.

Stanovich, K., & Stanovich, P. (1995). How research might inform the debate about early reading acquisition. *Journal of Research in Reading, 18*(2), 87-105.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual

differences in the acquisition of literacy. *Reading Research Quarterly, 21*, 360-407.

Stice, C.F., & Bertrand, N.P. (1990). Whole language and the emergent literacy of at-risk children: A two-year study. Nashville: Center of Excellence, Basic Skills, Tennessee State University (ED 324 636).

Torgensen, J.K., Wagner, R., Rashotte, C.A., Alexander, A.W., & Conway, T. (in press). Preventive and remedial interventions for children with severe reading disabilities. *Learning Disabilities: A Multidisciplinary Journal.*

Vellutino, F.R. (1991). Introduction to three studies on reading acquisition: Convergent findings on theoretical foundations of code-oriented versus whole-language approaches to reading instruction. *Journal of Educational Psychology, 83*(4), 437-443.

Vellutino, F.R., & Scanlon, D.M. (1987a). Linguistic coding and reading ability. In S. Rosenberg (Ed.), *Advances in applied psycholinguistics* (pp1-69). New York: Cambridge University Press.

Vellutino, F.R., & Scanlon, D.M. (1987b). Phonological coding, phonological awareness, and reading ability: Evidence from a longitudinal and experimental study. *Merrill-Palmer Quarterly, 33*(3), 321-363.

Wagner, R.K., & Torgesen, J. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin, 101*, 192-212.

Yopp, H.K. (1988). The validity and reliability of phonemic awareness tests. *Reading Research Quarterly, 23*(2), 159-176.

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