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The Prevention of Reading Difficulties

Joseph K. Torgesen
Florida State University

The purpose of this article is to provide practical advice about methods to prevent reading failure that is grounded in the new knowledge we have acquired about reading and learning to read over the past 2 decades. Recent research on reading is used to establish a set of facts about reading and reading growth that is relevant to establishing instructional objectives and methods for the prevention of reading difficulties. Within the context of our current understanding of the reasons many children find it difficult to learn to read, the article also identifies the instructional conditions that need to be in place to prevent the development of reading difficulties in all but a very small proportion of children. The article concludes with a discussion of issues and procedures for the early identification of children who are likely to experience difficulties learning to read. © 2002 Society for the Study of School Psychology. Published by Elsevier Science Ltd

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The purpose of this article is to provide practical advice about methods to prevent reading failure that is grounded in the new knowledge we have acquired about reading and learning to read over the past two decades. Most of this new knowledge about reading has been reported in two recent consensus documents. One report (Snow, Burns, & Griffin, 1998), titled *Preventing Reading Difficulties in Young Children*, was prepared by the National Research Council and published by the National Academy of Sciences. The other document, titled *Teaching Children to Read* (National Reading Panel, 2000) was commissioned by the U.S. Congress and supported in development by the National Institute of Child Health and Human Development and the U.S. Office of Education. Both documents were written by committees of professionals who were asked to identify the findings about reading and reading instruction that were most consistently supported in recent research.

These are interesting and challenging times for anyone whose professional responsibilities are related in any way to literacy outcomes among school children. For, in spite of all our new knowledge about reading and

Received June 19, 2001; accepted October 30, 2001.
Address correspondence and reprint requests to Joseph K. Torgesen, Department of Psychology, Florida State University, Tallahassee, FL 32306-1270. Phone: (850) 644-1707; fax: (850) 644-7739; E-mail: torgesen@psy.fsu.edu

reading instruction, there is a wide-spread concern that public education is not as effective as it should be in teaching all children to read. Fueled by such facts as the statistic that 37% of fourth-grade school children cannot read well enough to effectively accomplish grade-level work (National Center for Education Statistics, 2001), there is an emerging sense of urgency about improving reading instruction and literacy outcomes in our country. The report of the National Research Council pointed out that these concerns about literacy derive not from declining levels of literacy in our schools, but rather from recognition that the demands for high levels of literacy are rapidly accelerating in our society. Clearly, children who become adults with low levels of literacy are at an increasing disadvantage in a society that is creating ever-higher demands for effective reading skills within the workplace. These rising demands can only be met by changing the way we work at teaching reading so that we produce better literacy outcomes for more children than ever before.

A major aspect of change in the way we work to teach reading to all children must involve allocation of resources for early identification and preventive instruction. The costs of waiting until mid-elementary school to identify children in need of special instruction in reading are simply too great. We know, for example, that delayed development of reading skills affects vocabulary growth (Cunningham & Stanovich, 1998), alters children's attitudes and motivation to read (Oka & Paris, 1986), and leads to missed opportunities to develop comprehension strategies (Brown, Palincsar, & Purcell, 1986). If children fall seriously behind in the growth of critical early reading skills, they have fewer opportunities to practice reading. Recent evidence (Torgesen, Rashotte, & Alexander, 2001) suggests that these lost practice opportunities make it extremely difficult for children who remain poor readers during the first three years of elementary school to ever acquire average levels of reading fluency. Finally, there is the very sobering fact obtained in several longitudinal studies that children who are poor readers at the end of first grade almost never acquire average-level reading skills by the end of elementary school (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Juel, 1988; Torgesen & Burgess, 1998).

This article is organized in three sections. The first section discusses a set of facts about reading and reading growth that is relevant to establishing instructional objectives and methods for the prevention of reading difficulties. These are also facts about reading that every school psychologist should know, and they represent a fundamental departure from views about reading that underlie many "wholistic" approaches to reading instruction currently in use. The next section discusses the instructional conditions that need to be in place to prevent the development of reading difficulties in all but a very small proportion of children. The article concludes with a discussion of issues and procedures for the early identification of children who are likely to experience difficulties learning to read. Information in

the second section should be helpful to school psychologists in their roles as consultants about effective educational practices, and the final section contains information of potentially direct use by school psychologists to enhance the effectiveness of their assessment work in schools.

FACTS ABOUT READING THAT ARE RELEVANT TO THE PREVENTION OF READING DIFFICULTIES

It is technically incorrect to call the ideas presented in this section "facts" about reading. Rather, they are conclusions about reading and reading growth that are now assumed to be true based on consistent research findings. All of the ideas presented here are consistent with the conclusions reported in the two recent consensus documents described in the introduction to this article. The first idea is not so much a "fact," but is a self-evident value judgment about reading for which there is wide-spread agreement.

The Ultimate Goal of Reading Instruction Is to Help Children Acquire all the Skills Necessary to Comprehend the Meaning of Text

In other words, the goal of literacy instruction is to help children acquire the skills that enable learning from, understanding, and enjoyment of written language. This is not a "controversial" assumption. No matter what one's instructional orientation may be, the long-term goal of reading instruction is to provide children with the skills necessary to construct, or comprehend, the meaning of text in its many forms and genres.

Two General Types of Skill and Knowledge Are Required for Good Reading Comprehension

To be able to construct meaning from text, a child must have (a) general language comprehension skills and (b) the ability to accurately and fluently identify the individual words in print. Knowledge of and active application of specific reading strategies are also helpful to maximize reading comprehension (Snow et al., 1998), but most of the variability among children and adults in comprehension of written material can be accounted for by measuring the two broad families of skills identified in Gough's simple view of reading (Gough, 1996; Hoover & Gough, 1990). That is, good general language comprehension and good word reading skills are the most critical skills required for effective comprehension of written material.

The fact that reading comprehension is the joint product of language comprehension ability and word identification skills must be considered when we set goals for the reading attainment of all children. In other words, we must recognize the fact that general cognitive ability (specifically verbal ability and knowledge) strongly influences reading comprehension

at the higher grade levels in elementary school (Adams, 1990). For this reason, I usually qualify the goal for reading instruction in the following way: The ultimate goal of reading instruction is to help children acquire the knowledge and skills necessary to comprehend printed material *at a level that is consistent with their general verbal ability or language comprehension skills.* If we were to adopt a strict grade-level reading comprehension criteria (i.e., every child will be able to fully comprehend material written at grade level in fourth grade), this would imply an expectation for all children to have at least average verbal ability. Decades of cognitive intervention research suggest that it is unrealistic to expect all children to attain verbal ability estimates within the average range as a result of special instruction (Lee, Brooks-Gunn, Schnur, & Liaw, 1990). Thus, it seems unrealistic to expect reading teachers to accomplish this goal starting as late as kindergarten or first grade. This statement does not ignore the fact that the verbal ability of many children can be dramatically increased by effective reading instruction (Torgesen, Alexander, et al., 2001); it is just meant to acknowledge the fact that this may not be possible for all children.

A Critical Problem for Most Children Who Experience Reading Difficulties Involves Early and Continuing Problems Acquiring Accurate and Fluent Word Identification Skills

When asked to read grade-level text, the typical poor reader in third or fourth grade will show two kinds of word-level reading difficulties. First, when they encounter a word they are not familiar with, they tend to place too much reliance on guessing the word based on the context or meaning of the passage (Briggs, Austin, & Underwood, 1984; Simpson, Lorsbach, & Whitehouse, 1983), which produces a high rate of word-level errors in their reading. Their phonemic analysis skills, or ability to use "phonics" to assist in the word identification process, is usually severely impaired (Bruck, 1990; Siegel, 1989). Second, most children who are having difficulty learning to read encounter many more words in grade-level text that they cannot read "by sight" than do average readers. Compared with children of the same age who are learning to read normally, the number of words that children with reading problems can recognize fluently and easily as "sight words" is usually quite limited (Manis, Custodio, & Szeszulski, 1993; Torgesen, Alexander, et al., 2001).

Difficulties learning to read words accurately are manifest from the very earliest stages of reading instruction. First, children who are destined to be poor readers in fourth grade almost invariably have difficulties understanding and applying the alphabetic principle in deciphering unfamiliar words. Their difficulties developing good analytic strategies for identifying unknown words makes it difficult for them to read independently, and it also produces far too many word reading errors. Both of these latter conse-

quences of failure to acquire good phonemic decoding skills affect the development of fluent word reading ability, which depends heavily on learning to identify large numbers of words by sight (Torgesen, Rashotte, & Alexander, 2001). Because words do not become sight words until they are read accurately a number of times, both inaccurate reading and diminished reading practice cause slow growth of fluent word-identification skills. Furthermore, the strongest current theories of reading growth link phonemic and sight word reading skills together by showing how good phonemic decoding skills are necessary in the formation of accurate memory for the spelling patterns that are the basis of sight word recognition (Ehri, 1998).

The difficulties acquiring accurate and fluent word reading skills shown by most poor readers are extremely important in light of the new information we have about the way word-level processes operate during skilled reading. Skilled readers do not "skim and scan" text as they read for meaning, but rather they directly fixate and process a very high proportion of all the words in text. Furthermore, they accurately identify most of the words in text by processing information about all, or almost all, the letters in words (Adams, 1990). In other words, skilled word recognition is heavily dependent upon very detailed knowledge of the letters used to spell individual words. Skilled readers do not guess at the identity of specific words in text by relying on context; rather, they are able to accurately and fluently identify words on the basis of their written spellings. Adams (1991) summarized these facts about word-recognition processes in skilled readers this way:

> It has been proven beyond any shade of doubt that skillful readers process virtually each and every word and letter of text as they read. This is extremely counter-intuitive. For sure, skillful readers neither look nor feel as if that's what they do. But that's because they do it so quickly and effortlessly. Almost automatically; with almost no conscious attention whatsoever, skillful readers recognize words by drawing on deep and ready knowledge of spellings and their connections to speech and meaning. (p. 207)

One of the keys to becoming a skilled reader is to acquire a large vocabulary of words that can be recognized fluently and accurately in text. We also understand now that early development of accurate phonemic decoding skills plays in important supportive role in helping children acquire the very specific memories for words that are required for automatic recognition (Ehri, 1998). Both of these facts underline the critical role of careful and explicit instruction in word-level reading processes as part of early reading instruction for children at risk for reading difficulties. Programs that are not sufficient to "normalize" the development of at-risk children in phonemic decoding skill and fluent word recognition have not accomplished one of the most critical goals of preventive reading instruction.

The Most Common Cause of Children's Early Difficulties in Acquiring Accurate and Fluent Word Recognition Skills Involves Individual Differences in Their Phonological Knowledge and Skill

This is one of the most important discoveries about reading difficulties in the last 20 years (Liberman, Shankweiler, & Liberman, 1989; Torgesen & Mathes, 2000). Children who enter first grade low in knowledge about the phonological features of words or who have difficulties processing the phonological features of words are at high risk for difficulties responding to early reading instruction. The tasks most commonly used to measure children's knowledge and processing skill for the phonological features of words are referred to as measures of phonological, or phonemic, awareness. These tasks require children to identify or manipulate the phonemes in words that are presented orally. Phonemic awareness tests do not involve letters. For example, a simple task in this domain would ask children to say which of three words (*bat, car, fork*) begins with the same sound as *bike*. A more difficult task might ask the child to pronounce the first sound in the word *bike*, and a still more difficult task might ask the child to say what word was left when the word *card* was pronounced without saying the /d/ sound. Both conscious awareness of the phonemes in words *and* ability to accurately identify them within words is necessary in learning to phonemically decode words in print (Wagner, Torgesen, & Rashotte, 1994; Wagner et al., 1997). Children who are delayed in the development of phonemic awareness have a very difficult time making sense out of "phonics" instruction, and they certainly have little chance to notice the phonemic patterns in written words on their own. A simple way to say this is that for individual children, phonemic awareness is what makes phonics instruction meaningful. If a child has little awareness that even simple words like *cat* and *car* are composed of small "chunks" that are combined in different ways to make words, our alphabetic way of writing makes no sense.

Discovery of the core phonological problems associated with early reading difficulties has had at least one unanticipated consequence. The ability to assess these core language problems directly has led to the discovery that the early word reading difficulties of children with relatively low general intelligence and verbal ability are associated with the same factors that interfere with early reading growth in children who have general intelligence in the average range (Fletcher et al., 1994; Share & Stanovich, 1995; Stanovich & Siegel, 1994). Weaknesses in phonemic awareness characterize children with reading problems across a broad span of general verbal ability. On the one hand, many children enter school with adequate general verbal ability and cognitive weaknesses limited to the phonological/language domain. Their primary problem in learning to read involves learning to translate between printed and oral language. On the other hand, another significant group of poor readers, composed largely of children from fami-

lies of lower socioeconomic or minority status, enter school significantly delayed in a much broader range of prereading skills (Whitehurst & Lonigan, 1998). Because these children are delayed not only in phonological but also general oral language skills, they are deficient in both of the critical kinds of knowledge and skill required for good reading comprehension (Gough, 1996). Even if these children can acquire adequate word reading skill, their ability to comprehend the meaning of what they read may be limited by their weak general verbal abilities.

Children with general oral language weaknesses will require special instruction in a broader range of knowledge and skills than those who come to school impaired only in phonological ability. What is well established at this point, though, is that both kinds of children will require special support in the growth of early word reading skills if they are to make adequate progress in learning to read.

INSTRUCTIONAL METHODS AND ELEMENTS THAT CAN HELP TO PREVENT READING DIFFICULTIES IN YOUNG CHILDREN

To adequately address the fundamental problem that too many children are leaving elementary school with reading skills inadequate for the next higher level of instruction, we must change the way we work to teach reading in three ways. First, we must insure that classroom instruction in kindergarten through Grade 3 is skillfully delivered with a balanced emphasis on word-level and reading comprehension skills. Second, we must have procedures in place to accurately identify children who fall behind in early reading growth, even when they are provided excellent classroom instruction. Third, we must provide these at-risk children with reading instruction that is more intensive, more explicit, and more supportive than can be provided in a classroom of 20 to 30 children.

Critical Elements of Regular Classroom Instruction

The report from the National Research Council (Snow et al., 1998) concluded that the most efficient way to prevent reading difficulties was to insure that every child received high quality balanced reading instruction in the early elementary grades. If any elementary school is producing high numbers of children in fourth and fifth grade who cannot read well enough to do grade-level work, the first place to suggest change is in the regular classroom reading curriculum in kindergarten through Grade 3. Both of our recent consensus documents (National Reading Panel, 2000; Snow et al., 1998) identified the critical components of early reading instruction as including explicit teaching to build phonemic awareness and phonemic decoding skills, fluency in word recognition and text processing, reading comprehension strategies, oral language vocabulary, spelling,

and writing skills. Instruction that includes these elements delivered in a consistent and skillful way is consistently more effective than instruction that does not contain these components.

In the introduction to this article, I mentioned that the most recent National Assessment of Educational Progress (National Center for Education Statistics, 2001) indicated that 37% of fourth-grade school children nationally do not have adequate reading skills for academic work at their grade level. This does not mean, of course, that 37% of all children in the United States have a reading disability and need special education. Rather, it suggests the need for strengthening the instructional environment in early elementary school by more consistent and skillful instruction in the critical elements identified in recent summaries of research on reading. For example, Foorman, Francis, Fletcher, Schatschneider, and Mehta (1998) demonstrated that well-balanced and skilled classroom instruction can dramatically reduce the incidence of reading failure in first- and second-grade classrooms without special interventions for most children.

Explicit instruction and practice to build phonemic awareness and phonemic decoding skills are particularly important for children who enter first grade low in talent or preparation for learning to read. Both Foorman et al. (1998) and Juel and Minden-Cupp (2000) found that explicit instruction and opportunities for extended practice with phonemically decodable texts were particularly beneficial for children at risk for reading failure. In the former study, the most phonemically explicit instructional condition produced the strongest reading growth for all children, but the effects were particularly striking for children with the weakest phonological skills entering first grade.

One of the arguments that is frequently made against increasing the explicitness of phonics instruction in early elementary school is that not all children need the same amount or explicitness of instruction in this area. This is, in fact, true. Many children enter school with excellent phonological processing skills and a strong beginning understanding of the alphabetic principle. For these children, most of the knowledge that must be acquired to become a skilled reader can be discovered by the child during interactions with print. As these children read, they notice useful generalizations about print–sound relationships, and they acquire a great deal of word-specific knowledge as well (i.e., the sight words that are required for fluent reading; Share & Stanovich, 1995). As Moats (1999) pointed out, "although some children will learn to read in spite of incidental teaching, others never learn unless they are taught in an organized, systematic, efficient way by a knowledgeable teacher using a well-designed instructional approach" (p. 7). What the data from studies such as the ones considered earlier (Foorman et al., 1998; Juel & Minden-Cupp, 2000) suggest is that explicit phonics instruction can help all children during the early stages of learning to read, but there will be individual differences in the amount of such instruction that is required.

Critical Elements of Instruction for Children at Risk for Reading Difficulties

A point that is clear from recent research is that traditional approaches to reading instruction in the early elementary grades have substantially underestimated the variability among children in their talent and preparation for learning to read. For example, Hart and Risley (1995) documented enormous differences among children from different socioeconomic strata in preschool opportunities to acquire oral language vocabulary. We also know that there are very significant differences among entering school children in their knowledge about letters, print conventions, and phonological sensitivity (Adams, 1990). Further, we know that the differences in knowledge and skill that make children more or less prepared to profit from reading instruction in first grade can be the result of either neurobiological factors that are genetically transmitted and constitutionally based, or they can be caused by a lack of adequate instruction and language experience in the child's preschool or home environment (Neisser et al., 1996; Olson, Wise, Johnson, & Ring, 1997). At present, one of the biggest challenges for schools is to provide a range of instructional opportunities in reading that matches the huge diversity in children's talent and preparation for learning to read. That is, if the diversity among children in talent and preparation for learning to read varies across a 100-point scale, and the range of instructional opportunities varies across only a 70-point scale, it is obvious that many children will not receive the instruction they require to become good readers.

Instruction for at-risk children must be more explicit than for other children. This point has already been made to some extent as we considered the differential effects of explicit instruction for children entering first grade more and less prepared for learning to read. Children who enter first grade with weaknesses in knowledge about letters, letter-sound correspondences, and phonological awareness require explicit and systematic instruction to help them acquire the knowledge and strategies necessary for decoding print. As Gaskins, Ehri, Cress, O'Hara, and Donnelly (1997) pointed out, "first graders who are at risk for failure in learning to read do not discover what teachers leave unsaid about the complexities of word learning. As a result, it is important to teach them procedures for learning words"(p. 325).

An illustration of this point is provided in a recent study of preventive instruction given to a group of highly at-risk children during kindergarten, first grade, and second grade (Torgesen, Wagner, Rashotte, Rose, et al., 1999). Of three interventions that were tested on children who were selected because of phonological weaknesses, the most phonemically explicit one produced the strongest growth in word reading ability. In fact, of the

three interventions tested, *only* the most explicit intervention produced a reliable difference in the growth of word reading ability over children who were not provided with any special interventions. Other studies (Brown & Felton, 1990; Hatcher, Hulme, & Ellis, 1994; Iversen & Tunmer, 1993) combine with this one to suggest that schools must be prepared to provide very explicit and systematic instruction in beginning word reading skills to some of their students if they expect all children to acquire word reading skills at grade level by third grade.

Instruction for at-risk children must be more intensive than for other children. The fact that instruction must be more explicit and comprehensive for these children implies that more skills and knowledge must be directly taught, which logically requires a greater number of teaching/learning opportunities. To say that instruction for at-risk children must be more *intense* than for other children simply means that it must contain more teaching/learning opportunities per day than typical classroom instruction. If at-risk children do not receive more teaching/learning opportunities per day than other children, they will acquire reading skills more slowly, and thus will experience the disadvantages outlined in the introduction of this article. Another factor that underlines the need for more intensive instruction is the fact that children who come to school with weaknesses in talent for learning to read learn more slowly than other children and will thus require more repetition in order to solidly establish critical word reading and comprehension skills. Although children whose risk status is determined primarily by lack of instructional opportunities in the preschool environment may learn at average rates, they have much more to learn than children who come to school with typical levels of preparation (Hart & Risley, 1995) and thus must be given more intensive instruction if they are to keep pace in reading growth with their age peers.

There are actually many different ways to effectively increase instructional intensity for children at risk for reading failure. For example, Greenwood and his colleagues (Greenwood, 1996) used the ClassWide Peer Tutoring model to increase amount of academic engaged time, and this increase has been consistently associated with improvements in learning outcomes in reading. In a similar vein, Doug and Lynn Fuchs reported success (Fuchs, Fuchs, Mathes, & Simmons, 1997) in using peer-assisted learning strategies to improve reading skills in mid-elementary school, and Mathes developed successful procedures that allow the use of peer tutoring for basic reading skills in first-grade classrooms (Mathes, Torgesen, & Allor, in press). For both older and younger children, the interventions provided by the peer-assisted procedures are both more explicit and more intensive than the instruction that is typically provided by the classroom teacher.

Another practical method for providing greater instructional intensity for at-risk children is to use special education or reading resource teachers

to provide small group (3–4 children) instruction in addition to the regular classroom instruction the children receive. There can be no question that children with reading difficulties, or children at risk for these difficulties, will learn more rapidly under conditions of greater instructional intensity than they learn in typical classroom settings. Meta-analyses consistently show positive effects of grouping practices that increase instructional intensity (Elbaum, Vaughn, Hughes, & Moody, 1999). One interesting finding that has emerged from these analyses is that, so far, one-to-one interventions in reading have not been shown to be more effective than small group interventions (Elbaum et al., 1999; National Reading Panel, 2000). Although Torgesen, Alexander, et al. (2001) recently demonstrated very powerful instructional effects for one-to-one instruction (as opposed to the larger group instruction typically provided in special education resource rooms), other studies have shown similar rates of growth for reading-disabled children using small groups of 3 and 4 children at a time (Rashotte, MacPhee, & Torgesen, 2001; Wise, Ring, & Olson, 1999).

Instruction for at-risk children must be more supportive than for other children. The needs of at-risk children for more positive emotional support in the form of encouragement, feedback, and positive reinforcement is widely understood. However, their potential need for more cognitive support, in the form of carefully "scaffolded" instruction, is less widely appreciated. Instruction for at-risk children should involve two types of scaffolding. One type of scaffolding involves careful sequencing so that skills build very gradually: The child is always systematically taught and practiced on the skills required for any task they are asked to do (Swanson, 1999). Another type of scaffolding involves teacher–student dialog that directly shows the child what kind of processing or thinking needs to be done in order to complete the task successfully. This type of scaffolding in instruction usually involves four elements: (a) the student is presented with a task such as reading or spelling a word, or making a paragraph summary (i.e., tries to spell the word "flat"); (b) the student makes a response that is incorrect in some way, or indicates that he/she doesn't know how to proceed (i.e., spells it "fat"); (c) the teacher asks a question that focuses the child's attention on a first step in the solution process, or that draws attention to a required piece of information ("If you read that word, what does it say?" Child responds, "fat." "So, what do you need to add to make it say flat?" No answer. "When you say *flat*, what do you hear coming right after the beginning sound /f/?"); and (d) another response from the child ("I hear the /l/ sound."). This kind of interaction between student and child continues until the child had been led to successfully accomplish the task. The point of this type of instructional interaction is that the child is led to discover the information or strategies that are critical to accomplishing the task, rather than simply being told what to do. As Juel (1996) recently showed, the abil-

ity to offer scaffolded support while children are acquiring reading skills may have increasing importance as the severity of the child's disability increases.

I have described three broad ways that instruction for children who are at risk for reading failure needs to be different from the instruction that is typically provided to all children in the classroom. Insuring that all three of these elements are part of the instruction for our most at-risk children represents an enormous challenge for our schools. The requirement for more explicit and supportive instruction demands a higher level of training and skill for teachers than is usually provided at present (Moats, 1994). The requirement for more intensive instruction for at-risk children must involve a reallocation of resources to make more teacher time available for preventive instruction and, in many cases, will probably require entirely new resources to adequately meet the instructional needs of all children who are at risk for reading failure.

What Do We Know About the Effectiveness of Early Preventive Instruction?

An obvious question that must be addressed before schools reallocate or invest new resources for preventive instruction is whether the procedures outlined above are actually effective in preventing reading difficulties in most children. Two kinds of information are required to provide a complete answer to this question. First, we must know to what extent appropriate preventive instruction can bring word reading and comprehension skills to adequate levels during the period of the intervention. Second, we must understand the long-term effects of preventive instruction on subsequent reading growth. Answering this latter question is complicated, because long-term outcomes can be influenced by many factors. For example, long-term outcomes can certainly be influenced by the extent to which the preventive instruction helps children acquire all the reading skills required as a foundation for further growth. However, these outcomes may also depend on the support for reading improvement (both in the school and in the home) that is provided after the preventive intervention is concluded. When the solid foundations for reading growth are established in the early primary grades, further reading growth is dependent almost entirely on the breadth and depth of the child's reading experience and practice (Snow et al., 1998).

In terms of immediate outcomes from preventive instruction, we know that it is possible to bring the word-level reading skills of children at risk for reading failure within the average range by the end of first or second grade when the intervention group is considered as a whole (Torgesen, in press). Children who achieve these average-level word reading skills can also comprehend text within the average range (Foorman et al., 1998) or at a level consistent with their general verbal ability (Torgesen, Wagner,

Rashotte, Rose, et al., 1999). However, there are large individual differences in response to the early interventions examined in research, and not all children show satisfactory outcomes.

Torgesen (2000) recently examined the outcomes from five prevention studies that all used similar measures to assess reading outcomes. These studies all contained at least one instructional condition that offered skilled delivery of explicit and systematic instruction in phonemic awareness, phonemic decoding, and fluent text reading. The children who received the preventive instruction were selected to be at risk for reading failure on the basis of either weak phonological processing skills or weak development of early word reading ability, and the preventive instruction was provided at some point during kindergarten, first grade, or second grade. The number of hours of special instruction varied between 340 hr of first- and second-grade instruction delivered to groups of 8 (Brown & Felton, 1990) and 35–65 hr of one-on-one instruction delivered in the second semester of first grade and the first semester of second grade (Vellutino et al., 1996).

Outcomes from these studies were analyzed to estimate the proportion of the population that would remain below the 30th percentile (by current norms) in word reading ability if the interventions were available to all children who needed them. The proportions varied between 6% of the population in the study that provided 35–65 hr of one-on-one instruction to 2% of the population in a study that provided 92 hr of computer-assisted tutoring to groups of 3 during first grade (Torgesen, Wagner, Rashotte, & Herron, 2001). These varying proportions of "treatment resisters" cannot be used to directly compare effectiveness of the different methods in these studies because the samples were selected by different methods, the populations from which they were selected also differed, and the background classroom instruction the children received also differed. The important point is that none of the interventions were sufficient to produce adequate reading growth in *all* children. Across all the interventions, the average estimate of "population failure rate" was 5%. It is interesting that this 5% figure roughly corresponds to the percentage of children who are currently identified as learning disabled, most of whom are identified because of problems learning to read. As a counterpoint to this estimate of population failure rate in early intervention studies, Scanlon, Vellutino, Small, and Fanuele (2000) recently reported a study in which the failure rate was essentially zero in their most effective condition. This condition involved a combination of small group intervention in kindergarten and one-on-one instruction in first grade, and it suggests that it may be possible to improve on past results with multilayered interventions in the early grades.

Of course, there are many reasons why outcomes from highly controlled research studies may be either unrealistically high or unrealistically low. One reason that they may sometimes be low is that the preventive instruction may be offered in the context of classroom instruction that does not

reinforce or encourage the skills being taught to the at-risk learners (i.e., Torgesen, Wagner, Rashotte, Rose, et al., 1999). As was mentioned earlier, to maximize reading growth, children at risk for reading difficulties must receive *both* strong classroom instruction in reading and more intensive, explicit, and supportive preventive instruction. A reason that research studies may produce unrealistically strong outcomes is that teachers may be more highly trained and supervised in these settings than usually occurs in schools. For these reasons, it is instructive to examine reading outcomes in schools where sound preventive procedures are implemented.

One such school is Hartsfield Elementary in Tallahassee, Florida (King & Torgesen, 2001). Over a 5-year period, this school worked to implement a balanced reading curriculum in kindergarten through Grade 3 and to establish significant amounts of preventive reading instruction for children who were performing below grade level in the first and second grade. The school serves a population of children who are about 65% minority (mostly African American), and 60% of the children are eligible for free or reduced lunch support. In the first year of the project, the new classroom reading instruction was only partially implemented, but by the end of the 5-year period, it was fully implemented in all primary-grade classrooms. The preventive instruction was phased in gradually beginning in the second year of the project as new resources for providing the instruction were identified. The results for word-level reading skills are presented graphically in Figure 1. The test used was a nationally standardized measure of word reading ability, and it was given by individuals other than the children's teachers at the end of each year to all children. The figure shows the percentage of children who ended first and second grade performing below the 25th percentile, and it also describes the change in average percentile for all children. As can be seen from the figure, during the 5-year implementation period, the percentage of children performing below the 25th percentile at the end of first grade dropped from 31.8% to 3.7%. At the end of the implementation period, the percentage of children (using only those children at Hartsfield with at least 2 years of instruction) still weak in word-level reading skills at the end of second grade was only 2.4%. In terms of the long-term impact of early intervention at this school, during the same period of time, Hartsfield achieved the largest growth of any of the 20 elementary schools in its district on the state-administered standardized reading test administered at the end of third grade. Median percentile in reading achievement for third-grade children on the California Achievement Test improved from 49 at the end of 1994 to 73 at the end of 1999.

IDENTIFYING CHILDREN IN NEED OF PREVENTIVE INTERVENTIONS

It is beyond the scope of this article to provide a detailed discussion of assessment procedures to identify children in need of special preventive in-

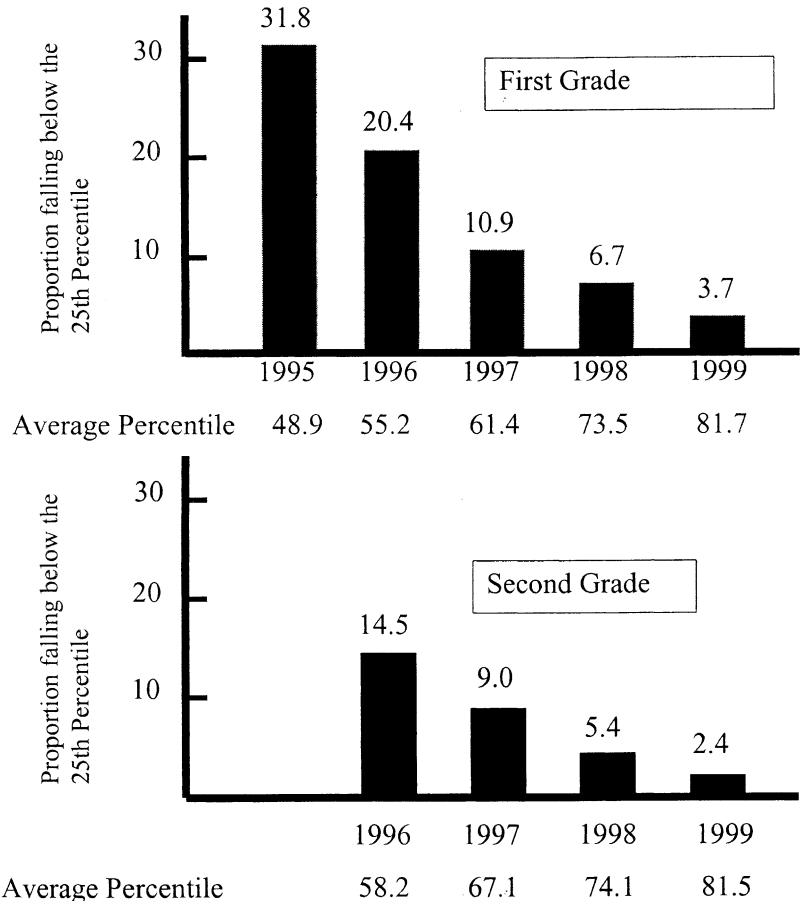

Figure 1. Changes in year-end reading performance of children during period of rapid curriculum changes in reading.

struction in reading. That topic is covered in another article in this issue (Fletcher et al.). However, for the sake of completeness, and because systematic assessment for early identification must be an integral part of any school-wide program to prevent reading disabilities, several critical points will be made here.

1. It does not take a lengthy assessment to approach the limits of accuracy in identifying children who require instruction that is more intensive, explicit, and supportive than that provided by the classroom teacher. In kindergarten, a reliable assessment of phonemic awareness, letter-sound knowledge, and vocabulary will identify most children at risk for reading failure. Children low in the first two measures will need special support

for the development of word reading ability, and children low in all three areas will require additional support in oral language development.

2. Unless screening criteria are set to identify high proportions of children as at risk, most early identification procedures at present produce a fairly high proportion of "false negatives" (i.e., children who pass the screening but later show difficulties learning to read; Scarborough, 1998). The simple reason for this is that reading growth is predicted by a variety of factors other than cognitive abilities and knowledge (Torgesen, Wagner, Rashotte, Rose, et al., 1999). However, the number of false negatives during the period from the start of school to third grade can be reduced to virtually zero if screening for reading difficulties is conducted regularly in first, second, and third grade. I would recommend assessment to monitor reading growth occurs at least three times a year during first, second, and third grade.
3. At the beginning of first grade, at-risk children can best be identified using procedures similar to those for children in kindergarten. However, after reading instruction begins in first grade, the best way to identify children who are falling behind in the ability to read words accurately and fluently is to measure that skill directly. We (Torgesen, Wagner, & Rashotte, 1999) recently published a test called the *Test of Word Reading Efficiency* that requires only 45 s to obtain a reliable measure of phonemic decoding efficiency, and another 45 s to measure the growth of sight word vocabulary. In first grade, I would recommend assessment of comprehension-related skills using a measure of oral language vocabulary rather than reading comprehension because comprehension is so heavily dependent on word reading ability in the early primary grades (Stanovich, Cunningham, & Feeman, 1984).
4. In second and third grade, the development of word-level reading ability should continue to be monitored using direct assessments to identify children who are falling behind their peers in these critical skills. At this point, group- or individually administered measures of reading comprehension may prove useful in identifying children who can continue to profit from more intensive work to build vocabulary and reading comprehension strategies.

Concluding Comments

Although we do not yet understand the conditions that must be in place to prevent reading difficulties in *all* children, we do know what must be done to very substantially reduce the number of children who fail to acquire adequate reading skills during the primary grades of elementary school. The key to taking advantage of this knowledge is finding the will to change the way we *work* at teaching reading. We must work more effectively to insure that classroom teachers acquire the skills and knowledge to teach reading

to children who do not learn easily. We must work to develop and institute procedures to identify children in need of extra instruction in a timely and accurate manner. Finally, we must work to find sufficient instructional resources to provide more intensive, explicit, and supportive instruction to the children who need it. We have numerous examples showing that working effectively in all these areas will dramatically increase our success in teaching all children to read well during elementary school.

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REFERENCES

Adams, M. J. (1990). *Beginning to read.* Cambridge, MA: MIT Press.

Adams, M. J. (1991). A talk with Marilyn Adams. *Language Arts, 68,* 206–212.

Briggs, A., Austin, R., & Underwood, G. (1984). Phonological coding in good and poor readers. *Reading Research Quarterly, 20,* 54–66.

Brown, A. L., Palincsar, A. S., & Purcell, L. (l986). Poor readers: Teach, don't label. In U. Neisser (Ed.), *The school achievement of minority children: New perspectives* (pp. 105–143). Hillsdale, NJ: Erlbaum.

Brown, I. S., & Felton, R. H. (l990). Effects of instruction on beginning reading skills in children at risk for reading disability. *Reading and Writing: An Interdisciplinary Journal, 2,* 223–241.

Bruck, M. (1990). Word-recognition skills of adults with childhood diagnoses of dyslexia. *Developmental Psychology, 26,* 439–454.

Cunningham, A. E., & Stanovich, K. E. (1998). What reading does for the mind. *American Educator, 22*(Spring/Summer), 8–15.

Ehri, L. C. (1998). Grapheme–phoneme knowledge is essential for learning to read words in English. In J. Metsala & L. Ehri (Eds.), *Word recognition in beginning reading* (pp. 3–40). Hillsdale, NJ: Erlbaum.

Elbaum, B., Vaughn, S., Hughes, M. T., & Moody, S. W. (1999). Grouping practices and reading outcomes for students with disabilities. *Exceptional Children, 65,* 399–415.

Fletcher, J. M., Shaywitz, S. E., Shankweiler, D. P., Katz, L., Liberman, I. Y., Steubing, K. K., Francis, D. J., Fowler, A. E., & Shaywitz, B. A. (1994). Cognitive profiles of reading disability: Comparisons of discrepancy and low achievement definitions. *Journal of Educational Psychology, 86,* 6–23.

Foorman, B. R., Francis, D. J., Fletcher, J. M., Schatschneider, C., & Mehta, P. (1998). The role of instruction in learning to read: Preventing reading failure in at-risk children. *Journal of Educational Psychology, 90,* 37–55.

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

Fuchs, D., Fuchs, L. S., Mathes, P. G., & Simmons, D. C. (1997). Peer-assisted learning strategies: Making classrooms more responsive to academic diversity. *American Educational Research Journal, 34,* 174–206.

Gaskins, I. W., Ehri, L. C., Cress, C., O'Hara, C., & Donnelly, K. (1997). Procedures for word learning: Making discoveries about words. *The Reading Teacher, 50,* 312–327.

Gough, P. B. (1996). How children learn to read and why they fail. *Annals of Dyslexia, 46,* 3–20.

Greenwood, C. R. (1996). Research on the practices and behavior of effective teachers at the Juniper Gardens Children's Project: Implications for the education of diverse learners. In D. L. Speece & B. K. Keogh (Eds.), *Research on classroom ecologies* (pp. 39–68). Mahwah, NJ: Erlbaum.

Hart, B., & Risley, T. R. (1995). *Meaningful differences.* Baltimore, MD: Brookes.

Hatcher, P., Hulme, C., & Ellis, A. W. (1994). Ameliorating early reading failure by integrating the teaching of reading and phonological skills: The phonological linkage hypothesis. *Child Development, 65,* 41–57.

Hoover, W. A., & Gough, P. B. (1990). The simple view of reading. *Reading and Writing, 2,* 127–160.

Iversen, S., & Tunmer, W. E. (1993). Phonological processing skills and the reading recovery program. *Journal of Educational Psychology, 85,* 112–126.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80,* 437–447.

Juel, C. (1996). What makes literacy tutoring effective? *Reading Research Quarterly, 31,* 268–289.

Juel, C., & Minden-Cupp, C. (2000). Learning to read words: Linguistic units and instructional strategies. *Reading Research Quarterly, 35,* 458–492.

King, R., & Torgesen, J. K. (2000). *Improving the effectiveness of reading instruction in one elementary school: A description of the process.* Unpublished manuscript, Florida State University, Tallahassee.

Lee, V., Brooks-Gunn, J., Schnur, E., & Liaw, F. (1990). Are Head Start effects sustained? A longitudinal follow-up comparison of disadvantaged children attending Head Start, no preschool, and other pre-school programs. *Child Development, 61,* 495–507.

Liberman, I. Y., Shankweiler, D., & Liberman, A. M. (1989). The alphabetic principle and learning to read. In Shankweiler, D. & Liberman, I. Y. (Eds.), *Phonology and reading disability: Solving the reading puzzle* (pp. 1–33). Ann Arbor, MI: U. of Michigan Press.

Manis, F. R., Custodio, R., & Szeszulski, P. A. (1993). Development of phonological and orthographic skill: A 2-year longitudinal study of dyslexic children. *Journal of Experimental Child Psychology, 56,* 64–86.

Mathes, P. G., Torgesen, J. K., & Allor, J. H. (in press). The effects of Peer-Assisted Literacy Strategies for first-grade readers with and without additional computer assisted instruction in phonological awareness. *American Educational Research Journal.*

Moats, L. C. (1994). The missing foundation in teacher education: Knowledge of the structure of spoken and written language. *Annals of Dyslexia, 44,* 81–102.

Moats, L. C. (1999). *Teaching reading is rocket science.* Washington, D.C.: American Federation of Teachers.

National Center for Education Statistics. (2001). *NAEP 2000 Reading. A report card for the nation and the states.* Washington, D.C.: U.S. Department of Education.

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction.* Washington, D.C.: National Institute of Child Health and Human Development.

Neisser, U., Boodoo, G., Bouchard, T. J., Boykin, A. W., Brody, N., Eci, S. J., Halpern, D. F., Loehlen, J. C., Perloff, R., Sternberg, R. J., & Urbina, S. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51,* 77–101.

Oka, E., & Paris, S. (1986). Patterns of motivation and reading skills in underachieving children. In S. Ceci (Ed.), *Handbook of cognitive, social, and neuropsychological aspects of learning disabilities* (Vol. 2). Hillsdale, NJ: Erlbaum.

Olson, R. K., Wise, B., Johnson, M., & Ring, J. (1997). The etiology and remediation of phonologically based word recognition and spelling disabilities: Are phonological deficits the "hole" story? In B. Blachman (Ed.), *Foundations of Reading Acquisition*. Mahwah, NJ: Erlbaum.

Rashotte, C. A., MacPhee, K., & Torgesen, J. K. (in press). The effectiveness of a group reading instruction program with poor readers in multiple grades. *Learning Disabilities Quarterly, 24,* 119–134.

Scanlon, D. M., Vellutino, F. R., Small, S. G., & Fanuele, D. P. (2000). Severe reading difficulties—Can they be prevented? A comparison of prevention and intervention approaches. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA, April.

Scarborough, H. S. (1998). Early identification of children at risk for reading disabilities: Phonological awareness and some other promising predictors. In B. K. Shapiro, P. J. Accardo, & A. J. Capute (Eds.), *Specific reading disability: A view of the spectrum* (pp. 75–120). Timonium, MD: York Press.

Share, D. L., & Stanovich, K. E. (1995). Cognitive processes in early reading development: A model of acquisition and individual differences. *Issues in Education: Contributions from Educational Psychology, 1,* 1–57.

Siegel, L. S. (1989). IQ is irrelevant to the definition of learning disabilities. *Journal of Learning Disabilities, 22,* 469–479.

Simpson, G. B., Lorsbach, T., & Whitehouse, D. (1983). Encoding and contextual components of word recognition in good and poor readers. *Journal of Experimental Child Psychology, 35,* 161–171.

Snow, C. E., Burns, M. S., & Griffin, P. (Eds.). (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.

Stanovich, K. E., Cunningham, A. E., & Feeman, D. J. (1984). Intelligence, cognitive skills, and early reading progress. *Reading Research Quarterly, 24,* 278–303.

Stanovich, K. E., & Siegel, L. S. (1994). The phenotypic performance profile of reading-disabled children: A regression-based test of the phonological-core variable-difference model. *Journal of Educational Psychology, 86,* 24–53.

Swanson, H. L. (1999). Reading research for students with LD: A meta-analysis of intervention outcomes. *Journal of Learning Disabilities, 32,* 504–532.

Torgesen, J. K. (2000). Individual differences in response to early interventions in reading: The lingering problem of treatment resisters. *Learning Disabilities Research and Practice, 15,* 55–64.

Torgesen, J. K. (in press). Lessons learned from intervention research in reading: A way to go before we rest. In R. Stainthorpe (Ed.), *Literacy: Learning and teaching.* Monograph of the British Journal of Educational Psychology, London: British Psychological Association.

Torgesen, J. K., Alexander, A. W., Wagner, R. K., Rashotte, C. A., Voeller, K., Conway, T., & Rose, E. (2001). Intensive remedial instruction for children with severe reading disabilities: Immediate and long-term outcomes from two instructional approaches. *Journal of Learning Disabilities, 34,* 33–58.

Torgesen, J. K., & Burgess, S. R. (1998). Consistency of reading-related phonological processes throughout early childhood: Evidence from longitudinal-correlational and instructional studies. In J. Metsala & L. Ehri (Eds.), *Word recognition in beginning reading* (pp. 161–188). Hillsdale, NJ: Erlbaum.

Torgesen, J. K., & Mathes, P. (2000). *A basic guide to understanding, assessing, and teaching phonological awareness.* Austin, TX: PRO-ED.

Torgesen, J. K., Rashotte, C. A., & Alexander, A. (2001). Principles of fluency instruction in reading: Relationships with established empirical outcomes. In M. Wolf (Ed.), *Dyslexia, fluency, and the brain* (pp. 333–355). Parkton, MD: York Press.

Torgesen, J. K., Wagner, R. K., & Rashotte, C. A. (1999). *Test of word reading efficiency.* Austin, TX: PRO-ED.

Torgesen, J. K., Wagner, R. K., Rashotte, C. A., & Herron, J. (2001). *A comparison of two computer assisted approaches to the prevention of reading disabilities in young children*. Manuscript in preparation.

Torgesen, J. K., Wagner, R. K., Rashotte, C. A., Rose, E., Lindamood, P., Lindamood, P., Conway, T., & Garvin, C. (1999). Preventing reading failure in young children with phonological processing disabilities: Group and individual responses to instruction. *Journal of Educational Psycholog, 91,* 579–593.

Vellutino, F. R., Scanlon, D. M., Sipay, E. R., Small, S. G., Pratt, A., Chen, R., & Denckla, M. B. (1996). Cognitive profiles of difficult-to-remediate and readily remediated poor readers: Early intervention as a vehicle for distinguishing between cognitive and experiential deficits as basic causes of specific reading disability. *Journal of Educational Psychology, 88,* 601–638.

Wagner, R. K., Torgesen, J. K., & Rashotte, C. A. (1994). The development of reading-related phonological processing abilities: New evidence of bi-directional causality from a latent variable longitudinal study. *Developmental Psychology, 30,* 73–87.

Wagner, R. K., Torgesen, J. K., Rashotte, C. A., Hecht, S. A., Barker, T. A., Burgess, S. R., Donahue, J., & Garon, T. (1997). Changing causal relations between phonological processing abilities and word-level reading as children develop from beginning to fluent readers: A five-year longitudinal study. *Developmental Psychology, 33,* 468–479.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development, 69,* 335–357.

Wise, B. W., Ring, J., & Olson, R. K. (1999). Training phonological awareness with and without explicit attention to articulation. *Journal of Experimental Child Psychology, 72,* 271–304.