Understanding Why a Child Is Struggling to Learn
The Role of Cognitive Processing Evaluation in Learning Disability Identification

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Learning disabilities (LDs) have long been presumed to be a neurological disorder resulting from a deficit in 1 or more cognitive processes. Although the emphasis on cognitive processing disorders has been included in the definition since the term was coined, and although it arguably represents the key distinguishing characteristic of LDs, it also has been the least well-operationalized component of the LD construct. In this article, first a brief synthesis of the emerging research examining the connection between cognitive processing deficits and academic achievement is presented. Next, the difficulty of operationalizing the implications from this body of research is described, as is the importance of developing an LD identification model that accurately reflects current understandings of the construct. Combined models for identification that rely on the use of both a student’s response to intervention and a comprehensive evaluation of cognitive processes are presented as best practice. Finally, implications for transitioning school-based LD identification models are discussed. Key words: cognitive processing, learning disability, response to intervention

Much heated debate surrounds questions about whether to use assessments of cognitive processes as part of the learning disabilities (LDs) identification process. Although it is standard training in clinical psychology and neuropsychology to identify the academic skills that are impaired in LDs, then to assess related processes that could explain the learning difficulty, and then to generate relevant treatment, most LDs are not identified within a clinical setting using clinical practices. Rather, LDs represent a fairly unique disorder in that they are more often than not identified within the context of the school setting.

As such, a number of researchers and practitioners advocate for identification methods that measure a student’s response to intervention (RTI) and that do not include measures of cognitive processes. RTI-only advocates argue that there is no evidence that the inclusion of cognitive processing assessments enhances the evaluation or leads to better or more effective treatment planning (Fletcher, 2010). Others advocate for a combined approach that includes RTI data to ensure that the learning difficulties are not the result of a lack of appropriate instruction, followed by a comprehensive evaluation of cognitive processing areas to determine the underlying cause of the LDs (Johnson, Humphrey, Mellard, Woods, & Swanson, 2010; Swanson, 2009). These proponents argue that there is sufficient research about the relationship of various processing areas to academic

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skills and that the assessment of these areas informs the individualized instruction that is the hallmark of special education.

This article argues in favor of the combined approach to LD identification. First, the limitations of RTI-only models are discussed. Next, a review of the current understanding of the interplay between cognitive processing areas and academic performance is provided. Then, case studies are presented as examples of how a combined approach might be applied. The article concludes with a discussion of the limitations of current understandings and the additional research still needed to inform practice.

LIMITATIONS OF RTI-ONLY APPROACHES TO LD IDENTIFICATION

Learning disabilities represent a complex disorder of the central nervous system that manifests in a variety of ways (Scanlon, 2013). Some students with LDs have difficulty learning to read or to perform in other basic academic areas; other students with LDs have difficulty with academic tasks not necessarily limited to a specific academic area but that impact across various areas such as managing large projects, developing and maintaining study habits, transferring strategies across content and settings, or navigating the social complexities of school. A neurologically based processing deficit, or “disorder in a basic psychological process” (Individuals with Disabilities Education Act [IDEA], 2004) is thought to underlie the child’s learning difficulties. This component of the LD definition—that LDs are a neurological disorder resulting from a deficit in one or more cognitive processes—has been included in the definition since the term was coined (Hallahan & Mercer, 2002). Although it represents the key distinguishing characteristic of LDs, it arguably has been the least well understood and at times, hotly debated, aspect of LDs. In an effort to bring clarity to this defining characteristic of LDs and to inform the diagnosis, identification, and subsequently, treatment of LDs, a substantial body of research has been devoted to identifying and understanding various cognitive processes and their relationship to academic achievement.

Recent years have witnessed an increasing number of studies examining the relationships between processing deficits and academic achievement, but the research base is nascent and difficult to synthesize in a manner that readily informs the practice of LD identification (Johnson et al., 2010). There are numerous reasons for this difficulty, perhaps best categorized as difficulty due to the (1) heterogeneous nature of LDs, (2) lack of consensus on the nature of the cognitive processes underlying the disorder, and (3) diversity of measurement tools and models in use across research studies (Scanlon, 2013). More generally, the approach to this research is quite varied.

Some researchers have focused on investigating the specificity hypothesis of LDs, which involves looking at the relationships of narrowly defined cognitive processes on specific academic achievement areas aligned with the federal definition of LDs (see, e.g., Berninger & O’Malley May, 2011; Compton, Fuchs, Fuchs, Lambert, & Hamlett, 2011; Frijters et al., 2011; Fuchs et al., 2008). The specificity hypothesis is that LDs are specific learning difficulties in which students experience impairments in certain areas of cognitive functioning that manifest in difficulty with certain academic areas (e.g., reading comprehension, basic reading skill, math problem solving, math computation, written expression) but not others and that are not explainable as general cognitive deficits (Compton et al., 2011; Fletcher, Lyon, Fuchs, & Barnes, 2007; Lyon, Fletcher, & Barnes, 2003).

Other researchers have focused on understanding a specific cognitive process, such as working memory, and then developing and testing models of how that process impacts academic achievement. Several studies, for example, have shown that working memory plays an important role in learning and accounts for significant variance in the comprehension performance of readers with LDs (Swanson, 1999; Swanson & Alexander,
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In studies examining the role of working memory, Swanson and Berninger (1995) and Swanson and Alexander (1997) found that a general working memory factor predicted reading comprehension, and phonological short-term memory was related to word reading deficiencies. Verbal working memory has been found across numerous studies also to be a strong predictor of math disability, but some studies combine verbal and numerical working memory tasks into a composite measure (e.g., Geary, Hoard, Nugent, & Byrd-Craven, 2008) and others use numerical measures of verbal working memory such as digit span backward (Swanson & Jerman, 2006). Numerical measures of verbal working memory have been found to correlate more with math difficulties than nonnumerical measures of working memory (Raghubar, Barnes, & Hecht, 2010), suggesting a potential confound of the sound–symbol representation of numbers. The research on understanding working memory and its role in the learning process is leading to the development of interventions designed to accommodate and remediate these deficits (Berninger, 2011).

Finally, other researchers look at more global processes, such as executive functioning, to understand how difficulties with various self-regulation tasks impact students with LDs (e.g., Meltzer, 2007; Pennington, 2009). Deficits in executive functioning are considered to lead to reading acquisition failure largely because executive functioning supports the development of strategies that allow students to be successful in performing and learning from complex tasks. Research on children with reading disabilities (RD) demonstrates particular difficulties in executive processing and the acquisition of self-regulatory strategies that are independent of their phonological processing difficulties (Swanson & Saez, 2003; Swanson & Siegel, 2001). These deficits of metacognitive function explain how children fail to transfer and generalize strategies during reading acquisition and reading remediation (Morris et al., 2012). They also can explain how students with executive function deficits struggle across the curriculum. Studies examining the impact of strategy instruction suggest that even when children with executive function deficits have received strategy instruction, they fail to transform simple strategies into more efficient forms, which limits the effect of these strategies on improving reading comprehension (Swanson, Hoskyn, & Lee, 1999). This suggests that scaffolding of these processes may be necessary to support students with executive function deficits.

Each of these lines of research is helping to inform the identification and treatment of LDs through increased understanding of cognitive processing deficits. For example, recent studies testing the specificity hypothesis are indicating an aptitude by treatment effect when interventions designed to address specific cognitive processes are employed (Fuchs, 2013).

In addition, working from Baddeley and Logie’s (1999) multicomponent working-memory model, Swanson and Siegel (2001) outlined a causal model of LDs, stating that limitations in working-memory capacity cause LDs through the disruption of cognitive operations that negatively impact performance in specific academic areas. Interventions developed to support both phonological reading interventions and the teaching of specific word identification strategies to compensate for working memory deficits have been demonstrated to lead to higher gains in reading performance and in the ability to maintain these gains after 1-year follow-up for children with severe RD (Morris et al., 2012). Finally, an increasing number of researchers are investigating interventions designed to support students with executive functioning deficits. Cognitive strategy instruction has been demonstrated to support student achievement in writing and school-based projects (Meltzer, Kurkul, Reddy, Greschler, & Gunning, 2013). These interventions could not have been developed without understanding the underlying causes of the students’ various LDs. Clearly, these diverse
The diversity of approaches, terminology, measures, and methods do make the immediate application of research findings challenging for policy makers and practitioners. CLINICAL VERSUS SCHOOL-BASED IDENTIFICATION MODELS

As the research base continues to develop, the current state of LD identification research leaves practitioners and policy makers in somewhat of a quandary. Learning disabilities represents a complex disorder in that, although categorized as a clinical condition called learning disorder in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM5; American Psychiatric Association, 2013), LD is most often identified within the public school system, which relies on the Individuals With Disabilities Education Act (IDEA, 2004) for definitions of LDs and guidelines about identification (Scanlon, 2013). Also in school settings, funding for specially designed instruction is driven by categorical diagnoses. Under the federal IDEA guidelines, a student may be considered to have an LD that impacts one or more of eight specific academic areas, which generally fall under three primary academic skill areas of reading, writing, and math, and also include listening and spoken language (Scanlon, 2013). Whereas our current clinical understanding of LDs allows for the identification of LDs that affect a wider range of skills that can impact academic performance and that typically include an evaluation of various cognitive processing skills, the focus in the IDEA on academic achievement in reading, writing, and math suggests that only if students experience difficulty in one or more of these three areas will they be identified as students with LDs (Scanlon, 2013).

These conflicting approaches to LD identification further exacerbate the confusion about what LDs are, how they are best identified, and subsequently, how they are most effectively treated. Given that most of the treatment of LDs is left to the public school system, the federal policy focus on academic achievement deficits, and the challenges in synthesizing and applying the current research examining the role of cognitive processing and academic achievement, it is understandable that there are numerous advocates for approaches that rely on functional assessments of academic performance and RTI instead of an evaluation of cognitive processing to determine whether a student has an LD.

RESPONSE TO INTERVENTION

At the time of IDEA 2004 reauthorization, an RTI approach was being considered as an alternative to the achievement-aptitude discrepancy model, which had been criticized as an invalid conceptualization of the notion of “unexpected underachievement” (Kavale, Holdnack, & Mostert, 2005). With the reauthorization of IDEA 2004, a student’s RTI may be included in the LD identification processes, and a number of states have adopted RTI methods for LD identification (Zirkel & Thomas, 2010).

There are many conceptualizations of RTI (Decker, Hale, & Flanagan, 2013), one of which is as an alternative identification method for LDs. As an LD identification method, the theory behind RTI is that when students are provided with evidence-based instruction and intervention that is generally effective for most students, students should “respond” or demonstrate progress in the specific academic area. Students who do not respond to this type of intervention, either by achieving grade-level performance standards or by demonstrating adequate growth, are identified as having an LD (Vaughn, Linan-Thompson, & Hickman, 2003).

Numerous variations of the RTI model exist, and it is beyond the scope of this article to review them in detail. In general, however, RTI models used for LD identification provide increasingly intensive...
tiers of instructional support to meet individual student needs. They are coupled with repeated application of standardized assessment tools, such as curriculum-based measurements (CBMs), to determine a student’s response to the tiers of instruction. The data generated from the monitoring of student progress are routinely analyzed to determine a student’s response and to inform when changes to the instructional program are warranted.

Advocates of RTI-only approaches to LD identification argue that the model provides a mechanism by which students can receive services prior to a formal diagnosis, thereby avoiding the “wait-to-fail” problems associated with the achievement/aptitude discrepancy model. Although RTI models do have the potential to solve many of the issues related to LD identification that schools have historically faced, the problems that RTI has the potential to solve are primarily related to standardizing the prereferral process (Kavale et al., 2005). For example, as noted, one of the primary criticisms of the IQ-achievement discrepancy formula was that it resulted in a “wait-to-fail” model to LD identification that required a student’s learning difficulties to become so significant that they were often near intractable (Siegel, 2003; Stanovich, 1993). In addition, critics of the discrepancy approach argue that it lacked treatment validity because studies of RD indicate that there is no differential effect for many standard protocol reading interventions for students with reading difficulties based on IQ (Shawwitz, Morris, & Shaywitz, 2008; Stage, Abbott, Jenkins, & Berninger, 2003; Vellutino, Scanlon, & Lyon, 2000). Although RTI does much to address the service delivery concerns associated with the discrepancy model, as a disability determination model, there is much about the RTI process that remains unknown. This limits its usefulness in making high stakes determinations of LD eligibility.

First, there is not enough information about what constitutes an adequate response to a number of programs across grade levels and content areas to have an LD identification model that adequately identifies students across the K-12 spectrum (Fuchs & Deshler, 2007). Second, empirically derived expectations for growth are limited to very few studies in early reading and math (Fuchs & Fuchs, 1993). Although large-scale CBM data systems provide benchmarks that provide a means by which weekly growth rates can be interpolated, the data collected within these systems are aggregated from a population that is not well defined and for whom very little information about the instructional program is included. This limits our ability to know how much growth we should anticipate from students within specific subpopulations who are provided with effective intervention programs. Third, RTI relies on the use of a highly prescriptive implementation system (e.g., standard protocol approach and progress-monitoring system), and ways to determine fidelity of implementation are neither well established nor easily put into practice in research studies, let alone in school systems (Mellard & Johnson, 2008). Fourth, most RTI models assume a narrow definition of LDs—one in which a basic skill deficit should be remediated by direct instruction focused on a foundational academic skill to support a student’s ability to meet grade-level performance targets in the general classroom. Most RTI models do not include a focus on more complex tasks, specifically in terms of how best to monitor progress of interventions or accommodations designed to support students in these areas. Finally, even if all of these concerns were sufficiently addressed—and that is a very significant condition, especially with the current climate of reduced school budgets and the new demands of the Common Core State Standards—what remains missing from RTI models of LD identification is the explanatory component of the diagnostic classification procedure (Johnson et al., 2010). Such approaches lend little to understanding the underlying cause of a particular child’s learning difficulty.
THE IMPORTANCE OF ACCURATE DIAGNOSTIC SYSTEMS

Diagnostic classifications serve many purposes. Their primary function is to provide a commonly accepted method for grouping signs and symptoms into commonly accepted clusters and assigning an identifying term (e.g., LDs) that is widely accepted by most practitioners. This labeling facilitates the transmission of clinically relevant information to providers of treatment (e.g., teachers, intervention specialists) (Witteman, Harries, Bekker, & VanAarle, 2007). Consistent classification also serves as a commonly agreed upon clinical definition to ensure uniformity in research and statistical evaluation. Reliable classification is important, especially for teachers, because they play a critical role in the LD evaluation, eligibility, and treatment delivery process. If the approach to identification is purely pragmatic (e.g., the child needs to be identified in order to receive services), the explanatory component (e.g., why does this particular child fail to respond to instruction?) of the classification process is lost. For the individual student, that means that he or she may not receive an intervention designed to address his or her specific needs. This is problematic on the level of the individual child. On the broader scale for the field of LDs, it also means fewer advances in the intervention and treatment research that can continue to move the field forward.

Accurate LD determination is arguably the most important outcome in improving LD identification and subsequent service delivery. To achieve accuracy, a classification model must reliably distinguish students who have an LD from those who do not. A primary difficulty in classification is that some conditions are neither clearly defined nor easily categorized. Learning disabilities is an example of such a classification due in large part to the heterogeneity of the disability. Not only is this heterogeneity demonstrated in the differences between clinical and school-based approaches to identification but also within school-based systems, where a wide variety of operational definitions are used. For example, some states use an RTI and noncategorical approach to identification (e.g., Iowa); some states have patterned their policy language on the federal regulations, which allow either an RTI approach or a pattern of strengths and weaknesses approach (e.g., Michigan), and some states require a comprehensive evaluation that includes documentation of low achievement, an assessment of the instructional environment, and documentation of a cognitive processing deficit (e.g., Idaho). The variety of operational definitions may result in less clarity about LD, because a student who is identified by one procedure may not be identified when a different procedure is used (Barth et al., 2008; MacMillan & Siperstein, 2002; McMaster, Fuchs, Fuchs, & Compton, 2005; Morris et al., 2012).

Classification models developed within the school setting often reflect only a symptom or set of symptoms rather than the condition itself. For example, the focus on low achievement and the ruling out of other explanations (exclusionary criteria) for the low achievement have led to an LD-by-default approach to eligibility decisions, in which LD is primarily defined by low achievement that is not explained by hearing or vision problems and cultural or environmental factors. The shift toward low-achievement-only definitions of LD is on the rise, because the effects of a neuropsychological disorder, which are thought to underlie LD, are usually manifested in the symptom of low achievement in reading, writing, or performing math calculations (Swanson, 2009). Given the relative ease of identifying low achievement as compared with identifying cognitive processing deficits, models that rely on low-achievement-only definitions of LD can be appealing to practitioners.

Ideally, however, diagnostic procedures for LD should comprise three main steps. A categorical diagnosis is first made (i.e., the student has an LD that affects reading), followed by an explanatory diagnosis (i.e., the student has a deficit in working memory and in phonological processing), and finally,
treatment planning (Witteman et al., 2007). As the diagnostic procedure is practiced under an RTI model, however, the emphasis is almost exclusively on treatment planning. This is problematic because treatment planning that is done in the absence of a full understanding of the child’s particular learning needs can be ineffective, lead to lost instructional time, and cause further frustration and negative impact to a child’s self-esteem, which can further hinder students in the learning process.

As outlined earlier in this article, the research examining cognitive processes and their relation to academic outcomes suggests that deficits in various processes result in low achievement in specific academic areas (e.g., reading, math, and writing). Understanding these connections provides the explanatory diagnosis that can help children with LD and their parents understand why they are having difficulty learning and can also inform intervention planning. For example, interventions for phonological processing deficits have been shown to be effective for a significant number of students with RD (Torgesen, 2002), but the research also demonstrates that students with RD may have deficits in other areas that impact reading. For example, several studies have examined how children with LD access information. Accessibility refers to the notion that information necessary for a task resides within the child because he or she has been taught that information. Several researchers have converged on the notion that children with RD have a difficult time accessing and retrieving knowledge; therefore, unless they are taught key executive processing and self-monitoring strategies during instruction, they may be unable to access information that will support their understanding of what they are reading (Swanson, 2009).

Despite these findings, cognitive processes are not routinely assessed as part of the LD identification process, and in RTI-only models, assessment of cognitive processes is not included as part of the evaluation criteria. As argued throughout this article, however, the omission of cognitive processing assessment ignores the defining characteristic of the LD construct, fails to provide the child and family with any explanatory information about the learning difficulties, and could limit the advancement of interventions designed to remediate these areas.

RTI AND COMPREHENSIVE EVALUATIONS

Some researchers have recommended a combined approach to LD identification (see e.g., Swanson, 2009) in order to develop an LD identification process that mitigates the problems associated with disentangling poor instruction from a learning disability and to provide a thorough assessment of cognitive processing areas. The combined approach to LD identification relies on the implementation of an RTI process to support the learning needs of students who struggle in the academic areas of reading, writing and/or mathematics but who do not necessarily have LDs. When well implemented, RTI models ensure access to evidence-based instruction and intervention that can support the needs of most of the students within a school, allowing the special education system to focus only on students who truly have disabilities. Students who do not respond to generally effective instruction and intervention are referred for a comprehensive evaluation that sheds light on the nature of the student’s learning difficulties. In this type of model, the multidisciplinary team (MDT) develops a hypothesis as to the nature of the child’s learning difficulties, conducts an evaluation to determine why a student might be experiencing learning difficulties, and decides how to design an appropriate intervention and accommodation program. The main elements of a combined approach to LD identification are perhaps best summarized by Mather and Gregg (2006):

1. Observe a limitation in one or more of the following areas of achievement: reading (basic skills, fluency, or comprehension); written language (basic skills, fluency, or expression); or mathematics (basic skills, fluency, or application).
Rule out alternative explanations for the limitation (e.g., cognitive impairment, lack of appropriate instruction).

2. Document the limitation using multiple sources of data (e.g., standardized or CBMs using multiple test formats; RTI; teacher, student, and parent reports; class work samples; and educational history).

3. Identify the specific cognitive and/or linguistic correlates that appear to be related to the identified area of underachievement difficulty. Revisit the exclusionary criteria to rule out alternative explanations for the cognitive or linguistic difficulties. (p. 103)

The important component of this approach is the focus on the explanatory diagnoses that can help inform the treatment planning. The assessment of cognitive processes offers the potential for the provision of explanations about why and how individual differences occur (Swanson, 2009). Cognitive processing evaluation has the potential to outline constraints in learning when individual differences cannot be explained as a function of best instructional practices.

CASE STUDIES

The benefits of a combined approach for LD identification are perhaps best demonstrated through case study examples. Because of space limitations, the description of these examples are necessarily brief and do not provide an exhaustive accounting of all of the assessment data upon which disability determination decisions should be made. The brief case studies are meant to provide a demonstration of why a comprehensive evaluation is an important component of the LD identification process and how the evaluation can inform next steps.

The three students described in this section attend a school that is located in a state that requires RTI and a comprehensive evaluation for LD determination. The state policy follows the three general steps outlined by Mather and Gregg (2006) previously. To document LD, the MDT must have evidence of the student’s low achievement, including performance not only on state assessments or CBMs but also on standardized academic achievement assessments. The team also must indicate what instruction and intervention have been provided and what the student’s response to that intervention has been, as well as an observation of the student’s functioning within the classroom. In addition, the evaluation must include an assessment of cognitive processing areas that indicate a pattern of strengths and weaknesses. The state policy does not indicate specific cut scores for determining when a deficit constitutes a “weakness,” because the research base to inform clear decision rules is currently lacking. Rather, the state has adopted a preponderance of evidence approach to LD determination.

This school uses a three-tiered model of RTI in which Tier 1 is the general education curriculum, Tier 2 is intervention, and Tier 3 is special education. The school’s core reading curriculum enables 85%–88% of students to meet grade-level reading performance targets without additional support. Tier 2 addresses the needs of students at a rate of about 70% (i.e., 70% of students in Tier 2 respond well to intervention and require no further support). In the school’s most recent school year, three students, Connor, Diego, and Ileana (pseudonyms), were not making any progress after 6 weeks of core instruction only in third-grade reading Tier 2, nor did they make progress when that was followed by another 12 weeks of Tier 2 intervention and core instruction (18 weeks into the school year). A brief description of reading performance for each of the three students follows.

Connor

On the reading CBM used at this school, Connor was reading at about 60 words correct per minute (wcpm) and making no errors. His rate of improvement (ROI) over an 18-week period was zero. When reading aloud, Connor read very slowly but accurately. At the end of a reading passage, he was able to answer both recall and inferential
questions with ease. On untimed reading assessments that focus on comprehension, his standard scores fell within the low average range, although when compared with his performance from earlier grades, his relative performance was lower each year. In his content area lessons (math and science), Connor was able to participate and complete assignments with the rest of the class, provided that the reading demands were not too high.

**Diego**

Diego’s reading CBM indicated that his reading rate was about the same as Connor’s, 64–68 wcpm, and that Diego made very few errors, typically no more than two or three in each passage. His ROI was also zero. When reading aloud, Diego’s reading was very slow and laborious. At the end of a passage, he was unable to recall basic facts, was unable to provide even a short summary of the main content, and could not answer any inferential questions. In class, Diego was frequently off task during reading instruction. In content classes (math and science), he was able to participate in activities that did not require reading, but he required frequent redirection to remain on task. On untimed reading assessments of comprehension, his performance was similar, and he tended to score in the below average range on several standardized reading measures.

**Ileana**

On reading CBM passages, Ileana was reading at about 84 wcpm and making about 3–4 errors each passage. Her ROI over the intervention period was zero. However, the number of errors she made decreased from 15 to 3. Ileana is an English language learner (ELL), who used her finger to track the words as she read. During the timed portion of the reading, she read very quickly. She moved her finger across the page so fast that she would sometimes skip 2–3 words to catch her voice up to her finger and then cycle back to the missed words when she realized she had skipped them. When encouraged to slow down, she read fluently but missing larger vocabulary words that she did not know. After reading the passage, she was able to answer most questions, both literal and inferential, and was able to tell her teacher which vocabulary words she could decode, but did not understand. When provided with a short, student-friendly definition of an unknown vocabulary word, Ileana was typically able to apply it in a new sentence or to demonstrate understanding by providing an example. Her reading performance in class was similar. That is, when given untimed tasks, she was able to participate in the class, but she sometimes struggled in content area lessons unless provided with preteaching of vocabulary words. Because she was an ELL, the school did not administer any standardized reading assessments to Ileana other than the required state measures and the CBMs used for both benchmarking and progress monitoring. It was noted that from second to third grade, Ileana’s performance level improved from the 10th percentile to the 35th percentile.

**Next steps**

Based on the information collected about these three students, the school team decided that Ileana should remain in a Tier 2 program that included a stronger emphasis on vocabulary development and comprehension. Ileana’s growth over her second- and third-grade years was consistent with language proficiency development, and, although she did not demonstrate growth in terms of words correct per minute (wcpm), she did significantly decrease the number of errors she was making while maintaining an adequate wcpm rate (her performance placed her in the 25th–30th percentile). Thus, she was judged to be demonstrating a strong, developing knowledge of decoding and comprehension skills.

Both Connor and Diego, however, were referred for a comprehensive evaluation that was guided by the way in which the two boys presented during reading. Based on Connor’s slow but accurate reading and his ability to comprehend grade-level material, it was hypothesized that Connor had processing speed and retrieval deficits that prevented him from
becoming a more fluent reader. An evaluation of these processes indicated that he did experience significant deficits in these areas, particularly for phonological coding and retrieval. Connor also had relative strengths in nonverbal reasoning and math computation.

The design of Diego’s evaluation was more complicated. Diego is of Hispanic descent, born in the United States (as were his parents), and English was the primary home language, although Spanish was also spoken when relatives and friends visited. As a result, English language learning issues were determined not to be the primary cause for his reading difficulties. His error rate in decoding words was not high, but he did struggle to sound out many words, even those that he had decoded previously in a passage. The MDT was uncertain how to focus the comprehensive evaluation, because it was unclear whether Diego’s decoding skills were not yet fluent enough to allow him to focus on comprehension tasks, or whether he had a possible deficit in working memory for which he was able to compensate when reading demands were not high (e.g., in content area classes that were still taught primarily through activities and hands-on learning in Grade 3). Multiple cognitive processing areas were assessed, and it was found that Diego had significant deficits in phonological working memory and short-term memory (verbal).

**Specially designed instruction**

Based on the results of the comprehensive evaluation, both Connor and Diego were found to have LD and were eligible to receive special education services. For both students, the “Accommodate–Remediate–Modify” (ARM; National Center for Learning Disabilities, 2007) planning framework was used to develop their specially designed instructional programs. The ARM framework includes procedures for (a) accommodation of a child’s learning environment, for example, allowing extra time, or providing an audio or e-version of a text; (b) remediation of the skill deficit to develop growth in the academic area of concern; and (c) modification of assignments, such as allowing for different ways to demonstrate understanding of content, or using a different text than the rest of the class. This comprehensive approach to instructional support for students with LD ensures that students maintain access to the general education curriculum while continuing to work on their area of deficit. It also allows school teams to capitalize on student strengths, while working on areas of need.

Connor’s specially designed instruction focused on drawing on his strengths in content area understanding, while supporting his processing speed and retrieval issues. Within the general education classroom, Connor was provided with several accommodations. First, he was provided more time to complete in-class assignments, quizzes, and tests, or he could have a teacher, aide, or peer tutor read the questions for him. In addition, content information was provided, when possible, through a variety of media, including video and e-books, or on the computer, using a print-to-speech reader. These accommodations allowed Connor to develop his content area knowledge across the curriculum so that his reading difficulties would not impede his performance in other content areas.

In addition to these accommodations, Connor’s reading assignments in the general classroom were modified when possible. For example, when the class was reading a novel or short story, Connor was provided with a lower level readability version of the same story and, when possible, with an audio version of the book. The modifications of these reading assignments were implemented to help him participate meaningfully with his general classroom peers in discussions about literature.

Finally, Connor received 45 minutes of reading instruction daily in the special education classroom. To facilitate his fluency, the 45-minute block of instruction began with spending the first 5 to 7 minutes having Connor read and reread passages that are at his independent level. The exposure to texts through wide reading has been shown to help
develop automaticity and fluency (Roberts, Torgesen, Boardman, & Scammacca, 2008), which in Connor’s case appeared to reflect his processing speed issues. The research examining fluency interventions suggests that repeated reading of the same text does not transfer to fluency in reading other texts, but that reading passages in which a large number of the words overlap may help students gain greater automaticity with those words in context (Roberts et al., 2008). For students with processing speed issues, automaticity at the word level may be a helpful strategy to promote overall fluency.

In the following 20-minute segment of the 45-minute session, instruction on phonics analysis and blending was provided to Connor. During this instruction, the special education teacher directly taught letter sound and letter-cluster-sound correspondences and also taught multisyllabic decoding skills. Word lists for phonics analysis were derived from direct instruction materials.

Then, the remaining 30 minutes consisted of work with the RAVE-O program (Wolf, Miller, & Donnelly, 2000). This approach focuses on developing reading behaviors such as word recognition and comprehension and on developing underlying elements such as visual scanning, orthographic pattern recognition, semantic and syntactic development, and lexical retrieval. Research on this multiple-component intervention approach by Morris et al. (2012) showed that such programs produced significant gains relative to control (single component) programs on all basic reading skill areas after 70 hours of intervention and at follow-up a year later.

As a result of this comprehensive ARM approach, Connor was able to achieve grade-level performance targets in content-area classes and math. In addition, he had begun to show growth in his fluency in reading. After 9 weeks of this approach, he was able to maintain grade-level performance in the content areas and to demonstrate gains in reading rate, increasing to 73–75 wcpm.

Diego’s program was designed in a similar way, using the ARM components, on the basis of his specific needs. To accommodate his working memory issues, Diego was provided with graphic organizers for his content-area classes. An additional accommodation Diego received was to have content represented in multiple forms (Hall, Meyer, & Rose, 2012). This accommodation not only helped Diego but other students in his class also benefited when material was presented in different formats. In content classes, Diego received similar accommodations to Connor (e.g., oral presentation of information), with the addition of receiving information in smaller clusters and with graphic supports (e.g., one-step directions, graphic organizers). To remediate his reading difficulties, Diego also received a similar instructional program as Connor. Repeated and new readings of text provided Diego with opportunities to be exposed multiple times to words, which strengthened his representation of words.

Distributed practice and organizational strategies were used to design Diego’s direct instruction phonics analysis strategies. Distributed practice involves the use of temporal gaps between study periods to promote long-lasting memory of information (Cepeda et al., 2009). Distributed practice is an essential component of many direct instruction programs, but for Diego, increased attention was paid to ensuring that sounds and blends taught were revisited on a more intentional basis. In addition to these interventions, Diego’s specially designed instruction consisted of cognitive strategy instruction to promote stronger reading comprehension strategies. Specifically, Diego was taught to summarize what he has just read at the end of each paragraph to support his memory and retention.

Diego did not show immediate gains in his reading performance as measured by CBMs. However, he did demonstrate stronger gains in his ability to comprehend text, and he stopped making errors in his reading. After 6 weeks of this instruction, Diego made small gains in his wcpm rate, improving to performances of about 68–71 wcpm.

These cases highlight the importance of having a responsive and adequate
instructional system within the school setting to effectively meet the diverse needs of many learners. As the research on intervention approaches to accommodate cognitive processing deficits continues to expand, more effective interventions may be developed. The increased use of technology as a means of accommodating children’s learning needs also shows potential to help more students with LD access the general classroom curriculum (Hall et al., 2012).

The individualized approaches used within these three case studies highlight the importance of hypothesis testing when determining the nature of a child’s learning difficulties. For each one of the three students presented in this article, an understanding of the reading process, along with an understanding of the associated cognitive processing deficits, allowed the school-based professionals to develop an instructional plan designed to meet each child’s unique needs.

Arguments against including cognitive processing deficits as a component of the LD evaluation typically have centered on the idea that there is no treatment validity in such assessments. However, the emerging evidence-base, some of which is reviewed here, suggests that there are effective ways to design academic interventions that address underlying cognitive processing concerns. More importantly, when these approaches to intervention are matched to student needs, students make greater gains (Fuchs, 2013). There are challenges to implementing this approach within a school setting. However, through this model, evidence-based diagnoses can be used to generate evidence-based treatment plans that can be evaluated for effectiveness on the basis of a student’s RTI (Berninger, 2011).

**CHALLENGES OF IMPLEMENTING CLINICAL APPROACHES IN SCHOOL SETTINGS**

The challenges of implementing a clinical approach to LD identification within the school setting are significant (Johnson, Semmelroth, Mellard, & Hopper, 2012). First, as with any significant change to policy, there is the immediate challenge of communication and ensuring that schools understand and are equipped to implement the changes. Communicating changes in policy through webinars, meetings, and written notices can be helpful in this regard but clearly represents only the initial step in implementation (Johnson, Semmelroth, et al., 2012).

Collecting baseline data on implementation and having a systematic process for continued data collection can inform targeted professional development needs. For example, in a state implementation project, Johnson, Semmelroth, et al. (2012) detailed a statewide process of LD eligibility professional development that informed technical assistance needs in the areas of progress monitoring, the selection of academic achievement assessments, and cognitive processing evaluation. As a result, relevant trainings and guides have been developed to support school-level MDTs in these various components of the LD comprehensive evaluation process. A third-year review of results showed significant improvements in progress monitoring and cognitive processing evaluation (Johnson, Hopper, & Henderson, 2012).

Additional challenges include coming to consensus on various processing areas and appropriate models for LD determination, understanding how a cognitive processing evaluation can inform intervention plans, and working to change school cultures that focus on a desire for services over accurate identification. These concerns are important to answer, because an improved evaluation process can lead to a more reliable means of identifying students with LD and ultimately to better services.

**CONCLUSIONS**

A model of LD identification consistent with current clinical understandings would warrant an evaluation of academic achievement to identify the student’s particular area(s) of concern, followed by an assessment of
Cognitive processing areas that are thought to underlie that particular area. Over time, if there is enough consistency in the patterns of data, cognitive processing screening could potentially identify students with LD earlier, and students at risk for LD could receive intervention more specifically tailored to meet their needs.

The current research contributing to understanding of these processes and their impact on academic performance demonstrates the benefits of continuing to conduct studies of these connections. In addition, this type of identification model is consistent with the federal definition of LD, in that it highlights both the unexpected nature of the low achievement and the underlying disorder in cognitive processing.

Cognitive processing deficits have long been considered to be at the core of LD (IDEA 2004, Public Law 108-446), but these processes are not frequently assessed as a part of LD determination. In light of a rapidly growing body of research that provides an understanding of how underlying cognitive processes are related to academic functioning, it is time to reconsider how the assessment of cognitive processing areas should inform an LD identification process.

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