Lessons learned from intervention research in reading: A way to go before we rest

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The last two decades of research on reading have been enormously productive in producing new knowledge of the ways in which children become skilled readers and of the factors that make it difficult for some children to learn to read well. In the USA, many of these advances in understanding of reading have been summarized recently in two influential documents. One report (Snow, Burns, & Griffin, 1998), entitled Preventing reading difficulties in young children, was prepared by the National Research Council and published by the National Academy of Sciences. The other document, entitled Teaching children to read (National Reading Panel, 2000) was commissioned by the US Congress and supported in development by the National Institute of Child Health and Human Development and the US Office of Education. Both documents were produced by committees of professionals who were charged with identifying the findings about reading and reading instruction that have been consistently supported in recent research. The range of information and depth of knowledge covered in both these documents are impressive and indicate that the degree of convergence in recent research discoveries has been substantial.

In the first chapter of the report of the National Research Council, the authors identify three basic problems that constitute early stumbling blocks on the road to becoming a good reader. These difficulties involve: (1) problems in understanding and using the alphabetic principle to acquire fluent and accurate word reading skills; (2) failure to acquire the verbal knowledge and strategies that are specifically needed for comprehension of written material; and (3) absence or loss of the initial motivation to read, or failure to develop a mature appreciation of the rewards of reading. Children can experience difficulties in learning to read for any of these reasons. However, the problem that is most consistently associated with serious disabilities in reading for young children involves difficulties in acquiring accurate and fluent word-reading skills (Bruck, 1990; Manis, Custodio, & Szczepinski, 1993; Siegel, 1989). A recent, widely cited piece of evidence for this statement comes from the Connecticut Longitudinal Study (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996) that followed the reading
growth of three groups of children from the age of 7 years into adolescence. One of the
groups consisted of average level readers, and the other two groups were made up of
two kinds of poor readers. One of these latter groups had a substantial discrepancy
between their reading skills and their overall learning ability as measured by an
intelligence test (IQ discrepant group), while children in the other group obtained
scores on reading and IQ tests that were consistently below average (nondiscrepant
group). Beginning at age 7, the performance of both groups of poor readers on
measures of basic word reading skills was substantially below that of the average
readers, and this difference remained substantial throughout development. Further-
more, growth in word reading skill for the two groups of poor readers was identical;
their growth trajectories completely overlapped one another. This study provides
strong support for the conclusion that classically ‘reading disabled’ (IQ-discrepant) and
‘garden variety’ poor readers have similar long-term outcomes for word reading skill.
Both groups showed substantial deficits in this area throughout development.

The consistency with which word-level reading problems appear as the primary
stumbling block to reading growth for children with reading disabilities recently led the
research committee of the International Dyslexia Association to propose a new
definition, which reads in part: “Dyslexia is one of several distinct learning disabilities.
It is a specific language-based disorder of constitutional origin characterized by
difficulties in single word decoding...” (Lyon, 1995). The reference to ‘language-based
disorder’ in this definition is supported by a range of converging findings indicating that
the word reading difficulties of children with reading disabilities are caused primarily by
weaknesses in the ability to process the phonological features of words (Liberman,
Shankweiler, & Liberman, 1989). These phonological processing difficulties manifest
themselves on a variety of non reading measures including tests of phonological
awareness, rapid automatic naming and verbal short-term memory (Stanovich & Siegel,
1994; Torgesen, 1999). Investigation of the relationships between these variables and
reading growth has been the focus of intense study over the past two decades, and
there is now a substantial body of both longitudinal-correlational (Wagner et al., 1997)
and experimental evidence (Bradley & Bryant, 1985; Hatcher, Hulme, & Ellis, 1994;
Lundberg, Frost, & Peterson, 1988) indicating that differences among children on these
language skills are causally related to variability in the rate at which children acquire
early word reading abilities.

With this brief background, it is easy to see why one important focus of intervention
research in the area of reading disabilities has been to study methods to prevent the
emergence of word reading difficulties in young children and to remediate them in
older children. In fact, regardless of whatever else (e.g. stimulation of vocabulary,
appreciation of the value of reading, building language comprehension) an intervention
accomplishes for children, if it is not successful in substantially increasing the efficiency
with which they identify words in text, it has not addressed the central issue in reading
disabilities. Although the ultimate goal of good reading instruction is to provide children
with all the skills that they require to construct the meaning of text, for children with
reading disabilities, a very significant part of that effort involves helping them acquire
efficient word-level skills.
Firm conclusions from recent research on the prevention of reading disabilities

In this section, I am going to draw three conclusions from recent research on the prevention of reading difficulties in young children. These conclusions are based on findings from studies that have been completed within the last 10 years and which have been conducted within the context of recently acquired knowledge about reading and reading growth. The first conclusion to be substantiated is: Instructional approaches that are more phonemically explicit and intensive have the strongest impact on the reading growth of children at risk for reading disabilities.

Findings from four recent studies are relevant to this conclusion. The first large-scale intervention study to be conducted within the context of recently acquired knowledge about the nature of reading disabilities was reported by Brown and Felton (1990). They identified a sample of children in kindergarten who fell in the bottom 16th percentile in their phonological processing abilities as measured by tests of phonological awareness, rapid automatic naming and verbal short-term memory. Children with general intelligence levels below 80 were excluded from the sample.

These children were randomly assigned to two instructional conditions and taught by specially trained teachers in groups of eight during first and second grade. The two instructional methods differed in the extent to which they emphasized the use of phonemic decoding strategies as an aid to early reading growth. One of the programmes provided systematic and explicit instruction in phonemic elements (letter-sound correspondences) and blending strategies, while the other method taught the children to rely first on context cues and to use analysis of the sounds in words to confirm contextually based guesses. In other words, the code-oriented condition provided significantly more instruction and practice in applying phonetic analysis and blending skills to reading words in text than the context-oriented instructional condition. Over the first and second grade years, the children received approximately 340 hours of instruction in each condition.

At the end of second grade, children in the code-oriented condition showed generally stronger word reading, phonetic decoding and comprehension skills than children in the context-oriented group, although the differences between groups on these measures were not statistically reliable. Scores on these three measures of reading skill are presented in Figure 1.

![Figure 1](image-url)  

**Figure 1.** Reading outcomes at the end of second grade for children in the code-emphasis and meaning-emphasis groups. From Brown and Felton (1990).
In another study that selected children on the basis of weaknesses in phonological knowledge and skill in kindergarten, Torgesen et al. (1999b) studied the effects of four instructional conditions on a variety of reading outcomes. The children in this study performed below the 12th percentile on pretest measures of phonological ability and came from a wide range of socio-economic backgrounds.

The children were randomly assigned to one of four instructional conditions: (1) phonological awareness plus synthetic phonics (PASP), which involved very explicit instruction in phonological awareness using articulatory cues plus extensive practice in decontextualized phonetic decoding; (2) embedded phonics (EP), which also provided explicit instruction in phonics but placed more emphasis on applications to reading and writing connected text, along with acquisition of a functional sight vocabulary; (3) a regular classroom support (RCS) group, which received direct tutorial support for the reading instruction provided in the regular classroom; and (4) a no-treatment control (NTC) group. Children in each of the instructional conditions received one-to-one tutoring in 20-minute sessions, 4 days a week for 2½ years beginning in the second semester of kindergarten. Half the sessions were led by well-trained teachers, and half were led by less well-trained instructional aides: over the entire period of instruction, the children received an average of 47 hours of instruction from teachers and 41 hours from aides.

Reading outcomes at the end of second grade for phonemic decoding skill, context-free word identification, and passage comprehension scores are presented in Figure 2. The differences across groups for all three measures were statistically reliable, although the differences for the word reading measures were stronger than those for passage comprehension. The most phonemically explicit group (PASP) showed particular advantages on the word level measures.

In a prevention study that selected children in a slightly different way than the previous two studies, Barbara Foorman and her colleagues (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998) examined the effects of four instructional conditions on reading growth in a sample of economically disadvantaged children who scored in the bottom 18% on their school district’s literacy survey at the beginning of first or second grade. Instruction was delivered at the classroom level in 90-minute daily

![Figure 2. Reading outcomes at the end of second grade for children in four instructional groups. (PASP = phonological awareness plus synthetic phonics, EP = embedded phonics, RCS = regular classroom support, NTC = no-treatment control). From Torgesen, et al. (1999b).](image)
instructional periods. The direct code condition provided explicit instruction in phonological awareness, phonics (with particular attention to blending as a key strategy) and literature activities. The embedded code condition also provided instruction in phonemic awareness, but utilized less direct instruction in systematic spelling patterns (onset rhymes) embedded in connected text. The implicit code condition was delivered in either a district standard format, or in a research format that involved additional training and supervision of teachers. The emphasis of this approach was on the teacher as facilitator rather than director of learning, and on children's construction of meaning. It did not provide systematic instruction in phonemic awareness or phonics.

At the end of one year of instruction, which involved approximately 174 hours in each condition, children in the direct-code condition obtained significantly stronger outcomes on measures of sight word reading, phonetic decoding and passage comprehension than children in the other three groups. These findings are illustrated graphically in Figure 3.

The last study to be considered for its conclusions about instructional effects was conducted by Iversen and Tunmer (1993). This study examined outcomes from two variants of the popular Reading Recovery approach to the prevention of early reading difficulties. The standard variant employed well-trained teachers to implement the Reading Recovery method in its standard form, while the modified version replaced some of the text reading time in the standard version with work explicitly focused on building phonemic decoding skills. Although children in both conditions obtained equally strong reading skills at the end of the intervention, those who received the modified version of Reading Recovery obtained skills sufficient to exit the programme in significantly fewer instructional sessions. It was estimated that addition of the explicit work in phonemic decoding strategies increased the efficiency of the instruction by 37%.

In all of these studies, children who were assigned to the most phonemically explicit instructional conditions obtained the strongest growth in word-level reading skills. Effects for word-level reading skills were statistically reliable for all studies except that reported by Brown and Felton (1990). However, in a follow-up report (Felton, 1993)

![Image](image_url)

**Figure 3.** Outcomes in word-level reading skills and passage comprehension for children in four instructional groups. From Foorman et al. (1998).
that examined the reading growth of children in this study 2 years following the intervention, evidence for statistically reliable instructional effects on growth of word-level skills was obtained. Although instructional effects for reading comprehension were less robust than those for word-reading ability, they always favoured children in the more phonemically explicit conditions. The study that obtained the most robust effects on comprehension (Foorman et al., 1998) used an instructional approach that incorporated explicit instruction in phonemic decoding skills as well as explicit instruction in comprehension strategies and ample opportunities to engage in meaningful reading activities under careful supervision. In contrast, in the study reported by Torgesen et al. (1999b), almost the entire instructional time of the most effective condition was devoted to word-level reading skills. This focus produced maximal growth in word-level skills during the limited instructional time available, and children in the PASP condition were the only ones who showed significant improvement over children in the no-treatment control group. However, the overall impact of the instruction would probably have been improved by additional time devoted to explicit instruction and practice of reading comprehension skills.

The second conclusion that is supported by recent research on the prevention of reading disabilities is: **Intensive preventive instruction can bring the average word-reading skills of children at risk for reading disabilities solidly into the average range.**

Evidence for this conclusion is immediately apparent from Figures 2 and 3, which report the results from the Torgesen (Torgesen et al., 1999b) and Foorman (Foorman et al., 1998) studies. Both these studies used reading measures that allow comparisons between the performance of children in their samples with that of a large, representative standardization sample. The scores in Figures 2 and 3 are standard scores, in which the population average is 100 and the standard deviation is 15. If we take as the lower bound of the average range a standard score of 92, which corresponds roughly with the 30th percentile, it is clear that the average word-level reading skills of children within the best instructional condition in each of these studies falls within that range.

Two other recent prevention studies reported similar outcomes. One of these studies (Vellutino et al., 1996) examined reading outcomes for children who were selected at the end of the first semester of first grade because they obtained word level reading scores below the 15th percentile. These children were given between 35 and 65 hours (depending on need) of one-to-one tutoring in reading during the second semester of first grade and the first semester of second grade. The children were explicitly taught a variety of strategies for word identification including: sight word instruction, phonetic decoding, and use of sentence context and pictures to help identify words, with the amount of time spent on various skills being determined by each child’s specific needs. Although there was substantial variability in the reading growth of the children receiving instruction, their average standard score for word-level reading skills at the end of second grade was 95, which is solidly within the average range.

The last study to be described here utilized computer software to provide supplementary instruction and practice to small groups of first graders selected to be the 18% most at risk for reading failure. Risk status was determined by scores on measures of phonological skill and knowledge at the beginning of first grade (Torgesen, Wagner, Rashotte, & Herron, 1999a). Children were randomly assigned to two instructional conditions, both of which provided explicit instruction in phonemic awareness and phonemic decoding skills along with opportunities to apply these skills
in reading and writing text. The programmes differed in instructional emphasis, with the Auditory Discrimination in Depth (ADD) (Lindamood & Lindamood, 1984) programme being the more phonemically explicit and intensive of the two. The Read, Write, and Type (RWT) (Herron, 1995), provided explicit instruction and practice in phonological awareness, letter-sound correspondences and phonemic decoding, but did so primarily in the context of encouraging children to express themselves in written language.

Instruction in both conditions was provided in 50-minute sessions, 4 days a week from October through to May of the first-grade year. Children were taught in groups of three. The first 25 minutes of each session involved teacher-led activities and instruction to prepare children for work on the computer, and the second half of the session involved individual work on the computer using software specifically designed to support the programme of instruction.

Children in both instructional conditions did very well. For example, the average standard score on the Word Attack measure was 114 and 108 for the ADD and RWT conditions, respectively. The children had obtained scores of 74 and 76 on this same measure at the beginning of the year. Corresponding end-of-year standard scores for the Word Identification measure were 111 and 107, with standard scores for the passage comprehension being 102 and 100, respectively. There were no reliable differences in outcome between methods, and performance on word-level measures at the end of the instruction was actually above average.

Although these studies demonstrate that we understand the conditions that need to be in place to bring the average word-level reading skills of children at risk for reading difficulties into the average range, there was considerable variability in response to even the strongest instruction within each study. This introduces the third conclusion from recent research: Even under the best-known instructional conditions, a substantial proportion of children have remained relatively impaired in word-level reading skills at the conclusion of the intervention.

I have suggested elsewhere (Torgesen, 2000) that a reasonable standard for preventive instruction with young children is to expect reading achievement within half a standard deviation of the mean, which corresponds roughly to the 30th percentile. I am comfortable with this standard based on current norms, but recognize that, as reading instruction for all children improves, it will require increasingly higher skills to achieve the 30th percentile level. As overall reading scores improve through more effective instruction, it may become the case that only children below the 20th or 10th percentile will have reading skills at a level that places them at risk for future reading growth. For the time being, and in the absence of well-established absolute standards of reading attainment for each grade level, I have adopted the goal for preventive programmes of insuring that children do not fall below the 30th percentile on critical word reading skills at any time during their early elementary years. This standard is slightly higher than the 25th percentile standard that is frequently adopted as a criterion for reading difficulties, in order to provide an extra measure of protection for future reading growth. I have advocated elsewhere (Torgesen, Rashotte & Alexander, 2001) a slightly lower standard (standard score 90) for remedial instruction with older children because the children to whom the standard is being applied are further along in the development of their reading skills.

Table 1 provides data from five prevention studies in which it was possible to identify the percentage of children in each intervention sample who obtained scores below the 30th percentile on measures of word reading ability at the end of the
Table 1. Proportions of students from early intervention studies with word-level reading skills below the 30th percentile at the conclusion of the intervention

<table>
<thead>
<tr>
<th>Study</th>
<th>Amount of instruction</th>
<th>Instructional group size</th>
<th>Sample failure rate</th>
<th>Population failure rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foorman et al. (1998)</td>
<td>174 hours</td>
<td>Whole class</td>
<td>35%</td>
<td>6%</td>
</tr>
<tr>
<td>Brown and Felton (1990)</td>
<td>340 hours</td>
<td>1:8</td>
<td>29%</td>
<td>5%</td>
</tr>
<tr>
<td>Vellutino et al. (1996)</td>
<td>35–65 hours</td>
<td>1:1</td>
<td>44%</td>
<td>6%</td>
</tr>
<tr>
<td>Torgesen et al. (1999)</td>
<td>88 hours</td>
<td>1:1</td>
<td>34%</td>
<td>4%</td>
</tr>
<tr>
<td>Torgesen et al. (2001)</td>
<td>80 hours</td>
<td>1:3</td>
<td>11%</td>
<td>2%</td>
</tr>
</tbody>
</table>

intervention. The measure of word-reading skill was an average of performance on measures of phonemic decoding ability and context-free word reading accuracy. From 11 to 44% of the children in these studies completed the intervention with critical word reading skills remaining below the 30th percentile. However, it is important to remember that these children represented the 12–18% of children most at risk for reading failure; they were not a random sample of all children. To obtain a rough idea of the proportion of all children who would remain with weak reading skills if these interventions were applied more broadly, we can multiply the percentage of weak readers in the intervention sample by the proportion of the population they represent. For example, in the study conducted by Barbara Foorman and colleagues (1998), the students who received the intervention came from the 18% most at risk for reading failure. At the conclusion of the intervention, 35% of this bottom 18% remained weak readers, and multiplying .18 by .35 would give us a population failure rate of 6%. In Table 1, these population failure estimates are reported in the column on the far right.

Although there are a number of important caveats to the estimation of population failure rates reported in Table 1 (Torgesen, 2000), one point is well established. We have not yet discovered the conditions that need to be in place for all children with the most serious disabilities to acquire adequate word-level reading skills in early elementary school. However, we clearly know how to sharply reduce the number of children who leave first and second grades with weak skills in this area. Most of the estimates reported in Table 1 suggest that 4–6% of children would still have weak word reading skills if those interventions were applied to all who needed them. It is striking that these figures are very similar to the percentage of the population that is currently being served in programmes for children with learning disabilities. At least in the USA, these incidence figures hover around the 5% mark. Thus, it may be the case that most of the interventions tested thus far are simply inadequate to prevent reading disabilities in the children who have typically been served by the public schools with this label. Although one condition in our last study reduced the number of children with weak word-level reading skills to an estimated 2%, there is no guarantee that all these children will continue to make adequate progress in second grade without some form of continuing special support.

Any attempt to understand the conditions that must be in place for children with the most serious disabilities to acquire adequate reading skills must address two questions. These questions are: (1) what is the best method, or combination of methods, of instruction for these children, and (2) how much special instruction will they require?
At this point in the development of our field, we have the beginnings of a consensus about the first question, but are still far from a consensual answer to the second.

**Interventions for older children with serious reading disabilities**

Research and clinical examination of remedial methods for older children with severe reading disabilities have a long history when compared with the more recent experimentation on methods for the prevention of reading disabilities (Clark & Uhry, 1995). However, most professionals in this area would agree that we know less about the conditions that need to be in place to help children acquire good reading skills after they have failed for several years than we do about preventing reading failure in the first place. In a recent discussion of efforts to provide remedial assistance to children with reading disabilities in the context of the regular classroom, Zigmond (1996) made the following point: “As a field, we have yet to demonstrate what instruction is needed to help students with learning disabilities who are far behind their peers make substantial progress in reading achievement, let alone whether this instruction can be incorporated into the organization and management framework of a general education setting” (p. 187).

In fact, the most that can be said of typical special education programmes for children with severe reading disabilities is that they tend to stabilize the relative deficit in reading skill rather than remediate it. That is, children do not fall farther behind in their reading skills once they are placed in special education, but neither do they ‘close the gap’ in reading ability with their age-level peers. Recently, Hanushek, Kain, and Rivkin (1998), using a very large sample from the Texas Schools Microdata Panel, showed that typical special education placements during the fourth and fifth grade years of elementary school accelerated reading growth by only 0.04 standard deviations over the rate that the children had been achieving in their regular classroom placements. While this represents a positive accomplishment for special education, it is hardly sufficient to normalize the reading skills of children with severe reading disabilities in any reasonable period of time.

Sharon Vaughn and her colleagues (Vaughn, Moody, & Schumm, 1998) have conducted observational studies of instruction in many special education classrooms, and have identified several reasons why most placements are not more effective in accelerating the reading growth of older children with reading disabilities. First, the interventions are offered with insufficient intensity. The teachers they observed were simply carrying too large a caseload of students, and they were not able to offer them the individualized instruction they require. Further, there was little direct instruction in such critical components as phonemic decoding and phonemic awareness - most instruction on word-level skills involved ‘phonics’ worksheets that the children completed independently. Finally, Vaughn and her colleagues observed little or no direct instruction in comprehension strategies, which has been shown to be a very effective form of instruction for older children with reading disabilities (Mastropieri & Scruggs, 1997).

We recently addressed the question of whether it is possible to produce substantial improvements in the reading skills of children with severe reading disabilities in a relatively brief period of time by examining the effects of two instructional approaches that were delivered intensively over an 8-week period of time (Torgesen et al., 2001). The children in the study were between 8 and 10 years of age when they received the
interventions, and they had been receiving special education services for reading for an average of 16 months prior to entering our study. They were nominated by their teachers as having serious disabilities in acquiring word-level reading skills, and their average score on two measures of word reading skill was more than 1.5 standard deviations below average for their age. The 60 children identified for the study fitted the classic pattern of children with severe dyslexia: their verbal intelligence was in the average range (average verbal IQ = 93) while their scores for phonemic decoding and word reading ability were very impaired (average standard scores for Word Attack and Word Identification were 67 and 69, respectively). Passage comprehension scores were relatively higher than word-level scores (the average standard score for Passage Comprehension was 83).

The children were randomly assigned to two instructional groups, and each group was provided with 67.5 hours of one-to-one instruction given daily in two 50-minute sessions, 5 days a week for 8 weeks. One of the groups received the Lindamood phoneme sequencing program for reading, spelling, and speech (LIPS) (Lindamood & Lindamood, 1998), while the instructional programme for the other group was developed locally and was referred to as embedded phonics (EP). These programs both involved explicit instruction in phonemic decoding skills, stimulation of phonemic awareness, building a sight word vocabulary of high-frequency words, and applications of these skills to reading and understanding text, but their instructional emphasis was very different. The LIPS programme worked intensively to build strong phonemic awareness by helping children discover the articulatory gestures associated with each phoneme. In order to provide a shared language for discussion of phonemes and correction of reading errors, each phoneme received a label that reflected a critical part of the articulation required to produce it in speech. For example, the phonemes /b/ and /p/ were labelled 'lip poppers' because the lips come together and then 'pop open' when they are pronounced. One of the phonemes (/b/) was referred to as a 'noisy lip popper' because it was voiced, while the other one (/p/) was called the 'quiet lip popper' because the vocal chords are not used when it is pronounced. A large share of the instructional time in the LIPS programme was focused on teaching children to accurately identify the number, order, and identity of sounds in words.

The embedded phonics programme was given that name because a relatively smaller amount of focused and explicit instruction in 'phonics knowledge and skill' was provided in the context of a programme that involved larger amounts of carefully monitored reading of text. In this programme, phonemic awareness was stimulated by asking children to write words they were learning, and to listen for sounds in words as an aid to spelling. Most of the instructional time in this condition was spent reading connected text, with the teacher providing careful error correction and discussion in order to help children generalize effective word decoding strategies to their text reading. There was also considerable discussion of the meaning of passages that were read in this condition.

To provide a clearer picture of the differences in instructional emphasis between conditions, we did a time-by-activity analysis that produced the following comparisons: (1) time spent on training phonemic awareness and phonemic decoding using single word practice was 85% for the LIPS and 20% for the EP programme; (2) time spent on direct sight word practice was 10% for LIPS and 30% for EP; and (3) time spent reading or writing connected text was 5% for LIPS and 50% for EP. In the context of these important differences in instructional emphasis, it should be emphasized that both conditions incorporated principles of instruction that have generally been found to be
Figure 4. Standard scores on the Broad Reading Cluster before, during, and following the intensive intervention. From Torgesen et al. (2001).

Successful for children with reading disabilities (Swanson, 1999). That is, both methods provided: (1) ample opportunities for guided practice of new skills; (2) very intensive instruction; (3) systematic cueing of appropriate strategies in reading words or text; and (4) explicit instruction in phonemic decoding strategies.

Figure 4 illustrates the dramatic improvement in reading skills experienced by children in both instructional conditions. The measure used to assess reading growth was standard scores on the Broad Reading Cluster from the Woodcock-Johnson Psycho-Educational Battery - Revised (Woodcock & Johnson, 1989) that were obtained before, during, and following the intervention period. The Broad Reading Cluster is composed of scores on the Word Identification and Passage Comprehension subtests of the WJPR. We obtained scores prior to the treatment from school records, with the average period elapsing between the school tests and our pretest being 16.6 months. During this 16-month time period, the children received remedial reading instruction within resource room settings. The teacher-to-student ratio in these resource rooms ranged between 1:8 and 1:18. When the rate of reading growth during the pre-intervention period (when the children were receiving regular resource-room interventions) was compared with growth during the intervention period in our study, the effect size for the LIPS group was 4.4, and that for the EP group was 3.9. Not only was reading growth powerfully accelerated during the intervention period, but the children continued to 'close the gap' in reading skill over the follow-up period in which they received no further intensive intervention. At the conclusion of the follow-up period, their standard score on the measure of broad reading skill was 92.5, which places the children at the lower end of the normal range of ability in word reading accuracy and comprehension.

Figure 4 also suggests that there was little difference in outcome between the two instructional conditions, and this is consistent with more extensive analysis of the outcome data. In fact, the only differences that emerged between the two groups were at the immediate post-test, with the LIPS group performing more strongly on a measure of phonemic decoding accuracy and one of two measures of phonemic awareness. These differences were no longer reliable at the 2-year follow-up point.
This study illustrates the power of intensive and appropriate instruction for older children with severe reading disabilities, and it is not alone in showing that we should expect more progress from children receiving remedial help than is typically obtained in special education settings. One way to describe the power of an intervention is to calculate a metric that estimates reading growth in terms of the change in standard score points per hour of instruction. Remember, a child’s standard score for a given measure of reading skill describes performance in comparison with a large, randomly selected standardization sample. If a child has a standard score of 70 on a typical reading measure, that means he/she is performing two standard deviations below average. Improvement in that standard score would mean that the child’s reading skills are ‘closing the gap’ with average level skills. Table 2 presents values for this metric for measures of phonemic decoding (word attack), context-free word reading (word identification), and reading comprehension (passage comprehension) across several studies. The studies by Wise, Ring, and Olson (1999), Lovett et al. (2000), Alexander, Anderson, Heilman, Voeller, and Torgesen (1991), and Truch (1994) all taught children similar to those selected for the present study, while Rashotte, MacPhee, and Torgesen (2001) worked with children of similar ages who were less severely impaired. It is apparent from Table 2 that the rates of growth for phonemic decoding skills, word-reading ability and reading comprehension are very similar across the group of studies of children with severe reading disabilities.

The consistency in rate of gain across the first five studies in Table 2 seems remarkable, and it suggests that the high rates of growth obtained in our study (Torgesen et al., 2001) should be generalizable to other settings, with other teachers implementing the interventions. The similarities in growth rate between the LIPS and EP conditions in our study suggest that, given the right level of intensity and teacher skill, it may be possible to obtain these rates of growth using a variety of approaches to direct instruction in reading. One might even suggest that these rates could serve as a benchmark for ‘reasonable progress’ in reading for students receiving remedial instruction in both public and private settings.

Table 2. Gains in standard score points per hour of instruction for three measures of reading skill

<table>
<thead>
<tr>
<th></th>
<th>Phonemic decoding</th>
<th>Word identification</th>
<th>Passage comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torgesen et al. (2001)</td>
<td>LIPS</td>
<td>.41</td>
<td>.20</td>
</tr>
<tr>
<td>67.5 hours of 1:1</td>
<td>EP</td>
<td>.30</td>
<td>.21</td>
</tr>
<tr>
<td>Wise et al. (1999)</td>
<td></td>
<td>.31</td>
<td>.22</td>
</tr>
<tr>
<td>40 hours, small group +1:1 computer practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lovett et al. (2002)</td>
<td></td>
<td>.34</td>
<td>.18</td>
</tr>
<tr>
<td>70 hours 1:4</td>
<td></td>
<td>.34</td>
<td>.23</td>
</tr>
<tr>
<td>Alexander et al. (1991)</td>
<td></td>
<td></td>
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<tr>
<td>65 hours 1:1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Truch (1994)</td>
<td></td>
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<td>80 hours 1:1</td>
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<td>Rashotte et al. (2001)</td>
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<td>.50</td>
<td>.19</td>
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<td>30 hours small group (4)</td>
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Before this section is concluded, it is important to mention the limitations in our findings concerning remedial instruction with older children. In both remedial studies we have conducted thus far (Rashotte et al., 2001; Torgesen et al., 2001), standard score gains in reading accuracy have been much larger than gains in reading fluency. Although the children showed remarkable progress in ‘closing the gap’ in reading accuracy and comprehension, they remained quite dysfluent relative to average readers. In fact, in the study described in this chapter, the children remained almost two standard deviations below average in their text-reading fluency scores at the conclusion of the 2-year follow-up period. This same dissociation of reading accuracy and reading fluency scores has not been found in two prevention studies we have conducted (Torgesen, Rashotte, & Alexander, 2001), and most probably represents the effect of enormous deficits in reading practice that accumulate during the years the older children remained poor, or essentially non readers.

The other caveat to the results reported here is that they did not apply to all children in the study. Depending upon the specific reading skill, anywhere from 15 to 60% of the children in the intervention sample obtained standard scores below 90 at the conclusion of the 2-year follow-up period. As with the prevention studies, it is unclear how much additional instruction it might take to help all children with severe reading disabilities acquire reading skills within the average range.

Conclusions

The title of this chapter suggests that we have ‘a way to go before we rest’ when it comes to understanding the conditions that need to be in place for all children to acquire sufficient reading skill so that they can learn from and understand written material at a level that is consistent with their overall intellectual ability. The documentation for this statement comes from the proportion of children still ‘at risk’ after high-quality preventive reading instruction, and the proportion of children who remain poor readers following intensive remedial interventions. At the same time, we have come a very long way towards understanding many of the critical elements of instruction required to prevent and remediate reading difficulties for most children who currently experience them. We know, for example, that instruction that is more phonemically explicit is most effective in preventing word-level reading difficulties in young children. One of the important remaining challenges in this area is to define the appropriate balance between phonemically explicit instruction at the individual word reading level and instruction in broad language skills and comprehension that is most effective in producing optimum long-term growth in reading comprehension, reading fluency and enjoyment of reading for at-risk children. Another important task will be to define the range of instructional intensity that must be available in order to provide appropriate amounts of instruction for all children.

The remaining challenges for research on remedial instruction are similar, with one additional problem. The additional challenge for remedial research is to determine how to focus or structure reading practice to improve reading fluency, while maintaining gains in reading accuracy and comprehension. This is not a simple challenge, when one understands the enormous deficits in reading practice that can accumulate from even two or three years of being a non-reader while one’s peers are reading up to a million words a year or more (Cunningham & Stanovich, 1998). Analyses we have reported elsewhere (Torgesen, Rashotte, & Alexander, 2001) suggest that reading fluency is
limited primarily by the number of words in a given text that can be recognized ‘by sight’ or at a single glance. Once poor readers improve their reading accuracy by developing more powerful decoding skills, the remaining challenge is to improve the extent of their ‘sight word vocabulary’ so that they recognize most of the words in grade-level text by sight. Text beyond the third or fourth grade level contains an extensive array of words that occur only infrequently in print (Adams, 1990). Thus, the amount of reading practice required for our erstwhile poor readers to ‘catch up’ with their normally reading peers in their ability to recognize most of these less frequent words by sight is staggering. The difficulty of playing ‘catch up’ like this may develop into one of the most powerful arguments for investment in preventive instruction with children who are at risk for the development of reading disabilities.

References


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