CHAPTER 8

The theory and practice of intervention: comparing outcomes from prevention and remediation studies

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Practitioners and researchers have been working for many years to develop and implement instructional methods that are effective in helping older children with reading disabilities acquire adequate reading skills (Clark and Uhry, 1995). However, there is consistent evidence from a variety of sources that typical school interventions for children with reading disabilities can most accurately be described as stabilizing their degree of reading failure rather than remediating or normalizing their reading skills (Kavale, 1988; Schumaker, Deshler, and Ellis, 1986). That is, children usually 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 average children of their same age level.

Recently, Hanushek, Kain, and Rivkin (1998) used a very large sample of children from the Texas Schools Microdata Panel to show 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 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.

The results from the analysis by Hanushek et al., (1998) applied specifically to resource room, or pullout methods of instruction, but nearly identical results have been reported for 'inclusion' interventions with older children. In fact, when summarizing the results from several studies of effectiveness for instructional models requiring that children with reading disabilities be instructed in the regular classroom environment, Zigmond (1996: 187) concluded thus: 'As a field, we have yet to demon-
strate 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.

Observational studies of instruction in many special education classrooms (Vaughn, Moody, and Shuman, 1998) have identified several reasons why most placements are not more effective in bringing the reading skills of older children into the average range within a reasonable period of time. First, the interventions are offered with insufficient intensity. The teachers they observed were simply responsible for too many students; they were not able to offer them the individualized instruction required by older children who have struggled for several years in learning to read. Further, there was little direct instruction or guided practice in such critical components as phonemic decoding and phonemic awareness. Most instruction on word-level skills involved ‘phonics’ worksheets that the children completed independently. A final important element that was missing in the classrooms observed by Vaughn and her colleagues was direct instruction in comprehension strategies, which has been shown to be a very effective form of intervention for older children with reading disabilities (Mastropieri and Scruggs, 1997).

Given that current methods of instruction and implementation are generally less effective than is desirable, what do we know that can lead to improvement in this situation? We actually know quite a lot. First, recent studies of intensive interventions using older children with reading disabilities have demonstrated that it is possible to accelerate their reading growth to a much greater extent than is typically achieved in special education classrooms. Results from this research demand that politicians, educational administrators, and teachers find ways to bring this more effective instruction into the lives of many more children than is currently the case. Second, comparisons of outcomes between remedial and preventive studies are helping us learn more about what we lose by waiting too long to intervene with children who have reading disabilities. These comparisons suggest that, while we must seek to implement more effective instruction for older children, at the same time we must begin to focus more and more of our instructional resources to prevent the emergence of reading disabilities in children who are just beginning to learn to read.

Outcomes from effective and intensive interventions
We have recently addressed the question of whether it is possible to ‘normalize’ the reading skills of children with severe reading disabilities in
a relatively brief period of time in a study that examined the effects of two instructional approaches with the worst readers from several special education classrooms (Torgesen, Alexander, Wagner, Rashotte, Voeller, Conway, and Rose, in press a). The children in the study were between eight 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 fit 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 (average standard score for passage comprehension was 83). As a note for the reader, throughout this chapter, I will be describing reading performance in terms of standard scores. The advantage of a standard score is that it indicates where a child falls into the overall distribution of reading ability among children of the same age. A standard score lower than 70 is vary rare; only 2% of children obtain scores that low. If children achieve a standard score of 100, they are exactly at average for their age.

The children in our study were randomly assigned to two instructional groups, and each group was provided with 67.5 hours of 1:1 instruction given daily in two 50 minute sessions, five days a week for eight weeks. Following this intervention, our instructors visited in the child’s special education classroom for one 50-minute session a week for eight weeks to help them learn to apply their new reading skills to classroom assignments, and to help the child’s teacher adjust the level of assignments to the child’s new reading skills. One of the groups received the Lindamood Phoneme Sequencing Program for Reading, Spelling, and Speech (LIPS) (Lindamood and Lindamood, 1998), while the instructional program 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 program 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 aspect 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 program focused on teaching children to accurately identify the number, order, and identity of sounds in words.

The Embedded Phonics program was given that name because a relatively smaller amount of focused and explicit instruction in phonics knowledge and skill was provided in a context that involved larger amounts of carefully monitored reading of text. In this program, 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:

- time spent on training phonemic awareness and phonemic decoding using single word practice was 85% for the LIPS and 20% for the EP program;
- time spent on direct sight word practice was 10% for LIPS and 30% for EP; and
- 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 noted that both conditions incorporated principles of instruction that have generally been found to be successful for children with reading disabilities (Swanson, 1999). That is, both methods provided:

- ample opportunities for guided practice of new skills;
- very intensive instruction;
- systematic cueing of appropriate strategies in reading words or text; and
- explicit instruction in phonemic decoding strategies.
Standard scores on several important reading measures are illustrated in Figure 8.1. In each graph in Figure 8.1, the children's reading standard scores are presented at the time intervention began (pre-test) and immediately at the close of intervention (post-test), which was an interval of about two months. The graphs also report scores at one and two-year follow-up intervals during which the children received no further intervention from us. About 40% of the children were removed from special education in the year immediately following our intervention.

The top panel illustrates growth in phonemic decoding skills, the middle panel shows growth in text reading accuracy, while the bottom panel shows growth in passage comprehension. The dotted line on each graph is drawn at standard score 90, which is generally considered to be the bottom limit of the 'average' range of reading ability. As can be seen in Figure 8.1, children in both conditions achieved scores either at the bottom of the average range (word reading ability), or solidly in the middle of the average range (comprehension) by the end of the two-year follow-up period.

Figure 8.2 contrasts the growth in reading skill obtained during the intervention with the growth the children were making in special education prior to the intervention. The measure used to assess reading growth was the Broad Reading Cluster from the Woodcock-Johnson Psycho-Educational Battery – Revised (Woodcock and Johnson, 1989) that was 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 pre-test 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) is compared to 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 did the intervention produce powerful acceleration of reading growth 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 8.1: Growth in phonemic decoding, text reading accuracy, and passage comprehension resulting from intensive intervention using two instructional methods.
Figure 8.2: Standard scores on the Broad Reading Cluster before, during, and following the intensive intervention. From Torgesen, JK, Alexander AW, Wagner RK, Rashotte CA, Voeller K, Conway T, Rose E (in press) Intensive remedial instruction for children with severe reading disabilities: Immediate and long-term outcomes from two instructional approaches. *Journal of Learning Disabilities.*

Figure 8.2 also suggests that there was little difference in outcome between the two instructional conditions, and that is consistent with more extensive analysis of the outcome data (Torgesen et al., in press a). 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 two-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 can reasonably expect more progress from children receiving remedial help than is typically obtained in special education settings. One general way to describe the power, or efficiency, of an intervention is to calculate how much the child's reading skills 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 to a large, randomly selected standardization sample. If a child shows improvement in his or her standard scores, it means that the child's reading skills are 'closing the gap' with average-level skills.

Table 8.1 presents gains in the number of standard score points per hour of instruction for measures of phonemic decoding (word attack), context-free word reading (word identification), and reading comprehension.
(passage comprehension) across several studies. These studies all used measures in which one standard deviation consists of 15 standard score points. The studies by Wise, Ring, and Olson (1999), Lovett, Lacerenza, Borden, Frijters, Seteinbach, and DePalma (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 (in press) worked with children of similar ages who were less severely impaired. It is apparent from Table 8.1 that the rates of growth obtained in the study described in this chapter are very similar to other studies of children with severe reading disabilities in the areas of phonemic decoding skills, word reading ability, and reading comprehension.

The consistency in rate of gain across the first five studies in Table 8.1 seems remarkable, and it suggests that the high rates of growth obtained in our study should be generalizable to other settings, with other teachers implementing the interventions. The similarities in growth rate between the LIPS and EP conditions in the Torgesen, et al., (in press a) 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 8.1: Gains in standard score points per hour of instruction for three measures of reading skill

<table>
<thead>
<tr>
<th>Study</th>
<th>Phoneme Decoding</th>
<th>Word Identification</th>
<th>Passage Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torgesen, et al. (in press a)</td>
<td>0.41</td>
<td>0.20</td>
<td>0.12</td>
</tr>
<tr>
<td>67.5 hrs of 1:1</td>
<td>0.30</td>
<td>0.21</td>
<td>0.15</td>
</tr>
<tr>
<td>Wise, et al., (1999)</td>
<td>0.31</td>
<td>0.22</td>
<td>0.14</td>
</tr>
<tr>
<td>40 hrs, sm grp + 1:1 computer practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lovett, et al., (2000)</td>
<td>0.34</td>
<td>0.18</td>
<td>–</td>
</tr>
<tr>
<td>70 hrs., 1:3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alexander, et al., (1991)</td>
<td>0.34</td>
<td>0.23</td>
<td>–</td>
</tr>
<tr>
<td>65 hrs., 1:1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truch (1994)</td>
<td>–</td>
<td>0.21</td>
<td>–</td>
</tr>
<tr>
<td>80 hrs. 1:1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rashotte et al. (in press)</td>
<td>0.50</td>
<td>0.19</td>
<td>0.32</td>
</tr>
<tr>
<td>30 hours small group (4)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Remaining problems with instructional outcomes from remediation studies

Although the data from the study by Torgesen, et al. (in press a) and the data summarized in Table 8.1 suggest that it is possible to achieve remedial outcomes for children with reading disabilities that are much stronger than is typically obtained in special education, even these results were not all that we might wish them to be. First, the results reported by Torgesen, et al., 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 two year follow-up period. Second, outcomes for reading rate, or fluency, were very different from those for reading accuracy. This difference is illustrated graphically in Figure 8.3, which plots growth in text reading accuracy and fluency from the Gray Oral Reading Test-Revised (Wiederholt and Bryant, 1992). At the conclusion of the two-year follow-up period, the average standard score for text reading accuracy across conditions was 90.9. In contrast, the final standard score for rate averaged across conditions was 71.7, a difference of about one-and-a-third standard deviations.

This disparity in outcome for reading accuracy versus reading rate was replicated in another recently completed intervention study with older children (Rashotte, MacPhee, and Torgesen, in press). In this study, struggling readers in grades 3–5 were provided with 35 hours of direct instruction in reading using a method that was roughly similar to the embedded phonics condition from our earlier study. However, in this later study, the instruction was provided in groups of four children, and the children began the study with higher reading skills than those in the earlier study. In the later study, the children's standard score for text reading accuracy at the conclusion of the intervention was 98.3, while their final score for text reading fluency was 85.3. Thus, even in a study involving children with less severe reading disabilities, there was a difference of almost one standard deviation in their scores for accuracy versus rate.

A different outcome for accuracy versus rate from prevention studies

Although we have now obtained substantial discrepancies in outcomes for reading accuracy versus reading rate in two remediation studies with older children, we have found a very different pattern of results from two recently completed studies of preventive instruction in children at-risk for the development of reading disabilities. Prevention Study I (Torgesen, Wagner, Rashotte, Rose, Lindamood, Conway, and Garvin (1999) provided
Figure 8.3: Growth rates for text reading accuracy versus text reading fluency in study of two intensive interventions.

88 hours of teacher- and aide-led instruction to children identified as the 12% most at risk for reading failure in kindergarten. The instruction was provided individually in four, 20-minute sessions per week, beginning in the second semester of kindergarten and extending through second grade. The children were randomly assigned to one of three instructional conditions, or to a no-treatment control group. Following the conclusion of instruction at the end of second grade, the reading development of these children was followed over the next two school years.

Prevention Study II (Torgesen, Wagner, Rashotte, and Herron, 2000) provided 92 hours of small-group and computer-based instruction to children identified as the 20% most at risk for reading failure at the beginning of first grade. The children who were randomly assigned to one of the two instructional conditions in this study were seen in four 50-minute sessions (25 minutes of small group teacher-led instruction and 25 minutes of individual computer based practice) per week from October through May of their first grade year. The reading development of these children was followed through the end of second grade.

Outcomes for text reading accuracy and rates from the most effective instructional condition in Prevention Study I are presented in Figure 8.4. This figure shows standard scores for accuracy and rate at the conclusion of the intervention and over the two years of the follow-up period to the end of fourth grade. It is obvious from Figure 8.4 that the children at risk for reading disabilities who received sustained preventive instruction in
this study did not experience the significant disparity in outcomes for rate versus accuracy that were obtained in the remediation studies with older children. The most effective instructional method in this study was based on the Lindamood Phoneme Sequencing Program for Reading, Spelling, and Speech (LIPS) (Lindamood and Lindamood, 1998).

To summarize the differences that we have found in outcomes for text reading accuracy versus text reading rate across two remediation and two prevention studies conducted thus far, final standard scores for accuracy and rate for each study are presented in Figure 8.5. These scores were obtained from the two year follow-up testing for Remediation Study I, immediate post-test for Remediation Study II, two year follow-up testing for Prevention Study I, and one year follow-up testing for Prevention Study II. For both remediation studies, the differences in scores for accuracy versus rate were statistically reliable and quite large, while the differences in the prevention studies were not statistically significant and very small.

The major finding illustrated in Figure 8.5 is that preventive studies do not show the large differences in outcomes for accuracy and fluency that are manifest in the remediation studies. One possibility might be that noticeable impairments in fluency do not begin to emerge in children with reading disabilities until late elementary school. However, the data from Prevention Study I show that a group of highly at-risk children actually obtained higher scores for fluency in fourth grade than they did in second
grade. It is also possible that the children in the prevention studies may not have been as severely impaired readers as those in the remediation studies because they were identified by risk status rather than actual reading failure. This may be true for Remediation Study I which intervened with children in the bottom 2% of reading skill, but it is less likely for the comparison with Remediation Study II, which served children in roughly the bottom 16% of reading skill. Further, a control group in Prevention Study I that received a variety of school-based interventions, but no research-based interventions, obtained a standard score of 81.7 on the fluency measure. Furthermore, a group of children from a large longitudinal study (Wagner, Torgesen, Rashotte, Hecht, Barker, Burgess, Donahue, and Garon, 1997) who were selected by the same criteria in kindergarten as those in Prevention Study I, but who received no research-based interventions, obtained a standard score of 76 on the rate measure at the end of the fifth grade. Thus, the differences in outcomes for accuracy versus rate measures in remediation and prevention studies cannot be simply ascribed to differences in the severity of reading disabilities of the children being served in the two types of studies.

Figure 8.5: Differences in outcomes for rate versus accuracy in prevention versus remediation studies.
Deficits in reading practice as a factor in continuing problems in reading fluency

Although a number of factors may be responsible for the continuing problems in reading fluency experienced by children in the remediation studies (Torgesen, Rashotte, and Alexander, in press b), the most important factor appears to involve difficulties in making up for the huge deficits in reading practice that the older children have experienced by the time they reach late elementary school. These differences in reading practice emerge during the earliest stages of reading instruction (Allington, 1984; Beimiller, 1977–8) and they become more pronounced as the children advance across the grades in elementary school. For example, Cunningham and Stanovich (1998) reported evidence suggesting enormous differences in the amount of reading done by fifth-grade good and poor readers outside of school. A child at the 90th percentile of reading ability may read as many words in two days as a child at the 10th percentile reads in an entire year outside the school setting. Differences in reading practice vary directly with the severity of a child's reading disability, so that children with severe reading disabilities receive only a very small fraction of the total reading practice obtained by children with normal reading skills.

One of the major results of the lack of reading practice experienced by children with reading disabilities is a severe limitation in the number of words they can recognize automatically, or at a single glance (Ehri, 1998; Share and Stanovich, 1995). Words that children can recognize easily because they have previously practiced reading them in text are sometimes referred to by teachers as the child's 'sight word vocabulary'. A principal characteristic of most children with reading disabilities after the initial phase in learning to read is a severe limitation in the number of words they can recognize 'by sight' or at a single glance (Rashotte, et al., in press, Torgesen, et al., in press a; Wise, Ring, and Olson, 1999).

We have shown elsewhere (Torgesen, et al., in press b) that inefficiency in identifying single words is the single most important factor in accounting for individual differences in text reading fluency in samples of children with reading disabilities. In other words, reading fluency for text is most directly dependent on the proportion of the words in the text that can be identified at a single glance. When these findings are combined with the fact that the number of less-frequent words (words children are less likely to have encountered before in text) increases rapidly after about third grade level (Adams, 1990), it is easy to see why it is so difficult for children who have failed in reading for the first three or four years of
school to close the gap in reading fluency with their normally achieving peers. If successively higher grade level passages include increasing numbers of less frequent words, and normal readers are continually expanding their sight vocabularies through their own reading behaviour, it should be very difficult for children, once significantly behind in the growth of their sight word vocabulary, to close the gap in reading fluency. Such ‘catching up’ would seem to require an extensive period of time in which the reading practice of the previously disabled children was actually greater than that of their peers. Even if word reading accuracy is dramatically increased through the more efficient use of analytic word reading processes, reliance on analytic processes will not produce the kind of fluent reading that results when most of the words in a passage can be recognized ‘by sight.’

The effect on reading rate of the proportion of words in a passage that can be recognized automatically can be illustrated by data from the intensive remediation study described earlier (Torgesen, et al., in press a). We calculated a words-per-minute score on the two most difficult passages the children read at the pre test, and compared this to their rate for passages of the same level of difficulty at the two-year follow-up test. For the most difficult passage at pretest, rate changed from 38 to 101 words per minute, with a corresponding drop in errors from 10 to two. On the next most difficult passage, rate changed from 42 to 104 words per minute, with a drop in errors from six to one. Thus, for passages that had a constant level of difficulty, the children’s reading rate more than doubled from pretest to the end of the follow-up period, presumably because at follow-up, the children could recognize more of the words in the passage easily and automatically. Another way to illustrate this effect is to compare the children’s text reading rate for passages that were at their ‘instructional level’ and which contained many words they had to analyse phonemically in order to read correctly, with passages at their ‘independent’ level at which most of the words in the passage could be recognized by sight. Their words per minute rate for passages at their instructional level was 78.3, while rate for passages at their independent level was 122 words per minute.

Conclusions

The results from the intervention research described in this chapter have several important implications for both educational practice and for future research. The first implication for practice and educational policy is that schools must work to provide more preventive interventions to eliminate the enormous reading practice deficits that result from prolonged reading
failure. One of the most important goals of preventive instruction should be to maintain the fundamental word reading skills of at-risk children within the normal range so that they can read independently and accurately. If they can read independently and accurately, and they are also taught to enjoy reading, it is likely that they will experience roughly normal rates of growth in their 'sight word vocabularies' and thus be able to maintain more nearly average levels of reading fluency as they progress through the elementary school years.

The second policy implication from these results is that schools must find a way to provide interventions for older children with reading disabilities that are appropriately focused and sufficiently intensive. We have seen a number of examples of the way this type of intervention can produce dramatic improvements in older children's text reading accuracy and reading comprehension in a relatively short period of time.

With this evidence in hand, schools, school boards, and parents need to work toward finding ways to bring more intensive instruction to more children, and we need to adjust our expectations about what constitutes 'reasonable progress in reading' for older children with reading disabilities.

With regard to research, the two most obvious questions arising from the findings considered in this chapter are:

- what is the most appropriate range of intensity and amount of remedial instruction that should be available to older children with reading disabilities; and
- how can reading practice be focused more effectively with older children to help them 'close the gap' in reading fluency with their normally achieving peers?

The first question arises from the fact that, even in the most effective remedial studies, significant numbers of children remain with poor reading skills at the conclusion of the intervention. There is substantial agreement about the elements of effective instruction for children with the most common form of reading disabilities (Lovett et al., 2000; Torgesen, et al., in press a), but there is much less information available about the amount and intensiveness of such instruction that may be required to help all children acquire adequate reading skills.

For children with reading disabilities who have limited sight word vocabularies and limited proficiency in decoding novel words, it seems that the first target of intervention should be to increase the accuracy of their individual word reading skills. More accurate reading at the word level through effective application of a repertoire of word analysis skills is necessary before children can consistently add to the depth and breadth of
their sight word vocabulary through independent reading (Share and Stanovich, 1995).

The most successful fluency intervention described to date, repeated reading, (National Reading Panel, 2000) is effective because it provides the kind of repeated exposure to words that leads either to acquisition of new ‘sight words’ or increases efficiency of access to words that are already in the child’s sight vocabulary. Simply providing more reading opportunities for these children may not be sufficient to increase their sight vocabulary at an acceptable rate, because, at higher grade levels, the less frequent words they are trying to learn occur at such infrequent intervals in text (Adams, 1990). Thus, an important question for future research is how to increase the efficiency of reading practice for children whose reading accuracy problems have been remediated through successful interventions. In other words, how should practice be engineered and focused so that it produces accelerated growth in the fluent word-reading processes that are the most critical factor in oral reading fluency?

Acknowledgement

The research reported in this chapter was supported by grant HD30988 from the National Institute of Child Health and Human Development, and by grants from the National Center for Learning Disabilities, and the Donald D Hammill Foundation.

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