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LANGUAGE AND READING DISABILITIES

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Chapter 5

Assessment and Instruction for Phonemic Awareness and Word Recognition Skills

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A number of factors influence how readily young school-age children become proficient readers, including exposure to print, letter knowledge, phonemic awareness (PA), and general language (particularly vocabulary; e.g., National Early Literacy Panel, Lonigan, Schatschneider, & Westberg, 2008). Previous chapters have discussed the importance of these skills and how they develop. The focus of this chapter is the assessment and instruction of phonemic awareness and word recognition skills in the early elementary school years. By third grade, all but the most struggling students would be well on their way toward mastery of these skills. By necessity, we have made a number of assumptions about readers of the book and, hence, this chapter. We assume that the reader has already learned from other chapters about the nature of reading disabilities and reading acquisition processes and will understand the language disabilities that directly interfere with the acquisition of good word recognition skills. The reader should also understand that the ultimate goal of reading instruction and intervention is to help children acquire all the skills required to comprehend the meaning of text, and that the acquisition of effective word-level reading skills is critical to the attainment of that goal. Finally, we assume that the reader has some knowledge about Response to Intervention (RTI), which is a prevention-oriented approach that provides early literacy intervention to children who are struggling with learning to read.

Because the development of phonemic awareness is critical to the subsequent acquisition of good word recognition skills, it seems logical to organize this chapter by an initial discussion about development and assessment in this area, and then to continue the discussion to the more complex issues involved in the assessment of word identification skills. Next, we use the RTI framework to organize a discussion of instruction and interventions for phonemic awareness and word recognition skills. We discuss both Tier 1, or classroom instruction that all children receive, and additional

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interventions, which are provided only to students who are not making adequate progress within Tier 1. Because there is currently such variation in how RTI is implemented, including the number of instructional tiers available and when special education actually begins, we will simply describe interventions and their suggested intensity, rather than assigning them to specific tiers.

DEVELOPMENT AND ASSESSMENT OF PHONEMIC AWARENESS

Several general issues related to assessment of phonological awareness must be considered before information about specific tests is presented. Perhaps the most central of these issues is the matter of definition. Before any construct can be assessed, it should be defined, and phonemic awareness is a construct that is not easy to pin down to a simple definition. One issue is whether we should consider phonemic awareness to be a kind of conceptual understanding about language or whether it should be considered a skill. What do we mean, precisely, when we say that a child's phonemic awareness has increased from the last time we measured it?

On the one hand, part of what we mean by phonemic awareness is that it involves an understanding that a single-syllable word such as *cat*, which is experienced by the listener as a single beat of sound, actually can be subdivided into beginning, middle, and ending sounds. Similarly, it involves the understanding that individual segments of sound at the phonemic level can be combined together to form words. Otherwise, the child would not be able to make sense of the request to blend the sounds represented by the letters *c - a - t* to make a word.

On the other hand, a complete understanding of phonemic awareness must also account for the fact that it behaves like a skill that develops across time in fairly predictable ways. That is, children seem to acquire an increasing ability to notice, think about, and manipulate the phonemes in words as they move from preschool through elementary school. For example, in the first few weeks of preschool, a student might express surprise about a classmate whose name starts "the same as mine." At the beginning of kindergarten, one child we asked to tell us the sounds in *dog* answered "woof-woof," indicating he either was unfamiliar with the task, or was unaware of sounds in words. But, by the middle of kindergarten the same child was able to isolate and pronounce the first sound and the onset of *dog*, and by the end of kindergarten, like most children, he could segment all the sounds in three- and four-phoneme words (Good, Wallin, Simmons, Kame'enui, & Kaminski, 2002). Children also show regular improvements during this same period of time in their ability to blend individually presented sounds together to form words (Torgesen & Morgan, 1990).

To account for both the conceptual and skill components of the construct, we need a definition of phonemic awareness such as the following: It involves a more or less explicit understanding that words are composed of segments of sound smaller than a syllable, as well as knowledge, or awareness, of the distinctive features of individual phonemes themselves. It is this latter knowledge of the identity of individual phonemes themselves that continues to increase after an initial understanding of the phonemic structure of words is acquired. For example, children must acquire a knowledge of the distinctive features of a phoneme such as /l/ so they can recognize it when it occurs with slightly varied pronunciation at the beginning of a word such as *last*, as the second sound in a consonant blend as in *flat*, in the middle of a word, such as *shelving*, at the end, as in *fall,* or when it occurs in a final blend such as in *fault*.

Sometimes, the term *phonological awareness* is used to refer to the construct we are discussing here, but this more global term actually implies a more general level of awareness than the words *phonemic awareness*. For example, awareness of the syllabic structure of words would qualify as a form of phonological awareness because it involves awareness of part of the sound

structure in words. In addition, rhyme awareness is a beginning form of phonological awareness because it involves an ability to analyze words at the level of the onset and rime (*c-at, m-at*). The distinction between these more general forms of phonological awareness and the more specific, discrete, form of phonemic awareness is supported by factor analyses of groups of these tasks, and it is important because measures of phonemic awareness appear to be more predictive of individual differences in reading and spelling growth (Høien, Lundberg, Stanovich, & Bjaalid, 1995; Lonigan, Schatschneider, & Westberg, 2008).

Thus, researchers have cautioned that preschool children with speech or language impairments (SI and LI, respectively) appear slower to develop phonological and phonemic awareness compared to their typically developing peers (Bird, Bishop, & Freeman, 1995; Boudreau & Hedberg, 1999), elevating their risk for reading difficulties (Aram & Hall, 1989; Bishop & Adams, 1990; Catts, 1991, 1993; Scarborough & Dobrich, 1990). This risk appears substantially higher for children with LI; according to the American Speech-Language-Hearing Association (2001), young children with LI are four to five times more likely than their peers to have reading problems later in elementary school and beyond. Catts and colleagues (2002) reported that roughly half of kindergarteners with LI developed reading disabilities by second grade. Similarly, when Puranik, Petscher, Al Otaiba, Catts, and Lonigan (2008) examined oral reading fluency scores of over 1,900 students with SI and LI across first through third grade, they found that significant differences in growth trajectories could be seen by January of first grade. Although reading growth was generally better for students with SI than those with LI, a large proportion of students with either impairment did not meet grade-level reading fluency benchmarks. Those students with persistent impairments grew slower than students whose impairments were resolved. These results highlight the need to identify, monitor, and address the phonological and word reading difficulties early among students with SI or LI.

The Importance of Phonemic Awareness in Learning to Read

In addition to understanding the concept of phonemic awareness, assessment must also be informed by an understanding of why phonemic awareness is important to the growth of word-reading ability. Phonemic awareness contributes to the growth of early reading skills in at least three ways:

1. ***It helps children understand the alphabetic principle and develop alphabetic knowledge.*** To take advantage of the fact that English is an alphabetic language, a child must be aware that words have sound segments that are represented by the letters in print. Without at least emergent levels of phonemic awareness, the rationale for learning individual letter sounds and "sounding out" words is not understandable.
2. ***It helps children notice the regular ways that letters represent sounds in words.*** If children can "hear" four sounds in the word *clap*, it helps them to notice the way the letters correspond to the sounds. The ability to notice the correspondence between the sounds in a word and the way it is spelled has two potential benefits. First, it reinforces knowledge of individual sound–letter correspondences, and second, it helps in forming mental representations of words that involve a close amalgamation of their written and spoken forms. Linnea Ehri (1998, 2002) has shown how developing readers use their awareness of the phonemes in words as a mnemonic to help them remember the words' spellings so they can eventually recognize many thousands of words "by sight."

3. ***It helps children become flexible decoders to decode even irregular words, and it makes it possible to generate possibilities for words in context that are only partially "sounded out."*** For example, consider a first grader who comes to a sentence such as, "The boy and his friends ride th_ _ _ bikes to the store," and cannot recognize the high-frequency but irregular word *their*, but knows the sound represented by the first digraph. An early level of phonemic awareness supports the ability to search the lexicon for words that begin with similar sounds. That is, in addition to being categorized by their meanings, words can be categorized by their beginning, middle, or ending sounds. If children are able to use information about the phonemes in an unknown word that they obtain from even a partial phonemic analysis to constrain their search for words that also fit the meaning of the sentence or paragraph, they will significantly increase the accuracy of their first guesses about the identity of unknown words in text. It is important for young children to become accurate readers as quickly as possible because words must be read accurately a number of times before they can become part of a child's sight vocabulary (Share & Stanovich, 1995).

This analysis suggests that phonemic awareness has its primary impact on early reading growth through its contribution to children's ability to use sound–letter correspondences to decode words in text. The ability to phonemically decode words is not an end in itself because phonemic decoding is too slow and effortful to support fluent reading and good comprehension. However, accumulating knowledge about reading trajectories indicates that phonemic reading skills play a critical role in supporting overall reading growth, particularly the growth of a rich vocabulary of words that can be recognized orthographically, or "by sight" (Ehri, 2002; Share & Stanovich, 1995). Further, the National Early Literacy Panel (NELP; Lonigan et al., 2008) synthesized existing correlational studies that examined the prediction of decoding ability and comprehension from children's preschool phonological skills. The Panel examined 69 studies and, on average, found a moderate relation ($r = .40$) between phonological awareness during preschool and later decoding once reading instruction began in school. A similar relation ($r = .44$) was found when the panel analyzed findings from 20 studies that examined the prediction of reading comprehension from early phonological awareness.

We now have compelling scientific evidence that phonemic awareness is an important prerequisite for learning to read. The most important evidence comes from well-designed experiments, or training studies, in which instruction in phonemic awareness has been shown to facilitate the acquisition of beginning word-reading skills, particularly phonemic decoding skills. In a seminal analysis of the results from 52 carefully selected experimental studies, Ehri and her colleagues (2001) reported a highly consistent effect for training in phonemic awareness on the development of reading skills. Not surprisingly, these studies showed that the effect of training in phonemic awareness was strongest for phonemic decoding skills in reading, and less strong, but still statistically significant, for measures of reading comprehension.

The NELP (Lonigan et al., 2008), in a synthesis of intervention studies with children age 5 and younger, showed it is possible to improve phonological awareness in preschool children through direct instruction. They reviewed studies that trained children in phonological awareness and in the alphabetic principle. In 51 studies that assessed phonological awareness as an outcome measure, the average effect size was .82, indicating a large impact. "This result means that, on average, children who received a code-focused intervention scored 0.82 of a standard deviation higher on measures of PA than did children who did not receive a code-focused intervention. To put this in context, if the average children not receiving a code-focused intervention scored 100

on a standardized test of PA that had a mean of 100 and a standard deviation of 15, the average children receiving a code-focused intervention scored 112 on the test (i.e., the difference between scoring at the 50th and 79th percentiles)" (p. 109). Furthermore, in secondary analyses, the NELP authors found even stronger effects of code-focused interventions for children who had weaker knowledge about the alphabet (ES = .99). They also compared the effect sizes of interventions that provided only phonological training (ES = .91), phonological and alphabetic knowledge training (ES = .70), only alphabetic knowledge training (ES = .48), and phonological awareness and phonics training (ES =.74).

Purposes for Assessment of Phonemic Awareness

The significant correlations between emerging phonemic awareness and later growth of reading skills (see Blachman, 2000; Lonigan et al., 2008 for a more recent reviews) suggests one of three reasons why we should be concerned about assessment of this construct. At present, phonemic awareness is being assessed to identify children at risk for reading failure before reading instruction actually begins, to monitor children's progress in acquiring critical reading skills, and to help describe the level of phonological impairment in children being diagnosed with reading disabilities (RD). Although these are all promising areas for the development of useful assessment procedures, we are still some distance away from being able to precisely identify children with RD on the basis of their performance on single measures of phonemic awareness in preschool or kindergarten, particularly for children with speech and language impairments and children with impoverished language and reading readiness. The most important problem is that these measures produce too high a number of false positives (children who are predicted to be poor readers, but turn out to be good readers; Blachman, 2000; Torgesen, Burgess, & Rashotte, 1996).

One solution to the problems inherent in single-screening assessments of phonemic awareness is to monitor progress in the growth of phonemic awareness skills several times across preschool through first grade. The advantage of multiple assessments of phonemic awareness is that they can provide an indication of children's response to the instruction they are receiving, and they can be used to identify children who are not keeping pace with expected levels of growth before the learning failure has become too severe (Good, Simmons, & Kame'enui, 2001; Good, Simmons, Kame'enui, Kaminski, & Wallin, 2002).

As an aid in the diagnosis of reading disabilities, measures of phonemic awareness are consistently more useful than any other measure of nonreading skills (Fletcher et al., 1994). However, the issue here is whether they actually add any precision to the diagnosis of reading disability beyond the information that is provided by direct measures of phonemic decoding ability. In one study that addressed this question (Torgesen, Wagner, Rashotte, Burgess, & Hecht, 1997), it was found that measures of phonemic awareness in second- and third-grade children provided a small amount of useful information beyond that provided by reading measures. However, the amount of additional information may not have been large enough to warrant the additional time it took to administer the phonemic awareness tests. Catts and Hogan (2002) reported very similar findings in a longitudinal study of kindergarten, second-, and fourth-grade-level students. Measures of phonemic awareness administered in kindergarten provided important unique information (beyond that provided by measures of phonemic decoding given in kindergarten) in explaining individual differences in word reading accuracy in second grade. However, when measures of phonemic awareness were given along with measures of phonemic decoding in second grade, level of phonemic awareness added very little to the prediction of

problems in word reading accuracy once individual differences on measures of phonemic decoding were taken into account.

The principal reason why assessment of phonemic awareness may not add to the diagnosis of reading disability once children have begun to learn to read is that phonemic decoding skills and phonemic awareness are very highly correlated with one another. However, it is far too early to rule out the use of phonemic awareness measures as part of a diagnostic battery for older children or adolescents with RD. In individual cases, these measures may have clinical or educational implications that go substantially beyond those derived from measures of nonword reading.

Procedures and Measures Used to Assess Phonemic Awareness

More than a decade ago, Catts and his colleagues (Catts, Wilcox, Wood-Jackson, Larrivee, & Scott, 1997) reviewed methods used to assess phonemic awareness and found over 20 different tasks that have been used by researchers to measure awareness of phonemes in words. In their analysis, they grouped these measures into three broad categories: (1) phoneme segmentation, (2) phoneme synthesis, and (3) sound comparison. *Phoneme segmentation* tasks require a relatively explicit level of awareness of phonemes because they involve counting, pronouncing, deleting, adding, or reversing the individual phonemes in words. Common examples of this type of task require pronouncing the individual phonemes in words ("Say the sounds in *cat* one at a time."), deleting sounds from words ("Say *card* without saying the /d/ sound."), or counting sounds ("Put one marker on the line for each sound you hear in the word *fast*.")

There is really only one kind of task that can be used to measure *phoneme synthesis*. This is the sound-blending task in which the tester attempts to pronounce a series of phonemes in isolation and asks the child to blend them together to form a word (i.e., "What word do these sounds make, /f/ - /a/ - /t/?). Easier variants of the sound-blending task can be produced by allowing the child to choose from two or three pictures of a word that is represented by a series of phonemes (Torgesen & Bryant, 1993).

Sound comparison tasks use a number of different formats that have a common requirement to make comparisons between the sounds in different words. For example, a child might be asked to indicate which of several words begins or ends with the same sound as a target word. In addition, tasks that require children to generate words that have the same first, last, or middle sound as a target word would fall in this category.

An important point about these different kinds of tasks is that they all appear to be measuring essentially the same construct. Although some research (Yopp, 1988) has indicated that the tasks may vary in the complexity of their overall cognitive requirements, and there may be some differences between analysis and synthesis tasks at certain ages (Wagner, Torgesen, & Rashotte, 1994), for the most part, they all seem to be measuring different levels of growth in the same general ability (Ehri et al., 2001; Høien et al., 1995; Stanovich, Cunningham, & Cramer, 1984). Differences among these tasks in their level of difficulty seem primarily related to the extent to which they require explicit manipulation of individual phonemes. For example, many kindergarten children have difficulty with certain kinds of phoneme segmentation tasks, but most can perform sound comparison tasks successfully.

A number of readily available measures can be used to assess phonemic awareness, and more are currently under development. It is beyond the scope of this chapter to critically evaluate each of the available tests; so in Table 5.1 we provide a list of 16 measures and summarize important information about each. Table 5.1 summarizes for each test the appropriate age range,

TABLE 5.1 Measures of Phonological and Phonemic Awareness

Measure	*Appropriate Grade Range*	*Skills Tested and Use*		*Test Design and Administration*	
	K–3	**Skills Tested**	**Most Common Use**	**Individual vs. Group**	**Criterion or Norm Referenced**
Comprehensive Test of Phonological Processing	K–12	Blending, Segmenting, Elision, Phoneme identity	Diagnostic	I	Norm
Preschool Test of Phonological and Print Processes	Pre-K	Blending, Elision	Preschool diagnostic	I	Norm
Dynamic Indicators of Basic Early Literacy Skills	K–1	Phoneme identity, Initial sound fluency, Segmenting	Screening, Progress monitoring	I	Criterion
Early Reading Diagnostic Assessment	K–3	Blending, Rhyming, Segmenting	Diagnostic	I	Norm
Fox in a Box	K–2	Blending, Rhyming, Segmenting	Diagnostic	I	Criterion
Lindamood Auditory Conceptualization Test	K–12	Segmenting and Substitution	Diagnostic	I	Criterion
The Phonological Awareness Test	K–5	Rhyme, Blending, Segmenting, Elision	Diagnostic	I	Norm
Rosner Test of Auditory Analysis	K–3	Elision	Diagnostic	I	Criterion
Test of Invented Spelling	K–1	Letter–sound correspondence	Informal	G	Criterion
Test of Phonological Awareness–2+	K–2	Sound comparison	Screening, Outcome	G	Norm
Yopp-Singer Test of	K–1	Segmenting	Informal		

Test of Invented Spelling	K–1	Letter–sound correspondence	Informal	G	Criterion
Test of Phonological Awareness–2+	K–2	Sound comparison	Screening, Outcome	G	Norm
Yopp-Singer Test of Phoneme Segmentation	K–1	Segmenting	Informal	I	Criterion
Woodcock Diagnostic Reading Battery	Pre-K–adult	Blending, Segmenting	Diagnostic	I	Norm
Texas Primary Reading Inventory	K–3	Blending, Segmenting	Screening, Progress monitoring, Outcome	I	Criterion
Test of Phonemic Awareness 2 Plus (TOPA–2+)	K–2	Initial and final sound and letter–sound correspondence	Screening	G	Norm
AIMSweb	K–1	Phoneme segmentation	Progress monitoring	I	Criterion
Get it Got it Go!	Pre-K	Alliteration, Rhyming	Progress monitoring	I	Criterion

skills tested, appropriate usage, administration, and design. Although the tests may be norm referenced or criterion based, they all have well-established predictive relationships with the growth of word recognition skills.

DEVELOPMENT AND ASSESSMENT OF WORD RECOGNITION

Assessment of word recognition skills is considerably more complex than assessment of phonemic awareness because readers can identify words in a number of different ways as they process text. To understand how children develop reading skills, it is important to understand how children learn to recognize written words accurately and automatically. Words in text can be identified in at least five different ways (Ehri, 2002):

1. By identifying and blending together the individual phonemes in words
2. By noticing and blending together familiar spelling patterns, which is a more advanced form of decoding
3. By recognizing words as whole units, or reading them "by sight"
4. By making analogies to other words that are already known
5. By using clues from the context to guess a word's identity

Researchers have also emphasized that morphological awareness, or the conscious knowledge of the individual units of meaning in language, including prefixes and suffixes, assists children in identifying unknown words in text (Apel, Wilson-Fowler, & Masterson, in press; Carlisle, 2004). For example, if the child can read *hope*, then knowing the inflected ending *ing*, could facilitate recognition of *hoping.* Older students also use morphological awareness to read derived words that share meaning (e.g., structure, construction). Different processes and knowledge are required to use each of these word identification methods, and these methods play roles of varying importance during different stages of learning to read.

A method that is of primary importance during early stages of learning to read is *phonemic decoding*. To use this method, readers must know the sounds that are usually represented by letters in words, then they must blend together the individual sounds that are identified in each word. This method is important to early reading success because it provides a relatively reliable way to identify words that have not been seen before. As children become more experienced readers, they begin to *process letters in larger chunks called spelling patterns.*

This improves decoding speed because it allows children to process groups of letters as units, rather than having to decode each graphophonic unit individually. Some common spelling patterns found at the ends of single syllable words in English are *-ack, -ight, -unk, -eat, -ay, -ash, -ip, -ore,* and *-ell.* Common affixes for longer words include *-able, -ing, -ous, -ize, pro-, con-, pre-*, and *un-*. A number of studies have shown that words that contain common spelling patterns like those listed are easier to decode if children are familiar with the patterns (Bowey & Hansen, 1994; Trieman, Goswami, & Bruck, 1990).

As children repeatedly read the same word several times, it eventually becomes stored in memory as a "sight word." No analysis is required to read sight words. A single glance at these words is sufficient to activate information about their pronunciation and meaning. Sight words are read rapidly (within one second) with no pauses between different parts of the word. Sight words are not recognized on the basis of shape or just some of the letters, but rather information about all the letters in a word is used to accurately identify it as a sight word (Raynor, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001).

Those who conduct research on word recognition use the term *orthographic processing* (Ehri, 2002) to refer to the way that words are recognized "by sight." The orthography of a language refers to the way it is represented visually. Hence, when researchers indicate that words are processed as *orthographic units*, they are implying that they are recognized on the basis of a visual representation that has been integrated with the word's phonemic structure and its meaning.

When sight words are well practiced (and hence orthographic representations are well established), they can be identified automatically, with almost no expenditure of attention or effort (LaBerge & Samuels, 1974). Having a large vocabulary of "sight words" that can be recognized automatically is the key to fluent text reading (Torgesen, Rashotte, & Alexander, 2001). Because so little effort is required to identify sight words, the reader is able to concentrate effectively on the complex processes involved in constructing the meaning of text (Perfetti, 1985).

Words can also be read by *analogy to known words* (Glushko, 1981; Laxon, Coltheart, & Keating, 1988). For example, the word *cart* might be read by noticing the word *car* and then adding to it the /t/ sound at the end. A longer word like *fountain* might be initially read by noticing its similarity to a known word like *mountain* and making the slight adjustment to pronunciation required for the different initial phoneme. Research has shown that children need to have at least a beginning level of phonemic decoding skill before they can effectively use an analogy strategy to identify unknown words (Ehri & Robbins, 1992).

A very different, and less effective, way to identify words in text is to *guess their identity from the context* in which they occur. This context may include pictures on the page or the meaning of the passage. When children make errors in their oral reading, the errors are often consistent with the context, which indicates that this is one source of information they are using to help them identify the words (Biemiller, 1970).

Research has shown that skilled readers do not rely on context as a major source of information about words in text, but that poor readers do (Share & Stanovich, 1995). Guessing words from context, by itself, is not a very accurate way to identify words in text, as is clear from work by Gough and Walsh (1991), which showed that only about 10 percent of the words that are critical to the meaning of passages can be guessed correctly from context alone. Nevertheless, when children phonemically decode words, often they do not arrive at the fully correct pronunciation unless they can use contextual constraints to suggest a real word that sounds like their decoding and makes sense within that context and unless they self-correct after reading words that do not make sense (Adams, 1990; Share & Stanovich, 1995).

Issues in the Assessment of Word Recognition

Children with RD, and many children with SI and LI, lack the ability to apply alphabetic strategies in reading new words (phonemic decoding) and the ability to retrieve sight words from memory (orthographic processing). They not only have difficulty becoming accurate in the application of these processes, but they frequently also have additional special difficulties with becoming fluent in their application. Before discussing specific methods for the diagnostic assessment of these word recognition skills, two general issues require discussion.

First, it is important for teachers and clinicians to have precise and reliable information about level of performance on important subskills in reading. The goal of the kind of assessments that will be discussed in this chapter is to quantify the degree of skill a child possesses in word identification processes that have been shown in many research studies to be critical contributors

to overall reading success. This information is vital for learning who is on grade level, for grouping children with similar instructional needs, for differentiating intervention, and for monitoring progress within RTI implementation.

The second issue is that the type of diagnostic assessments described here are also different from the more informal assessments of word recognition skills that are frequently used by teachers to help guide instruction. The kinds of assessments used by many teachers to help them plan instruction involve the use of placement tests and informal inventories designed to indicate the specific knowledge or skill a child has within several broad domains of word-reading skill. For example, such inventories might be used to indicate which letter–sound correspondences are already known to the child, whether the child can blend the sounds in words that contain final consonant blends, what is known about common prefixes and suffixes, whether syllabification strategies are understood, and precisely what words are known from a list of high-frequency words. Or, teachers may use mastery tests that accompany a core reading program to learn which students have mastered a critical skill taught within the curriculum. Therefore, we emphasize that these informal measures are neither designed nor intended to meet acceptable standards of reliability and validity for use within an RTI framework to determine who needs extra intervention. In other words, these informal measures are not suitable candidates for screening, progress monitoring, diagnostic, or outcome assessments.

Commonly Used Measures of Word Recognition Ability

It is beyond the scope of this chapter to identify all the available tests of word-level reading skills. Rather, in Table 5.2, we provide examples of tests that can be used to assess the major dimensions of word-reading ability. An adequate diagnostic assessment of children's word recognition abilities should include an assessment of: (1) word-reading accuracy (both in and out of context); (2) phonemic decoding skill; and (3) reading fluency. Fluency measures become more important after about second to third grade, after children have acquired foundational word recognition skills they can apply with reasonable accuracy. Measures that involve out-of-context word reading more directly assess the kinds of word recognition skills that are particularly problematic for children with RD because they eliminate the contextual support on which these children rely heavily. However, it may be useful diagnostically to determine the difference for a specific child between "in context" and "out of context" reading accuracy to determine how well the child can use context to support the word recognition processes. In addition to formal assessments in these domains, it is usually useful to observe the way a child reads text at varying levels of difficulty. Careful observations of oral reading behavior can provide useful information about the way that the child integrates all sources of information about words in text.

CODE-FOCUSED CLASSROOM INSTRUCTION AND MORE INTENSIVE SMALL-GROUP SUPPLEMENTAL INTERVENTION

There is now a very strong consensus among professionals who study reading and reading disabilities that instruction in phonological awareness, alphabetic knowledge, and word reading strategies is an important part of any good reading curriculum (Adams, 1990; Blachman, 1989; Bus & Van Ijzendoorn, 1999; Ehri et al., 2001; Lonigan et al., 2008; National Reading Panel [NRP], 2000; Snow, Burns, & Griffin, 1998). Because it is so important for all students to acquire sound word-level reading skills in the early grades, policy makers have passed

TABLE 5.2 Commonly Used Measures of Word Recognition Ability

Measure	Grade Range	Word Reading Skills Tested	Individual vs. Group	Criterion or Norm

TABLE 5.2 Commonly Used Measures of Word Recognition Ability

Measure	Grade Range	Word Reading Skills Tested	Most Common Use	Individual vs. Group Administration	Criterion or Norm Referenced
Diagnostic Assessment of Reading	1–3	PD, TRA, TRF	Diagnostic	I	Criterion
Early Reading Diagnostic Assessment	K–3	PD, WRA	Diagnostic	I	Normed
Fox in a Box	K–2	PDA, TRA, TRF, WRA	Diagnostic, Progress Monitoring	I	Criterion
Dynamic Indicators of Basic Early Literacy Skills	K–3	PDF, TRF	Screening, Progress Monitoring,	I	Normed Benchmarks
Test of Word Reading Efficiency	1–12	PDF, WRF	Screening, Progress Monitoring, Diagnostic	I	Normed
Gates-MacGinitie Reading Test, 3rd ed.	K–12	PDA, WRA	Diagnostic, Outcome	I/G	Normed
Gray Oral Reading Test–4	1–12	TRA, TRF	Diagnostic, Outcome	I	Normed
Group Reading Assessment & Diagnostic Evaluation	K–12	PDA, WRA	Diagnostic, Outcome	I/G	Normed
Texas Primary Reading Inventory	K–2	PDA, WRA, TRF	Diagnostic, Progress Monitoring	I	Criterion
Wide Range Achievement Test	K–12	WRA	Diagnostic, Outcome	I	Normed
Woodcock Reading Mastery Test–R	K–3	PDA, WRA	Diagnostic, Outcome	I	Normed
Woodcock-Johnson Psychoeducational Battery	K–12	PDA, WRA	Diagnostic, Outcome	I	Normed
Test of Silent Word Reading Fluency	1–12	SWRF	Progress Monitoring	G	Normed
AIMSweb	K–8	LNF, LSF, NWF, ORF	Progress Monitoring	I	Criterion

Note: PDA = Phonemic Decoding Accuracy, PDF = Phonemic Decoding Fluency, WRA = Word Reading Accuracy, WRF = Word Reading Fluency, TRA = Text Reading Accuracy, TRF = Text Reading Fluency, SWRF = Silent Word Reading Fluency, ORF = Oral Reading Fluency, LNF = Letter Naming Fluency, LSF = Letter–Sound Fluency, NWF = Nonsense Word Fluency

legislation (i.e., NCLB, IDEA) encouraging the use of *multitiered* models of instruction and assessment to ensure that all students receive the instruction they need (President's Commission on Special Education, 2002). Multitiered models appear necessary because some children, including children with speech or language impairments and children at risk for reading disabilities, will need more intensive instruction than is delivered in general education classrooms (Fuchs & Fuchs, 1998; Fuchs, Fuchs, McMaster, & Al Otaiba, 2003; Torgesen, 2002b; Vellutino et al., 1996). Multitiered models are also preferable to traditional service delivery because intervention is provided sooner (Vaughn & Linan-Thompson, 2003). In the past, special services were not available for many children until they fell far behind their expected reading achievement in third or fourth grade (President's Commission on Special Education, 2002).

The foundation of a multitiered approach, or Tier 1, calls for the classroom teacher to faithfully implement explicit and systematic *classroom* instruction with the expectation that the teacher will accelerate most children's learning. At this level, it is expected that teachers ensure each child is given a combination of whole-class and small-group instruction on tasks that are at the appropriate level for his or her literacy development until they understand and master early word-reading skills (Ehri, 2002; Snider, 1995). To ensure that such instruction is benefiting most children and to identify, or screen for, children who are not mastering skills taught, progress on essential word-reading skills is monitored in all students.

For small numbers of students who do not respond well to Tier 1 instruction, subsequent supplemental tiers of *intervention* that increase in intensity are provided. Intervention may involve more practice on certain instructional components, may be delivered more frequently and with greater duration, and ideally will be provided by a more expert teacher or clinician. Because of its comparative complexity and intensity, intervention may eventually be conducted by someone other than the classroom teacher who works with small student groups or individual tutorials. Although there are many variations to the number of tiers within RTI models, students who do not respond eventually undergo formal identification and provision of special education services and appropriate accommodation. Before we discuss issues for future research and development, we address four relevant questions: First, what do we know about effective code-focused classroom instruction? Second, what do we know about Tier 1 instructional strategies that maximize reading outcomes? Third, what do we know about training code-focused skills through supplemental interventions that are powerful enough to improve reading in children with the most severe reading problems? Finally, what do we know about poor responders?

What Do We Know About Effective Code-Focused Classroom Instruction?

It is possible to combine what is known about reading growth with knowledge of the instructional factors that support reading growth and that can prevent RD for most children. In general, instruction to stimulate phonological awareness should begin by providing exposure to rhyming songs, books, and activities for children in preschool and the early part of kindergarten. Once children begin to understand the concept of rhyme (as shown by their ability to decided whether words rhyme or to generate rhyming words), they can begin to do a variety of sound comparison activities involving the first, last, and middle sounds of words. Tasks that require children to manipulate, segment, or blend individual phonemes would come next and are most appropriate for use immediately prior to or in conjunction with instruction in sound–letter correspondences and phonemic reading and writing. Table 5.3 provides some examples of phonological awareness activities along a continuum of difficulty.

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TABLE 5.3

Activit

I Spy

What starts with my sound?

Guess my word/ I'm thinking of

TABLE 5.3 Phonological Awareness Activities along a Continuum of Difficulty

Activity	Objective	
I Spy	Students will learn to identify rhyming words	Place some familiar objects or pictures that rhyme near the small group of children (e.g., "snake," "rake," "lake") *Model*: "I spy with my little eye, something that rhymes with snake. It's a lake." *Guided practice*: "Your turn. See if you can guess what I see. I spy with my little eye something else that rhymes with snake." *Extra support:* If child struggles, provide a forced choice such as, "Is it a pen or a rake?" *Enrichment/extension*: "Can you think of something else that rhymes with snake?" Read a book that has lots of rhyming words and have children identify the rhymes.
What starts with my sound?	Students will learn to isolate initial sounds	Place some common objects or pictures that begin with two easily distinguishable letters near the small group of children (e.g., "mom," "mat," "monster," "car," "can," "coat"). *Model*: "I can match these pictures with their starting sound. This letter says /m/ like moon. So I am going to put all the pictures that start with the /mmm/ sound with the letter." *Guided practice*: "Your turn to match the pictures with their starting sound. Say /mmm/ with me. Can you find something that starts with /mmm/?" *Extra support*: Give a forced choice, emphasizing the first sound: "Is it 'mmmmom' or 'car'?" This may be easier using continuous sounds like /mmm/ rather than stop sounds. *Enrichment/extension:* "Can you think of something else that starts with /mmm/?" Read a book that emphasizes alliteration such as *Fox in Socks* by Dr. Seuss (1965).
Guess my word/ I'm thinking of	Blending and segmenting	Place some objects or pictures that begin with two easily distinguishable sounds near the small group of children (e.g., "map," "mouse," "sock"). *Model*: "I am going to say these words in a funny slow way. See if you can guess my picture, 'mmaap.' " *Guided practice*: "Your turn to match the pictures with their starting sound. Say /mmm/ with me. Can you find something that starts with /mmm/?" *Extra support*: "Is it mouse or sock?" *Enrichment/extension:* "Can you think of something else that starts with /mmm/?"

(*continued*)

TABLE 5.3 *(continued)*

Activity	Objective	
Sound boxes/ Word building	Blending and segmenting	Place some objects or pictures that have two or three phonemes and that begin with two easily distinguishable letters near the small group of children (e.g., "bee," "bus," "rat," "rock"). *Model*: "Today we are going to build some words with these blocks. First, I'll make 'bee.' " Move a marker as you say both sounds in /b/ /e/. "There are two sounds in 'bee.' " *Guided practice*: "Your turn to build 'be' with the blocks. Now let's try to build 'bus.' " *Extra support*: "Let's build it together." *Enrichment/extension:* "Can you build 'rock' all by yourself? What word has more sounds, bee or rock?" Include some decodable words.
Stand up when you hear your silly-sound-name	Manipulation	A good transition activity. *Model: "*Today I am going to call you to line up in a silly way. I am going to pretend everyone's name starts with a /mmm/ like Mary's. Mary, you come up and be the leader, because we are using your letter today!" *Guided practice:* Looking directly at her, ask Alexis, "Malexis, will you line up?" *Extra support*: And take his hand, and say, "Monathon, will you line up?" *Enrichment/extension*: "If your silly-sound-name is Marlos, line up."
Read-aloud books		Choose a predictable story with rhyming text (see Yopp, 1995, for an annotated bibliography of read-aloud books for developing phonemic awareness)

Similarly, instruction in word recognition should explicitly follow a scope and sequence that parallels phonological awareness instruction, beginning by teaching high utility, consonant letter–sound correspondences. Table 5.4 describes some examples of instructional activities that are useful for teaching word-reading skills systematically. Early on, preschool and kindergarten teachers may help children become aware of the spelling of their own names (Ehri, 2002). Further, to maximize children's attention to print and to letter–sound associations, research has shown teachers should make use of certain genres of books—alphabet books and print-rich storybooks (i.e., storybooks featuring interesting print features, like speech bubbles and font changes; see Smolkin, Conlon, & Yaden, 1988)—because these types of books allow more authentic and explicit opportunities to highlight print. For instance, Justice and her colleagues (2005) reported more than twice as many visual fixations on print for 3- to 5-year-olds in print-rich than typical picture-rich story books. Nevertheless, Justice's research highlights the need for teachers to reference the print because only about 5 to 7 percent of the time do children pay attention to print rather than pictures (Justice, Pullen, & Pence, 2008).

TABLE 5.4 Instructional Activities Useful for Teaching Word-Reading Skills

Phase	Activity
Letter–Sound Correspondence	T-**Each letter stands for a sound. When people read, they use letter sounds to help them figure out words. Let's learn the sound for the letter *m*.** (Hold up a card with the letter *m* written on it. Point to the letter *m*.) **This letter's sound is /mmm/. What sound?** S-/mmm/ T-(Point to the letter *m* again). **What sound?** S-/mmm/ T-**Let's practice the letter sounds we have learned so far.** (Teacher holds letter cards that contain letters in which the students have already been taught their sounds. She points to each letter and asks, "What sound?" Immediate corrective feedback is offered.)
Decoding	Once students have learned a few useful letter–sound correspondences (e.g., /m/, /t/, /s/, /a/) the decoding process is taught explicitly: T-(Writes the letter *m* on the board) **What's the sound**? S-/m/ T-(Writes the letter *a* next to the *m*) **What's the sound?** S-/a/ T-(Writes the letter *t* next to the *a*) **What's the sound?** S-/t/ T- **Blend it.** (Sweeping hand under the word) S-mat T- **Sound out the word.** (Sweeping hand under each letter) S-/m//a//t/ T- **Blend it**. (Sweeping hand under the word) S-mat This instructional routine is implemented daily so students receive ample practice with the decoding process. Words are made up of previously learned letter sounds. After students have had practice with this process, the same words are organized in a list and students practice reading them fluently. These same words are incorporated in sentences and stories so students can practice and experience success at reading connected text.
Spelling	Once students know letter sounds (/m/, /t/, /s/, /a/), spelling activities can be implemented. T-**Spell the word *mat*. Write each letter's sound as you say the sound to yourself.** S-(Students write the word *mat*) T-(Models spelling the word *mat* on the board as she says each sound. Students check their spelling. Teacher asks a student to use *mat* in a sentence.)

(*continued*)

TABLE 5.4 (*continued*)

Phase	Activity
Advanced Decoding	When students use advanced decoding, they recognize chunks of words, also referred to as phonograms (e.g., *-an*, *-at*). It is important to note that beginning reading instruction should not begin with advanced decoding instruction. This is due to the fact that beginning readers who rely mostly on recognizing chunks of words to determine pronunciation are less skilled at word identification than beginning readers who analyze words fully, phoneme by phoneme. Relying on recognizing chunks of words, or phonograms, is less efficient and less generalizable than phonemic decoding. Therefore, it is important to begin reading instruction with decoding sound by sound (as described earlier). Once students are successful at decoding words by individual phonemes, advanced decoding can be introduced. When advanced decoding is taught, it is important to teach phonograms made up the letter sounds already learned by the students. For example, if the /a/ and /n/ are already known letter sounds, then the phonogram */an/* would be a good choice to teach. The instructional routine for advanced decoding is similar to the instructional routine for decoding: T-(Writes the letters *an* on the board and points to one at a time asking for each sound) S-/a/ /n/ T-**Blend it.** (sweeping hand under the chunk). S-an T-Tell students this is a word family, and it will help us read other words. T-(Writes the letter *f* in front of *an* and points to the *f*) **What's the sound**? S-/f/ T-(Sweeps hand under word) **Blend it.** S - fan T-(Writes the letter *m* in front of *an* and points to the *m*) **What's the sound**? S-/m/ T-(Sweeps hand under word) **Blend it.** S – man T-(Writes the letter *c* in front of *an* and points to the *c*) **What's the sound**? S-/k/ T-(Sweeps hand under word) **Blend it.** S - can

TABLE 5.4 (*continued*)

Phase	Activity
Sight Words—Fluency	*Teaching sight words:* There are two important ways to explicitly teach sight words. The first method involves selecting words from lists of high-frequency words or from selections that will soon be read and providing directed practice for children in reading these words. For high-frequency words, teachers typically put the words on cards, and then drill students until they are able to pronounce the words in less than one second. Sometimes, children are encouraged to "sound out" the words the first time they see them on the cards, and then, for irregular words, the teacher explains the parts of the words that "don't play fair." This procedure encourages the students to notice all the letters in a word's spelling. The second way to directly build fluency is to provide practice with the repeated reading of phrases or short paragraphs containing a few (not too many) words the student needs to learn. Typically, the teacher asks the student to reread about three times, and sometimes a stopwatch is used to record the improved reading time on each subsequent reading of the text. Material that is used to practice fluency using repeated reading should be read initially with at least 95 percent accuracy.
Analogy	Word walls are frequently used in classrooms. This technique can help most children learn to read and write the words posted on the walls when certain conditions are in place: the words are used often in reading and writing, words are organized or grouped according to a common letter pattern, meanings of words are discussed, and students have daily practice finding, writing, and chanting the words. To help students learn to read by analogy, teachers could group words by common spelling patterns and provide students ample practice reading and writing these words (e.g., *sack, lack, back, tack, slack, crack; night, bright, light, flight*). An activity could include students sorting word cards under the proper rime. For example, *sack, lack, tack, crack* would be sorted under the rime *–ack*. *Night, bright, flight* would be categorized under the rime *–ight.*
Context	When teaching students to use context, the preferred strategy is to encourage students to first analyze unknown words phonemically, and then guess a word that makes sense in the context of the passage and that matches the sounds identified in the unknown word. So, for example, if a child encountered the sentence, *The boy _____ his dog in the woods,* with the blank representing an unknown word, it is difficult to guess from context alone the right word to fill in the blank. However, if the child was able to do even a little phonemic analysis first, such as sounding out the first sound (ch) in the word, the range of words that fit the context is dramatically narrowed. As children become able to identify more of the phonemes in words, their choices become even more constrained by their knowledge of the sounds that must be present in whatever word they guess, and they become more accurate readers.

As children learn about letter–sound correspondences and can recognize their own name, teachers introduce frequent initial and ending sounds (e.g., m, s, t, n), followed by short vowels (e.g., a), followed by a blending routine (/m/ /a/ /t/ is "mat"). This careful instructional sequence provides children opportunities to begin to read words and simple sentences right away. Next, consonant digraphs and long vowels should be taught, followed by vowel digraphs and variant vowel digraphs and diphthongs. It is important to note that even when letter sounds are taught in isolation, it is essential to quickly offer opportunities for students to practice reading words using those letter sounds. Instruction in how to read irregular words is also important. Oftentimes, teachers use the terms *sight words, high-frequency words*, and *irregular words* interchangeably. However, this is not accurate. A *sight word* is any word that a student can read from memory. That is, a student has had sufficient practice and exposure to a word such that he or she has committed it to memorize and can read it automatically (Ehri, 2002). *Regular words* are those words that follow the most common letter–sound patterns and are easily decoded. *Irregular words* contain spelling patterns that "do not follow the rules" or that do not follow the most common letter–sound patterns. It is important to note that most letters in irregular words conform to common letter–sound conventions (e.g., all but the *s* in *island*, the *w* in *sword*, the *t* in *listen*). *High-frequency* words include a small number of words that appear frequently in print. High-frequency words can be regular (e.g., *that, with, and*) or irregular (e.g., *some, was, said*; Honig, Diamond, & Gutlohn, 2000).

Next, teachers can instruct children about syllable types and how to use morphemic analysis to help students to read multisyllabic words and become aware of the chunks of meaning within larger words. Other, more sophisticated, strategies include reading words by analogy and using context. When students are taught to read words by analogy, for example, it is imperative that the analogous word is stored in memory as a sight word. That is, when using the familiar word *moon* to read the unfamiliar word *spoon*, it is important that the students have had sufficient practice reading the word *moon* such that it is a sight word for them. Students need to be taught the strategy of looking for familiar words when they encounter new words (Gaskins, Ehri, Cress, O'Hara, & Donnelly, 1997).

Furthermore, children can be explicitly taught to use context as a clue in identifying unknown words. However, we should never encourage students to use context alone to guess at the identity of unknown words because normal text is not sufficiently redundant to make context by itself a reliable clue to the identity of specific words. Some books for beginning readers are written using highly predictable text, but if a child learns to rely solely on context to identify new words, he or she will not be well prepared when asked to read more natural text in which context does not constrain word choice to the same extent. Finally, opportunities for students to read aloud with feedback from a highly qualified teacher or well-trained tutor help students to become proficient readers.

What Do We Know About Tier 1 Instructional Strategies That Maximize Reading Outcomes?

First, we know that the effects of preventative early literacy overall, and of phonological awareness and word recognition training more specifically, appear strong in preschool and kindergarten before children have begun to read (Bus & Van Ijzendoorn, 1999; Lonigan et al., 2008; NRP, 2000). It also makes intuitive sense that it would be easier to prevent than to remediate reading difficulties. Within preschool and kindergarten, most children benefit from small-group instruction that is relatively brief (i.e., 15 minutes daily) and that includes engaging gamelike activities.

Second, we know that methods that integrate instruction in alphabetic knowledge or phonics to directly link newly acquired phonemic awareness to reading and spelling are more effective than those that do not (Bus & Van Ijzendoorn, 1999; Ehri et al., 2001; Lonigan et al., 2008; NRP, 2000). Thus, although most instructional programs in phonemic awareness begin with oral language activities, the most effective programs conclude by leading children to apply their newly developed ability to think about the phonemic segments in words to reading and spelling activities. The importance of the progression from oral to written language activities was illustrated in the first major demonstration of the effectiveness of training in phonemic awareness reported by Bradley and Bryant (1985). In this study, phonemic awareness was stimulated by using activities that required children to categorize words on the basis of similarities in their beginning, middle, and ending sounds (sound comparison tasks). However, in one of the conditions, this training was supplemented by work with individual plastic letters to illustrate the way new words could be made by changing only one letter (or sound) in a word. Children in this latter condition showed the largest benefit from the phonemic awareness training program. Although training in phonemic awareness, by itself, can produce significant improvement in subsequent reading growth (Lundberg, Frost, & Peterson, 1988), programs that directly illustrate the relevance of the training to reading and spelling activities consistently produce the largest gains in reading (Blachman, Ball, Black, & Tangel, 1994; Byrne & Fielding-Barnsley, 1995; Cunningham, 1990; Fuchs, Fuchs, Thompson, et al., 2001; Hatcher & Hulme, 1999).

It is recommended, therefore, that practitioners combine training in phonological awareness with instruction in how the alphabet works. This integration of orally based instruction in phonological awareness with activities involving print does not mean that training in phonological awareness is useful only if it precedes systematic and complete "phonics" oriented reading instruction. These activities should be included simply to help children learn to apply their newly acquired phonological awareness to reading and spelling tasks. The print-based activities that should accompany instruction in phonological awareness are necessarily very simple. For example, children who have been taught a few letter sounds and achieved a beginning level of phonemic awareness should be able to identify the first letter of a word when they hear it pronounced. They might also be led to substitute different letters at the beginning or end of a word like *cat* to make different words. They could also be asked to pronounce the "sounds" of the letters *c - a - t* and then blend them together to form a word. If children have learned to blend orally presented sounds together, they can be led to perform the same process when letters represent phonemes.

Third, researchers have shown that classroom teachers who use an explicit core reading instructional program with a strong and systematic emphasis on code-focused skills are more likely to maximize reading outcomes for most children than those teachers who use less explicit and less systematic programs. Foorman, Francis, Fletcher, Schatschneider, and Mehta (1998) evaluated the effectiveness of three types of core reading programs in nearly 70 classrooms. On average, the first and second graders taught with core reading programs that emphasized direct instruction and that included controlled vocabulary text showed more improvement in reading than children taught with a core program that was less direct (i.e., phonics was taught through trade books less explicitly and systematically) or children who were taught with a core program that was implicit. Although children's initial level of phonemic awareness moderated their rate of reading development, a majority of children responded well who were taught with the direct instruction core reading program.

Subsequent to the NRP report in 2000, most currently available core reading programs that claim to be research based also contain materials and procedures to provide explicit and systematic instruction in phonemic awareness and word recognition in kindergarten and first grade

(Al Otaiba, Kosanovich-Grek, Torgesen, Hassler, & Wahl, 2005). More evidence that this type of core reading program maximizes student outcomes comes from another large-scale kindergarten study, also conducted by Foorman and colleagues (Foorman et al., 2003). This multiyear study involved three cohorts and over 4,800 students who attended struggling schools whose teachers were provided professional development. Foorman and colleagues reported that children whose teachers used systematic and explicit reading curricula that explicitly linked phonemic awareness and the alphabetic principle in kindergarten achieved reading performance that was at the national average.

A fourth way to maximize the impact of Tier 1 instruction is to focus on a limited set of skills such as blending and segmenting and to teach these skills explicitly and systematically (Ehri et al., 2001). As we previously discussed, explicit instruction includes modeling, guided practice, and immediate corrective feedback, and systematic instruction is based on a scope and sequence that moves from easier to more difficult tasks. A number of factors influence the difficulty of blending and segmentation tasks, and there is not one particular sequence to which every teacher must adhere. Roughly, though, researchers (Chard & Dickson, 1999; Lonigan et al., 2008; Snider, 1995) have proposed that phonological instruction should begin with larger linguistic units and proceed to individual phonemes, as it is easier to blend and segment syllables and onset-rime units than individual phonemes. At the phonemic level, instruction should begin with simple, two- and three-phoneme words such as "no, sun, man," which are easier to blend or segment than words with initial blends such as "stop" or "flag." Similarly, Snider (1995) suggested that continuous sounds, which may be sung or stretched without distorting their sounds (e.g., m, s, and vowels) are easier to "stretch out" than stop sounds (e.g., b, t) and so should be used for initial instruction. Imagine how much easier it would be to teach a child to blend "mmmaaannn" than /b/ /a/ /t/, which a child might mispronounce as "buh" "a" "tuh."

The final way to maximize the effectiveness of code-focused classroom instruction is to ensure teachers have the requisite knowledge to use data to inform instruction. At least one study conducted by Piasta and colleagues (2009) showed that when classroom teachers had very little knowledge about how to teach code-focused skills, their students who received more code-focused instruction actually scored lower than children with less instruction. Thus, even with a good core reading program, teacher knowledge matters. Fortunately, we also know that professional development that helps teachers use child data to differentiate instruction is associated with stronger Tier 1 outcomes. In other words, if Joey does not know how to segment the initial sound of words and knows very few letter sounds, he would need different instructional activities and support than Suzy, who is able to blend individual phonemes to name a CVC word such as "cat." There is a growing body of evidence that teachers who learn how to group their students homogeneously for instruction and who individualize or differentiate what they do in small-group instruction have students with significantly greater reading outcomes (Al Otaiba et al., in press; Connor, Morrison, Fishman, Schatschneider, & Underwood, 2007).

What Do We Know About Training Code-Focused Skills Through Supplemental Interventions?

Experienced reading clinicians have favored phonemically based approaches to instruction for children with RD from very early in the history of the field (Clark & Uhry, 1995). However, research and case study information tended to emphasize how extremely difficult it is to teach these children generalized phonemic reading skills (Lovett, Warren-Chaplin, Ransby, & Borden, 1990; Lyon, 1985; Snowling & Hulme, 1989). In contrast to these earlier results, later work by

Lovett and her associates (Lovett et al., 2000) and by others (Foorman et al., 1998; Torgesen et al., 1999; Torgesen et al., 2001; Vellutino et al., 1996; Wise & Olsen, 1995) has reported significant success in building generalized phonemic reading skills in children with phonologically based RD. In fact, in a review of outcomes from intervention research with children identified because of difficulties acquiring accurate and fluent word-level reading skills, Torgesen (in press) concluded that intensive and skillfully delivered instructional interventions produced the largest gains in phonemic decoding ability, followed by gains in text reading accuracy, reading comprehension, and reading fluency.

Al Otaiba and her colleagues (Al Otaiba, Puranik, Zilkowksi, & Curran, 2009) synthesized the findings of phonological awareness intervention research studies delivered to young children with SI or LI to describe how effective various training approaches have been in improving their phonological and, when possible, early reading skills. Generally, students with SI were easier to remediate; the majority of these children made short-term improvements in phonological skills after receiving early intervention that combined speech articulation with phonological awareness training. However, there were few efforts to document their subsequent reading development. One study incorporated multiple treatment components (including rhyme, blending, and segmenting) and reported positive short- and longer-term effects (Warrick, Rubin, & Rowe-Walsh, 1993). By first grade, children who received intervention in kindergarten had caught up to same-age typically developing peers on all measures of phonological awareness, suggesting that explicit segmentation intervention in analyzing words to the level of the individual phonemes, as recommended by the NRP (2000) for typically developing children, may also support reading development for students with LI.

Both of the strongest research studies involving students with LI (Warrick et al., 1993) and SI (Moriarty & Gillon, 2006) included phonological awareness skills that are consistent with those taught in current core beginning reading programs and preschool curricula. However, for both students with LI and SI, there were large individual differences in response to interventions. It is important to note that the collaborative model in which children were seen only once a month was ineffective. An implication of Al Otaiba et al.'s review (2009) is that children with LI and SI likely will need ongoing intervention that combines speech production and phonological training provided by speech-language pathologists that is carefully aligned with the early phonological awareness, small-group instruction provided by the classroom teacher.

The most appropriate conclusion from instructional research with children with LI or RD is that it is clearly possible to have a substantial impact on the growth of their phonemic decoding skills if the proper instructional conditions are in place. These conditions appear to involve instruction that is more *explicit*, more *intensive*, and more *supportive* than what is usually offered in most public and private school settings (Torgesen, Rashotte, Alexander, Alexander, & MacPhee, 2003).

Instruction becomes more *explicit* when the teacher or clinician makes fewer assumptions about preexisting skills or children's abilities to make inferences about sound–letter regularities on their own. As Gaskins et al. (1997) have 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). Based on information already considered in this chapter, one way to make instruction in word-learning strategies more explicit is to provide direct instruction to increase children's level of phonemic awareness. Although some form of instruction in phonemic awareness characterizes all successful programs, there has been substantial variability in the way this instruction is provided. Another way to make instruction for children with RD more *explicit* is to

provide direct instruction in sound–letter correspondences and in strategies for using these correspondences to decode words while reading text. Explicit instruction and practice in these skills is characteristic of *all* programs that have produced substantial growth in phonemic decoding skills in children with RD. In a direct test of the utility of this type of instruction, Iverson and Tunmer (1993) added explicit training in phonemic decoding to the popular *Reading Recovery* (Clay, 1979) program, which has traditionally placed less emphasis on instruction and practice in these skills. This carefully controlled study showed that a small amount of explicit instruction in phonics increased the efficiency of the *Reading Recovery* program by approximately 37 percent.

Yet another way in which the explicitness of instruction and practice for children with RD must be increased is a careful and systematic focus on building reading fluency. Many children with RD may require more opportunities to correctly pronounce new words before they can add them to their sight vocabulary (Reitsma, 1990). Research has demonstrated that practice repeatedly reading either individual words or text can lead to improvements in reading fluency for children with reading difficulties (Levy, Abello, & Lysynchuk, 1997; Meyer & Felton, 1999). The primary value of both of these types of interventions is that they provide children opportunities to repeatedly read new words within a short enough interval of time that the children can "remember" how they pronounced the words previously and learn to rely on their emerging orthographic representation of the word to identify it in print. An interesting new development to aid the provision of explicit practice to develop fluency is the use of texts that have been specifically engineered for this purpose (Hiebert & Fisher, 2002). These texts provide ample repetition of high-utility, high-frequency words within a thematic structure to ensure that students receive many opportunities, within a single reading of the text, to pronounce important words multiple times.

In addition to being more *explicit*, effective reading instruction for children with RD must be more *intensive* than regular classroom instruction. Increased intensity involves more teacher–student instructional interactions, or reinforced learning trials, per unit of time. Intensity of instruction can be increased either by lengthening total instructional time (thus increasing the number of instructional interactions per day or week), or by reducing teacher–pupil ratios (thus increasing the number of instructional interactions per hour). The most powerful method of increasing instructional efficiency for children with RD may be to substantially reduce the teacher–pupil ratio for part of the day (Elbaum, Vaughn, Hughes, & Moody, 1999).

There are actually a variety of ways to accomplish this reduction in teacher–pupil ratio for children who are struggling to learn to read. For example, Greenwood (1996) has obtained increased amounts of student engagement and increased reading achievement for at-risk students through the use of the ClassWide Peer Tutoring model. Others who have used peers effectively to increase the number of instructional interactions per hour for struggling readers are Doug and Lynn Fuchs and their colleagues (Fuchs, Fuchs, Mathes, & Simmons, 1997), and Patricia Mathes and her colleagues (Mathes, Torgesen, & Allor, 2001). Keep in mind that a small proportion of young children may not respond to peer tutoring (e.g., Al Otaiba & Fuchs, 2006), so it is important to monitor their progress and consider alternative interventions. Another method for increasing the intensity of instruction for struggling readers is small-group instruction provided by the regular classroom teacher during part of the reading block. In addition to the regular classroom teacher, this small-group instruction can also be provided by carefully trained paraprofessionals (Torgesen, 2002a) or by specialists such as a special education teachers, Title I reading intervention teachers, or speech/language pathologists. One interesting finding that has emerged from meta-analyses of intervention studies is that one-to-one interventions in reading

have not consistently been shown to be more effective than small-group interventions (Elbaum et al., 1999; NRP, 2000; Wanzek & Vaughn, 2007).

A third way to make instruction more successful for children with RD involves the level of *support* provided within the instructional interactions. At least two kinds of special support are required. First, because acquiring word-level reading skills is more difficult for these children than others, they will require more *emotional* support in the form of encouragement, positive feedback, and enthusiasm from the teacher to maintain their motivation to learn. Second, instructional interactions must be more supportive in the sense that they involve carefully *scaffolded* interactions with the child. In her investigation of the characteristics of effective reading tutors, Juel (1996) identified the number of scaffolded interactions during each teaching session as one of the critical variables predicting differences in effectiveness across tutors. A scaffolded interaction is one in which the teacher enables the student to complete a task (e.g., read a word) by directing the student's attention to a key piece of information or breaking the task up into smaller, easier to manage ones. The goal of these interactions is to provide just enough support so the child can go through the processing steps necessary to find the right answer. In essence, the teacher leads the child to do all the thinking required to accomplish a task (decoding or spelling a word) that he or she could not do without teacher support. With enough practice, the child becomes able to go through the processing steps independently. Juel's finding about the importance of carefully scaffolded instructional interactions is consistent with the emphasis on these types of interactions in the teachers' manuals that accompany two instructional programs shown to be effective with children who have severe RD (Lindamood & Lindamood, 1998; Wilson, 1988).

Thanks to the hard work of researchers, a large array of programs and sets of materials have been developed specifically to help teachers provide effective instruction in phonemic awareness and word recognition for young children. Programs are available both to supplement the whole-class instruction provided by the teacher by providing more intensive small-group or individual intervention for students who are having difficulties learning to read (e.g., *Ladders to Literacy* by O'Connor, Notari-Syverson, & Vadasy, 2005; *Phonemic Awareness in Young Children: A Classroom Curriculum* by Adams, Foorman, Lundberg, & Beeler, 1997; *Earobics* by Cognitive Concepts, Inc., 1998; *Road to the Code* by Blachman, Ball, Black, & Tangel, 2000; *Phonological Awareness Training for Reading* by Torgesen & Bryant, 1993; *The Lindamood Phoneme Sequencing Program for Reading, Spelling, and Speech* by Lindamood & Lindamood, 1998; *Teacher-Directed Paths to Achieving Literacy Success* by Mathes, Allor, Torgesen, & Allen, 2001; and *Sound Partners,* by Vadasy et al., 2004).

Although a complete review of the efficacy of early code-focused interventions provided to students with RD is beyond the scope of this chapter; recently Wanzek and Vaughn (2007) completed a meta-analytic synthesis of this research published from 1995–2005. The extant research included 18 studies in which investigators had examined the impact of extensive interventions, operationalized as lasting over 100 hours and provided in small groups, on reading outcomes across the early grades (K–1). Specifically, Wanzek and Vaughn described some interesting findings with regard to intervention components that were associated with relatively higher effect sizes. Studies with the highest effects emphasized phonics instruction that incorporated either letter–sound identification with word blending or word patterns such as rimes. Some studies integrated encoding or spelling with phonics instruction. Wanzek and Vaughn found no clear relation between the effect size and duration of treatment, but as they suggested, the relationship may be confounded by the fact that children who continued to need more help were among those initially impaired. Similarly, due to the designs of the studies,

it was not possible for Wanzek and Vaughn to directly compare the efficacy of small-group to one-on-one interventions. It was encouraging that in 14 of the 18 studies, school personnel implemented interventions, but in each case, personnel were trained and supported by research staff.

One example of these programs is *Sound Partners,* which is a well-researched explicit code-focused (K–2nd grade) supplemental tutoring intervention program designed to be implemented by volunteers or paraeducators for 30 minutes, four times each week (e.g., Jenkins, Vadasy, Firebaugh, & Profliet, 2000; Vadasy, Jenkins, Antil, Wayne, & O'Connor, 1997; Vadasy, Jenkins, & Pool, 2000; Vadasy, Sanders, & Abbott, 2008; Vadasy, Sanders, & Peyton, 2006). Vadasy and colleagues developed 100 scripted lessons that provide a systematic and structured routine to train letter–sound correspondences, decoding words with familiar sounds or from common word families, practicing sight words, demonstrating fluency on decodable text, and monitoring comprehension.

A second example is *Proactive Reading* (now published by SRA as *Early Interventions in Reading*, Mathes & Torgesen, 2005). As noted by Wanzek and Vaughn (2007), Mathes and coinvestigators conducted the only study that documented whether Tier 1 was effective (Mathes et al., 2005) and was one of three investigations including students who had not responded to previous Tier 1 instruction (one involved *Sound Partners,* Vadasy et al., 2002; another was conducted by Vaughn, Linan-Thompson, & Hickman, 2003). In their large-scale experiment, Mathes and colleagues (2005) gave first-grade teachers feedback about student progress in oral reading fluency and provided professional development regarding linking assessment data to instruction. They randomly assigned poor readers to continue enhanced classroom instruction or to participate in one of two supplemental small-group interventions: *EIR* or *Responsive Reading Instruction* (Denton & Hocker, 2006). *EIR* is a supplemental explicit training program designed for struggling readers (1st–2nd grades). There are 120 scripted lesson plans that include about 7 to 10 short, interrelated activities and that provide opportunities for children to apply skills in context. Both supplemental interventions taught code-focused skills, but *Responsive Reading Instruction* was less directive and required teachers to respond to individual students' strengths and weaknesses as they were observed during the lesson. Both interventions were delivered daily to small groups (of three children) by well-trained certified teachers and lasted 40 minutes a day for 30 weeks. (However, *EIR*, as published, is intended to be used for 4 to 5 days per week for about 45 minutes per lesson and can also be implemented by certified teachers or by well-trained paraeducators.) On average, these initially poor readers were able to achieve grade-level reading at the end of the year. Not surprisingly, the two intervention groups outperformed the enhanced classroom group on outcomes of phonological awareness, word reading, and oral reading fluency. By the end of the study only a small proportion of students read below the 30th percentile on a standardized test of word reading. If the study findings were extrapolated to the larger population, we would expect only about 3 percent of students in the enhanced classroom condition, 0.2 percent in the *EIR* intervention, and 1.5 percent in the *Responsive Reading Instruction* intervention would read below average. It is noteworthy that both interventions, teamed with enhanced classroom instruction, resulted in significant increases in children reading at grade level.

The What Works Clearinghouse (WWC) has published reviews of many currently available programs. The WWC is part of the Institute for Education Sciences, and it provides ongoing reviews of programs. A tutorial about how the WWC works is available at http://ies.ed.gov/ncee/wwc/help/tutorials/tour.asp.

What Do We Know About Poor Responders?

Research has consistently shown that there is always a small proportion of children whose improvement is very small, in contrast to peers who show stronger growth trajectories. In the research literature, these children are referred to alternately as either "nonresponders" or "treatment resistors" (see, for example, Al Otaiba & Fuchs, 2002; Al Otaiba & Torgesen, 2007; Torgesen, 2000). Two relevant reviews of the extent literature on nonresponders found a fairly consistent relationship between low initial phonological awareness and treatment nonresponsiveness (see Al Otaiba & Fuchs, 2002 or Nelson, Benner, & Gonzalez, 2003 for a discussion of characteristics of nonresponders). Of course, growth in word recognition ability requires knowledge and skills other than phonemic awareness. Additional characteristics that are correlated with treatment unresponsiveness include slow performance on rapid naming tasks, attention and behavior problems, poor phonological memory, poor orthographic processing, and low IQ or low verbal ability (Al Otaiba & Fuchs, 2002; Nelson et al., 2003). Thus, roughly 3 percent to 5 percent of the general population of students will likely be poor responders to supplemental interventions (Wanzek & Vaughn, 2009), and there is very little evidence about how to help children catch up to the performance of their peers without RD, particularly in terms of fluency and comprehension.

Thus special educators and speech language pathologists will likely need to develop expertise on using data to screen children, to monitor their progress to gauge the success of interventions, to tailor intervention, and also to collaborate on Individualized Education Planning for students with RD. It is likely that the influence of phonemic reading skill on the growth of fluent word recognition processes will be affected by a number of other factors such as size of oral vocabulary, amount of reading practice and breadth of print exposure, and effective use of context (Cunningham & Stanovich, 1998). Weaknesses in phonemic decoding ability may be compensated for by strengths in one of these latter factors, whereas extra strength in phonemic reading ability may enable growth in orthographic skills, even in the presence of weakness in one of these other variables. It is also possible that many children with phonologically based reading disabilities may have additional weaknesses that interfere specifically with the formation of orthographic representations for words (Wolf & Bowers, 1999).

Some researchers have expressed concern for limitations of using phonological awareness measures for universal screening at the beginning of kindergarten because many measures designed to be used at that time may be characterized by floor effects (Catts, Petcher, Schatschneider, Bridges, & Mendoza, 2009). This is problematic because floor effects will make it more difficult to accurately predict which children truly need extra help and to distinguish these children from those who simply lack literacy experience at the beginning of kindergarten. Even in first grade, poor responders may pass through multiple tiers before they are eligible to receive special education (Fuchs, Compton, Fuchs, & Bouton, in press; Fuchs, Fuchs, & Strecker, 2010). These researchers suggest that dynamic assessment, or DA, could be used to distinguish children who are unable to perform a task such as phonemic segmentation or phonemic decoding independently but who could learn the task after a brief teaching cycle of assistance or scaffolding by a well-trained examiner (for a more thorough discussion of DA, see Grigorenko & Sternberg, 1998). Thus, Fuchs et al. proposed DA as "an index of a child's readiness to change and as such it represents a unique means of differentiating performance among children at the low end of the achievement continuum" (in press).

Some preliminary work with kindergartners by Bridges and Catts (in press) shows that a DA phonological protocol could reduce the rate of false positives (children really did not need

extra help to reach grade-level reading) associated with the DIBELS Initial Sound Fluency task by over a third. These authors were predicting outcomes on an end-of-year word-reading or word attack standardized assessment. At the same time they found that DA minimally increased false negatives (children who needed help but were not identified). Whereas these results suggest that the DA can improve the specificity as a secondary measure, Bridges and Catts (in press) cautioned that their DA measure alone showed relatively poor sensitivity among kindergarteners. Fuchs and colleagues (in press) examined whether DA could improve identification for first-grade poor responders beyond more traditional measures (IQ, vocabulary, phonological awareness, timed alphabetic skills) in predicting end-of-year decoding and comprehension. In a sample of over 300 first graders, they found that a DA decoding protocol did have construct validity relative to the traditional measures and that it predicted reading performance. However, the amount of unique variance was small (ranging from 1 percent on passage comprehension up to 2.3 percent on word attack). As researchers improve on these efforts to create more powerful DA methods, it is likely that the expertise of special educators and speech language pathologists may be needed if the DA protocols incorporate more intensive teaching trial and experimental teaching.

Finally, it seems clear that instructional methods must have a significant impact on the phonemic reading skills of these children if they are going to have a long-term effect on reading growth. This inference creates a dilemma of sorts for those who are interested in preventing or remediating reading disabilities. Instruction to build phonemic decoding skills, which are seen as essential in normal reading growth, is instruction directed toward the primary cognitive/linguistic *weakness* of most children with severe RD. There is a strong component of instructional theory in the area of learning disabilities (Hammill & Bartel, 1995) that emphasizes teaching to children's strengths rather than their weaknesses. Thus, we sometimes see recommendations to children with RD using "sight word," "visually based," or even other whole-language-like approaches that do not overly stress limited phonological abilities. Even though this may be an attractive instructional approach to many teachers, it is important to emphasize that we have converging evidence that teaching phonemic decoding skills is more effective than other methods of teaching students how to read (Lonigan et al., 2008; NRP, 2000).

ISSUES FOR FUTURE RESEARCH AND DEVELOPMENT

Although research over the past 40 years has made enormous progress in helping to develop appropriate diagnostic and instructional procedures for children who experience difficulties acquiring good word recognition skills, many important issues remain for further research and development. First, and foremost, is the need for stronger procedural guidelines for RTI, including improved screeners and a better understanding of how long students should stay in an intervention and how good versus poor response is best measured.

A second issue is the need for professional development for teachers, school psychologists, speech language pathologists, and special educators. All these individuals must understand how to use data to group children and to match their needs with interventions. Knowledge about how to link Tier 1 with supplemental interventions is also needed. Encouragingly, most of the instructional programs and materials currently available can be adapted for uses other than those for which they seem most clearly appropriate. That is, skillful teachers should be able to adapt "whole-class" materials to support instruction for small groups of at-risk children, and the more intensive material can also be adapted for whole-class instruction (Foorman & Torgesen, 2001).

A third issue is that special education is likely after RTI to have the most severe or most-resistant-to-treatment RD, but yet little is known about how effective interventions can be when delivered to students who have not been helped by Tier 1 and Tier 2. Only two studies to date shed light on this topic (Denton, Fletcher, Anthony, & Francis, 2006; O'Connor, 2000) and both suggest that we really don't have the answer of how to help all children achieve and stay on grade level. Findings from these two just-mentioned studies, and from another conducted by Linan-Thompson and colleagues (2003), suggest to us an analogy to the medical field. When doctors prescribe an antibiotic, if you don't take the whole dose, not only may you get sicker, but also the germs themselves become more difficult to fight on a local and global level. This is important because we still do not understand fully the amount and type of instruction and practice that will be required for *all* RD children to attain normal word-level reading ability. Even in studies that produce very large gains in phonetic reading ability (i.e., Torgesen et al., 2001), some children remain significantly impaired in this area at the conclusion of the study. Furthermore, even in a remedial effort that produced very large improvements in the accuracy of children's word recognition skills, the children, as a group, still remained very dysfluent readers when compared to average readers of their own age. Part of this problem with fluency may result from the nature of reading fluency itself (Torgesen et al., 2001), but part of it may also be amenable to better instructional practices in this area.

A fourth issue is that we need a better understanding of the range of individual differences in the level of word recognition ability and fluency required for good reading comprehension. We know that, in general, better phonemic reading ability and more fluent word recognition skills are associated with better reading comprehension (Share & Stanovich, 1995). We also know that better phonemic reading skills are reliably associated with more accurate and fluent word recognition ability (NRP, 2000). However, cases have been reported in which students seem able to develop good word recognition ability in the absence of strongly developed phonemic skills. In one particular case (Campbell & Butterworth, 1985), the student was highly motivated to learn to read, had substantially above-average general intellectual ability, and was particularly strong on measures of visual memory. If there prove to be certain limits on fluency of phonological processes in reading for many children, it will be very helpful to understand more fully what other routes to effective reading may be available.

A final issue arises from the movement toward school-based accountability for the reading achievement of all children in the United States. The provisions of the No Child Left Behind Act of 2002 required states to set reading standards by third grade to evaluate whether or not a child has attained adequate reading skills. Within each state, the effectiveness of both preventive and remedial programs in reading will ultimately be evaluated by determining the percentage of children who fail to meet standards for adequate reading ability by the end of third grade. Typically, the tests that states use to assess reading outcomes are measures of reading comprehension that are administered to classroom-sized groups. These tests usually include lengthy passages, and require both multiple choice and written answers to questions.

The new accountability standards require all students to be tested by the same measures. Thus, the effectiveness of instructional procedures for students with RD will ultimately be evaluated in terms of their ability to help these children respond adequately on complex, group-administered measures of silent reading comprehension. To date, none of the studies of intensive interventions for older students with word-level RD has included information about the success of students on these "high-stakes," state-administered reading achievement tests. Measures typically used in intervention research are administered one-to-one, involve shorter reading passages, and provide a number of supports not available during group-administered tests.

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