With the recent reauthorization of the Individuals With Disabilities Education Improvement Act (IDEA, 2004), states now have the option of discontinuing use of IQ-achievement discrepancy procedures as part of the learning disability (LD) identification process in favor of a Response to Intervention (RTI) approach. RTI is based on the premise that students are identified as LD when their response to an effective educational intervention is dramatically inferior to that of peers (e.g., D. Fuchs, Mock, Morgan, & Young, 2003; Vaughn & Fuchs, 2003). RTI approaches for identifying children with reading disabilities (RD) have advantages over traditional IQ-achievement discrepancy procedures, including earlier identification of RD to avoid a “wait-to-fail” model, a strong focus on providing effective instruction and improving student outcomes, and a decision-making process supported by continuous progress monitoring of skills closely aligned with desired instructional outcomes (see Vaughn & Fuchs).

RTI models for identifying RD rely on accurately identifying children who without Tier 2 tutoring would develop RD. Tier 2 is intended to prevent reading difficulty by delivering a more intensive (and presumably effective) intervention that accelerates reading development, and to assess the child’s responsiveness to instructional intensity from which the vast majority of children should profit. In the event the child responds, he is returned to classroom instruction and is deemed disability-free. Otherwise, it is assumed that the child has an intrinsic deficit, that is, a putative deficit or disability that prevents the child from benefiting from the instruction (Vaughn & Fuchs, 2003). Failure to respond appropriately to Tier 2 instruction signals a need for the child to move to a third and final RTI tier, synonymous with special education placement, after an abbreviated special education evaluation.

**RTI Models for RD Identification**

RTI models for identifying RD rely on accurately identifying children who without Tier 2 tutoring would develop RD. Tier 2 is intended to prevent reading difficulty by delivering a more intensive intervention that accelerates reading development, and to assess the child’s responsiveness to this instructional intensity. The success of RTI—in terms of both prevention and identification—hinges on using a diagnostic screening device to accurately determine a “risk pool” of children who require Tier 2 intervention.

By definition, a diagnostic screening measure is a brief assessment that provides predictive information about a
child's development in a specific academic area. Its purpose is to identify any children who are at risk so that these children can receive extra support through Tier 2 intervention services. This diagnostic screening represents a form of high-stakes decision making—IDEA requires that states identify, locate, and evaluate all children with disabilities (from birth to age 21) who are in need of early intervention or special education services. Given this requirement, RTI procedures for determining RD risk must yield a high percentage of "true positives" (approaching 100%), while at the same time identifying a manageable risk pool by limiting the number of children falsely identified as at risk for RD.

How can practitioners improve their ability to systematically identify children truly in need of Tier 2 intervention, within an RTI model of identification and prevention? The RTI process includes making diagnostic decisions, adapting screening measures as a function of reading development, and continually improving the accuracy of screening decisions. Our recommendations include diversifying screening information to include family risk factors, focusing on first-grade children, and conducting short-term progress monitoring to gauge response to the general education curriculum.

**Diagnostic Decision Making**

The majority of RTI models for preventing and identifying children with RD begin with a universal screening device. The school administers this screening measure to all children to identify an initial pool of children suspected of being at risk for developing RD. This risk pool can be further refined by administering additional tests to children whose scores do not clearly distinguish them as at risk for RD. Screening information must then be dichotomized into a yes-no decision of risk for each child screened. In making a diagnostic decision there are four possible outcomes, two that are correct and two that are incorrect:

- In one correct outcome, RD risk is present (or positive); this outcome is referred to as a "true positive." In the other correct outcome, RD risk is absent or negative; this outcome is designated a "true negative."
- Of the two incorrect outcomes, one is "false positive" and the other "false negative." False positives occur when children who eventually become good readers score below the cut score on the screening instrument and are falsely identified as at risk. False positives undermine the intent of RTI by increasing the number of children identified as at risk, and, as a result, stress school resources to provide intervention to an inflated percentage of the population (Fletcher et al., 2002; Jenkins & O'Connor, 2002). False negatives refer to children who score above the cut score on a screening instrument but who later exhibit reading problems. As a result, at-risk children are deprived of the early intervention they require.

The majority of RTI models for preventing and identifying children with RD begin with a universal screening device.

Typically, schools make these risk decisions by selecting a critical cut-point of scores. A child scoring below the cut-point is considered at risk of developing RD. The cut-point can be adjusted up or down to produce more or fewer positive decisions. Adjusting the cut-point to be more lenient will increase the probability that a greater percentage of true positives will be identified as at risk for RD. Unfortunately, more lenient cut-points also result in a greater number of false positives. Alternatively, if the cut-point is made stricter to decrease the probability of false positives, then the number of true positives will correspondingly go down. When setting cut-points, schools need to establish a balance between true positives and false positives. This balance should be determined by the negative ramifications of misdiagnosing true positives as not at risk for RD versus the cost of providing Tier 2 intervention to children who are false positives and would develop normally in reading without the intervention.

The vast majority of prediction studies have focused on identifying children at risk of RD prior to the onset of formal reading instruction. Early identification of a risk pool of children facilitates their participation in second-tier intervention before the onset of significant reading problems, and increases the possibility that they will establish and maintain normal levels of growth in critical early reading skills. However, predicting which children are at risk for developing RD based on measures of early language ability and print knowledge has proven problematic. Many kindergarten studies using measures of phonological processing, alphabetic knowledge, general language ability, and print concepts overpredicted risk status with estimates of false positives ranging from 20% to 60% (see Jenkins & O'Connor, 2002; Torgesen, 2002). At the same time, rates of false negatives also have been high, ranging from 10% to 50% (Torgesen). Thus, there is considerable need to improve our ability to identify initial risk within an RTI approach to preventing and identifying RD.

**Screening With an Eye on Reading Development**

The majority of early reading screeners focus on language-based tasks that are pivotal to the proper development of two broad areas: word reading and language comprehension (Gough & Tunmer, 1986). These two areas interact during reading, but they can also function independently and compete with each other for resources. Jenkins and O'Connor (2002) argued that specific traits that forecast later reading...
success may vary according to children’s reading development, suggesting that the measures included on a screening battery should change as a function of grade level. During early reading development, as children learn to “crack the code,” the processes that support word reading ability account for the majority of performance variability on reading tasks. As children become more fluent in recognizing words, the relative importance of word reading in accounting for reading skill variation diminishes and language comprehension skill and background knowledge account for the lion’s share of individual differences in reading skill. Although word reading and comprehension skill share many important underlying processes, there are processes unique to each skill. In assessments intended to identify children at risk for future reading problems, it is essential to include predictors sensitive to future word reading and comprehension skills in the screening battery.

**Components of Word Reading**

Research indicates that phonological awareness skills and emergent print knowledge are the strongest early predictors of word reading development (e.g., Adams, 1990; Scarborough, 1998). Phonological awareness is the explicit knowledge of, and sensitivity to, speech sound segments used in a language. Phonological awareness skills facilitate the acquisition of spelling-to-sound translation routines that form the basis of early decoding skill development, and therefore are strongly associated with the development of early word reading skills. Phonological awareness has typically been assessed using a variety of tasks such as rhyming, alliteration, blending of syllables, blending of speech sounds, segmenting of syllables, segmenting of speech sounds, and finally manipulation of syllables and of speech sounds. When choosing among so many different phonological awareness tasks, it is important to make sure that the task used on a screening measure is age appropriate. Schatschneider, Francis, Foorman, Fletcher, and Mehta (1999) reported that blending tasks are more accurate determinants of phonological awareness skills in younger children, whereas deletion tasks are better predictors in older children.

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Measures of emerging print knowledge have been shown to be strong predictors of early word reading ability. One of the best print knowledge predictors of future word reading skill is letter-naming skill. Letter-name knowledge influences early word reading by promoting the emergence of a phonologically based strategy. This strategy bridges the gap from a strictly visual-cue strategy of word reading to a phonetic-cue strategy. In fact, letter knowledge is a good early predictor of children at risk for future word reading problems independent of phonological awareness skill. When measured in preschool through early first grade, letter knowledge is the single best predictor of subsequent word reading ability (Share, Jorm, Maclean, & Matthews, 2002). Treiman, Weatherston, and Berch (1994) found that children learned letters with the letter sound in their name faster than letters that did not have the letter sound in the name. (For example, children’s knowledge of letters such as v and k was better than h and w.) With the exception of children with persistent reading problems, who often experience lasting problems retaining short vowel sounds, the predictive utility of letter knowledge quickly diminishes as children learn to read.

In addition to phonological awareness skill and letter knowledge, the amount of time that a child is exposed to print is also important to reading development. As children interact with our writing system they are exposed to the various relationships that constitute our spelling system, and develop an understanding of the basic properties of our writing system. Children as early as first grade become sensitive to letter sequence constraints within the English spelling system (Treiman, 1993). For instance, when first-grade children are asked to choose which letter string (beff vs. ffeb) looks more like a word they consistently select beff over ffeb. Kindergarteners, however, do not consistently choose either pair above the level of chance, which means they likely guess; results suggest that performance on this task was related to word reading ability and not age (Compton, 2000). This mental collection of spelling patterns in a language—orthographic knowledge—is a necessary part of the ability to identify words rapidly in a text. However, this type of orthographic knowledge is used best as an early predictor to distinguish at-risk children from typically developing children. It loses its predictive power soon after children begin formal reading instruction.

There is some consensus that measures assessing phonological awareness, letter knowledge, print concepts, and orthographic knowledge are particularly sensitive in predicting early word reading problems (Torgesen, 2002). This set of measures is sufficient for kindergarten screening batteries. As children move into first grade, however, screening batteries should broaden to include additional measures assessing decoding and word identification skills. In the early elementary grades, measures of speeded word recognition emerge as one of the most reliable indicators of serious reading problems (Compton & Carlisle, 1994). Automatic and fluent word recognition is important to comprehension of a text. A child who struggles to recognize words automatically and fluently will have fewer resources available for building meaning out of the text.

**Components of Reading Comprehension**

Reading comprehension relies on more than just accurate and fluent word recognition. Ultimately, the efficiency with which a person builds a mental representation of a text’s meaning requires sufficient knowledge of and
ability to access vocabulary, grammar, and relevant background knowledge. It comes as no surprise, then, that measures of naming and processing speed, working memory, and oral language improve the prediction of reading comprehension performance. In particular, vocabulary, grammatical ability, and sentence repetition skill have a strong influence on later comprehension even after accounting for participants' age, gender, IQ, and socioeconomic standing.

Reading comprehension relies on more than just accurate and fluent word recognition.

Vocabulary is the main oral language contributor to word-level comprehension. It supports comprehension because children must be able to efficiently retrieve the meaning of the words in a text. Early vocabulary knowledge has consistently been shown to relate to later reading comprehension skill (see McCordle, Scarborough, & Catts, 2001). Vocabulary is clearly an important variable when predicting long-term reading development and reading disability and can be included in screening batteries as early as preschool (Scarborough, 1991).

At a sentence level, the grammatical structure of the language is equally important for construction of text meaning as vocabulary. Grammar comprises both syntax and morphology. Syntax is the rule system within a language that governs the way that words can be arranged within a clause and/or a sentence. Morphology is the smallest unit of meaning contained within a word and is often associated with root words and a combination of prefixes and suffixes to form words. Although less studied than phonological awareness or vocabulary, children's grammatical development in these two areas are good predictors of early reading achievement (Elbro & Scarborough, 2004). Grammatical abilities at the beginning of kindergarten are predictive of variance in reading at the end of first grade (Share, Jorm, Maclean, & Matthews, 1984). Both receptive grammar tasks (such as understanding the meaning of complex syntactic and morphological clauses) and expressive grammar tasks (mean length of utterance and sentence repetition tasks) measured in young children have been shown to account for variance in reading development (Scarborough, 1998).

Background knowledge is also very important to constructing the meaning of text, but difficult to measure. Individuals who are proficient at comprehending a written text make connections within and across texts. This integration of information requires background knowledge from a variety of sources on a range of topics. In addition, children need to have a schema for the various situations elaborated in a text. For example, a story about a library or a zoo requires some level of knowledge about those places. Children with more elaborate schemas will have a deeper level of comprehension than children with little to no background knowledge about those places. It is also important for children to realize when their schemas are incorrect or incomplete and to assimilate the new information.

In sum, a broad array of skills influences early reading development. Numerous groups have argued that multivariate approaches to screening increases accuracy beyond reliance on any single test or measure (Compton, Fuchs, Fuchs, & Bryant, 2006; Fletcher et al., 2002; Francis, Fletcher, Catts, & Tomblin, 2005; McCordle et al., 2001). Therefore, we recommend using screening batteries during the RTI process that include multiple tasks, rather than single-task instruments. Screening batteries should include a mixture of seven broad skills areas that relate to future reading skill: (a) phonological skills, (b) orthographic knowledge, (c) letter knowledge, (d) word reading ability, (e) vocabulary, (f) syntactic ability, and (g) background knowledge. Each of these skills is influenced by development; consequently, the items on the screener should vary as a function of age and reading development. A screener's effectiveness depends not only on how well it evaluates behaviors, but also on how well a measure is incorporated into the response to intervention process.

Improving the Accuracy of Screening Decisions

The accuracy of RD risk determination can be improved by diversifying the screening information to include family risk factors, focusing on first-grade children, and conducting short-term progress monitoring to gauge student response to the general education curriculum.

Diversifying Screening Information

Influential variables such as home environment and attention/behavior ratings tend to be left off of classroom-based screeners in favor of language-based tasks, with the assumption that these measures do not provide enough predictive value to warrant the extra time and resources required for their administration. To the contrary, studies have reported that phonological skills and home background factors are reliable predictors of early reading development (Vellutino et al., 1996).

Home background variables such as socioeconomic status (SES) and home literacy environment have predictive validity in identifying students who may fail to respond properly to intervention (Foorman et al., 1997). Snow, Barnes, Chandler, Goodman, and Hemphill (1991) noted that parent education and income was highly associated with
student achievement, more so than school or classroom factors. Parent income and education and student eligibility for free or reduced lunch are used most frequently in research to approximate student SES. Whether students qualify for free or reduced lunch tends to have a slightly higher relation to academic achievement than parent income, education, or occupation (Sirin, 2005). Sirin noted that although SES measures have proven to be reliable predictors across studies, measures of home background variables such as number of books in home, availability of computers, and other educational resources have also proven to be good predictors. The relation between these home background variables and achievement is strongest when the data are collected directly from parents, as opposed to secondary sources or students (Sirin); a parental survey is the most efficient means of gathering this information.

Many genetic factors also influence reading ability, and some of these factors interact with one another and with the environment. An estimated 30% to 70% of the variability in performance on measures of reading ability is genetically determined (Pennington & Olson, 2005). Pennington and Lefly (2001) reported that children without a reading disability diagnosis who had a parent or sibling with a diagnosed reading disability scored significantly lower than same age controls on measures of basic literacy skills such as reading and spelling. Therefore, family history of a reading problem can be a powerful tool to predict at-risk status, especially when used in conjunction with assessments of linguistic and cognitive skills.

A child’s attention and behavior in the classroom environment are also highly predictive of future language and literacy growth. Teacher ratings of student attention and behavior are highly effective predictors of future reading ability and growth (Stage, Abbott, Jenkins, & Berninger, 2003). Attention is important because of its relevance to attention deficit/hyperactivity disorder (ADHD), but even in children without an ADHD diagnosis, attention explains significant variance in word reading task after accounting for age. Given the high percentages of reported false negatives and false positives when using just language and print knowledge to predict risk, teacher ratings of student behavior and attention should also be included in the assessment battery.

**Focusing on First-Grade Children**

Research shows that accurate determination of the risk pool tends to increase as children experience more reading instruction, leading some to suggest that screening should occur at the beginning of first grade rather than in kindergarten (Fletcher et al., 2002). Increased power to classify correctly first-grade children as at risk for RD likely comes from three sources (Fletcher et al.):

- The collection of first-grade screening measures expands to include skills more closely aligned with reading (e.g., word identification and nonword decoding).
- Initial differences among kindergarten children due to variation in family literacy practices may diminish with formal kindergarten instruction.
- Measurement precision increases with age as intrachild instability decreases.

Despite the benefits of waiting another year, the accuracy of determining risk among first graders is still less than ideal. Simply waiting to screen until the beginning of first grade will likely be insufficient to improve the accuracy of RD risk determination to a level that is required within an RTI model. We recognize the tension created by waiting to make risk designations in first grade versus making decisions in kindergarten, allowing early preventive intervention. It therefore may make sense to identify and give support to those children most at risk for developing reading difficulties in kindergarten, and monitor the progress of the remaining risk pool into first grade.

**Children’s Response to General Education Curriculum**

A third approach for increasing the accuracy of RD risk designation is short-term progress monitoring (i.e., 5–10 weeks into first grade). Inadequate response to classroom instruction, as revealed by slope and/or level, should indicate risk for poor long-term outcome beyond that associated with initial screening performance (e.g., L. S. Fuchs & Fuchs, 1998). L. S. Fuchs, Fuchs, and Compton (2004) reported that growth (i.e., slope) on a measure of word identification fluency correlated strongly with end-of-first-grade word identification, passage reading fluency, and passage comprehension. In addition, Compton et al. (2006) demonstrated that using progress monitoring data from the beginning of first grade significantly improved the ability to predict who would develop RD at the end of second grade. Even so, very few studies have examined the utility of using short-term progress monitoring as a strategy for determining long-term outcome, or how progress monitoring might be used in combination with other screening measures to improve decision accuracy; this is an important avenue for future research.

**Final Thoughts**

Although an RTI approach has undeniable advantages over traditional IQ-achievement discrepancy procedures, its effectiveness is dependent on the accurate and efficient identification of a risk pool of children who enter Tier 2 intervention.
intervention by instituting early screening that focuses on the areas of phonological skills, orthographic knowledge, letter knowledge, word reading ability, vocabulary, syntactic ability, and background knowledge. Moreover, schools should take into account that academic performance is influenced significantly by home environment, and factor variables such as number of books in the home and the occurrence of reading disability in other family members into the risk calculation. Finally, progress monitoring techniques will help to accurately gauge children’s response to the general education curriculum.

**References**


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