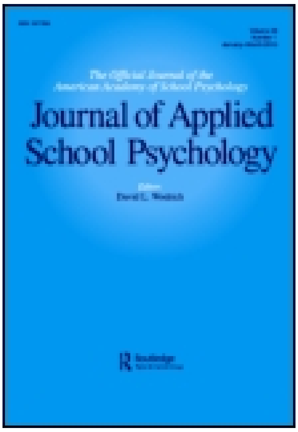

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Dimensional Integration of Assessment Outcomes With Intervention Services for Children With Specific Learning Disabilities

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Dimensional Integration of Assessment Outcomes With Intervention Services for Children With Specific Learning Disabilities

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This article reviews critical issues with integrating different procedures for identifying children with specific learning disabilities permitted in the federal regulations of the 2004 Individual With Disabilities Education Act 2004. Theoretical differences between behavioral approaches that focus on recording behavioral responses based on manipulating variables and approaches that focus on measuring attributes internal to the person (e.g., cognition, cognitive processing, intelligence) are identified as primary barriers to integrating different approaches. A coding scheme that represents disability severity along a continuous dimension based on empirical evidence across multiple domains of functioning (e.g., academic, cognitive, social-emotional) is proposed. Similarly, interventions are represented along a continuous dimension and linked to disability severity through specification of intervention levels. The coding scheme provides a general framework for integrating assessment results with intervention services for children with specific learning disabilities and other developmental disabilities.

KEYWORDS *assessment, intervention, learning disabilities*

Revisions to federal disability policies have, arguably, resulted in the most substantial changes in the procedures for identifying children with disabilities. The purpose of this article is to highlight methodological and conceptual difficulties in various procedures accepted under the federal revisions for identifying children with specific learning disabilities (SLDs). We first address

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emerging contradictions in the literature on response-to-intervention (RTI) methodology. In addition, we address problems with IQ-discrepancy methods. Then, we advocate for hybrid models to facilitate integration across various SLD identification methods. Conceptual distinctions between Academic Content Delivery Systems and Individual Attribute Models is made to characterize different SLD models by the extent in which the model emphasizes environmental parameters (RTI) or internal attributes of a child (psycho-educational assessment) as the focus of measurement. The article concludes with an organizational framework to demonstrate how Academic Content Delivery System and Individual Attribute Model schemes may be linked as a general model for categorical placement by postulating a continuum of intervention services prescribed based on the number and severity of academic and cognitive deficits.

Changes to the Individuals With Disabilities Education Improvement Act of 2004 provide the following options as criteria for SLD identification:

1) Severe discrepancy: may permit use of this practice, but may not require it
2) RTI: must permit use of this practice
3) "Other" research-based procedures: may permit use of this practice

Severe discrepancy provisions typically encompass traditional methods of using ability-achievement discrepancy approaches. RTI provisions are specified as "... a process which determines if a child responds to scientific, research-based intervention as part of the evaluation procedures" (Individuals With Disabilities Education Improvement Act, 2004, Section 614(b)(6)). "Other" approaches are globally considered "a pattern of strengths and weaknesses in performance, achievement, or both, relative to age, state-approved grade-level standards, or intellectual development, that is determined by the group to be relevant to the identification of [SLD]" (Individuals With Disabilities Education Improvement Act, 2004, Section 300.309(a)(2)). A pattern of strengths and weaknesses and RTI are newly available methods of SLD identification; however, the inclusion of RTI is considered the most radical change in federal policy in the past 20 years.

In fewer than 2 years, almost every state has adopted, or is in the process of adopting, some form of RTI regulations (Berkeley, Bender, Peaster, & Saunders, 2009; Zirkel & Krohn, 2008). The majority of states permit RTI in conjunction with severe discrepancy, and/or other research-based approaches (Berkeley et al., 2009; Zirkel & Krohn, 2008). Six states have adopted, or are in the process of adopting, an RTI-only model, which includes prohibiting the use of a "severe discrepancy" procedure (Zirkel & Krohn, 2008).

Numerous RTI categorical systems have been proposed, and there is a lack of consensus on categorical definitions. For example, some have categorized RTI models as either standard protocol or problem solving (D. Fuchs, Mock, Morgan, & Young, 2003; L. S. Fuchs, 2003). Other RTI models have been categorized as either preventative or eligibility oriented (Burns, Vanderwood, & Ruby, 2005). Yet, other categories are instructional and diagnostic, which is meant to distinguish using RTI to improve academic skills versus to identify children with learning disabilities (Torgesen, 2007). Furthermore, there is disagreement in the use of these categories (Burns, Deno, & Jimerson, 2007) as well as which categories represent true RTI models (Shinn, 2005) or original RTI models (Kovaleski, 2007).

Understanding these distinctions is important because RTI models vary in definition, terminology, experimental design, systems of measurement, decision-making criteria, professional role assignment, and validity (D. Fuchs, Deshler, & Reschly, 2004; D. Fuchs et al., 2003; Gerber, 2005; Hale, 2006; Hale & Fiorello, 2004; Kavale & Forness, 2000; Kavale, Holdnack, & Mostert, 2006; Naglieri & Crockett, 2005). It can be argued that such variability is fairly benign when RTI is used merely for instructional support without consideration of SLD identification. However, when used for the purpose of identifying children with SLD, or other disabilities, RTI's procedural variability may no longer be benign because disparate practice leads to markedly different referral procedures and inconsistent treatment of children with identical problems (Berkeley et al., 2009).

The lack of consensus in defining a unified RTI model has been repeatedly noted in the literature (Burns & Ysseldyke, 2005), as is confusion over RTI vernacular (Christ, Burns, & Ysseldyke, 2005). This issue is important because reliability of empirical findings supporting RTI depends heavily on the specific nature and type of methodology and procedures under investigation. At first, as reflected in federal guidelines, RTI was described as a "scientific" procedure and perhaps viewed as de facto valid (Reschly & Ysseldyke, 2002; Tilly, Harken, Robinson, & Kurns, 2008; Ysseldyke et al., 2008). However, this assumption has been met with criticism (Graner & Faggella-Luby, 2005; J. A. Naglieri & Crockett, 2005; National Joint Committee on Learning Disabilities, 2005), and questions as to whether RTI meets criteria for being "scientifically based" remains (Fuchs, 2003). When defining RTI by specific components, some RTI models appear to have more empirical support than others (D. Fuchs et al., 2003). It is interesting that RTI procedures with the most empirical support are the least likely to be adopted by states (Berkeley et al., 2009). Compounding these problems are fidelity issues that have long-been noted with multi-tiered models (Telzrow, McNamara, & Hollinger, 2000), as well as the interactive effects of blending different RTI procedures together whose effects are virtually unknown (Kovaleski, 2007).

There are additional challenges to using scientifically based procedures, because determining what procedures are genuinely science is unclear (Torgesen, 2009). That is, the term *science-based* practice is ambiguous enough to lead to different interpretations. For example, in some cases a scientifically based intervention is one that appears in a catalog of acceptable interventions that have been qualified according to set criteria (Kratochwill & Shernoff, 2004). In other cases, scientifically based interventions refer to any procedure that demonstrates a desirable change in behavior within an applied context (VanDerHeyden, Witt, & Barnett, 2005). Although both interpretations may be equally valid, they can result in different practices. In the first example, the focus is on selecting interventions from a catalog or database of accepted interventions (e.g., What Works Clearinghouse); whereas in the other case, the interventions are created and tailored to a unique context.

This issue is not trivial, as ambiguities in defining *scientifically based practice* led to the demise of the Reading First program, which was a billion-dollar government initiative for science-based reading practices. Linked to many RTI programs using the Dynamic Indicator of Basic Early Literacy Skills (DIBELS), the committees in charge of determining scientifically based practice were held to demonstrate biased judgment in favor of programs for which some committee members had financial interests (U.S. Department of Education, 2006). Compounding the issue, a recent Reading First Impact Study concluded that Reading First failed to demonstrate gains in reading, which would seemingly lead to the conclusion it was not scientifically based (Gamse, Bloom, Kemple, & Jacob, 2009). Other studies have concluded that the DIBELS has measurement limitations, with significant floor effects, potentially making it inappropriate as a universal screener (Catts, Petscher, Schatschneider, Bridges, & Mendoza, 2009). At the very least, such examples demonstrate that the "science" in "response to scientifically based interventions" may be more difficult to operationalize than was anticipated before RTI being included in federal law.

In addition, variability in defining RTI leads to the problem of defining successful outcome indicators or expected benefits of RTI (L. S. Fuchs, 2003). For example, problem-solving models that focus on reforming general education (Tilly, 2002; Ysseldyke et al., 2008; Ysseldyke et al., 1997) view improvement in statewide achievement tests as the primary outcome variable in RTI models (Kovaleski, 2007) and, in turn, view the school psychologists as an instructional consultant who serves to facilitate broad educational reform (Tilly et al., 2008). Conversely, for those who view the benefits of RTI as a solution to the rising costs of special education (Chambers, Parrish, & Harr, 2002), enrollment reductions in special education may be the primary RTI outcome variable (Vaughn & Fuchs, 2003; D. Fuchs & Fuchs, 2002; D. Fuchs & Young, 2006).

There may be other problems associated with RTI. Specifically, the heterogeneity in RTI models can lead to unforeseen challenges in their large-scale implementation (Kavale & Spaulding, 2008). Reactions to these problems, and suggested remedies, are varied. Some notable problems with RTI have been described as "myth" (Fletcher, Lyon, Fuchs, & Barnes, 2007;

Jimerson, Burns, & VanDerHeyden, 2007), possibly for fear that they will impede the progress of RTI. Others readily acknowledge problems but believe the problems are solvable and should not impede schools' transition to an RTI model (Brown-Chidsey & Steege, 2005; Fletcher et al., 2007; Gresham, 2002; Reschly, 2003; Tilly, 2002). Still, skepticism persists (Kavale, Kauffman, Bachmeier, & LeFever, 2008; Mather & Kaufman, 2006; Reynolds & Shaywitz, 2009), as does the risk that some problems are irresolvable (Willis & Dumont, 2006).

HETEROGENEITY IN SLD IDENTIFICATION MODELS

As a potential contributor to the problem that may explain the significant variability and lack of consensus across RTI models, the majority of research on RTI appears to have primarily occurred after RTI was included in federal regulations. This may be demonstrated by a frequency count of research articles before and after implementation of the Individuals With Disabilities Education Act 2004 using the keywords *response to intervention* and/or *RTI* performed in preparation of this article. Specifically, three prominent school psychology journals: (1) *School Psychology Review*, (2) *School Psychology Quarterly*, and (3) *Psychology in the Schools* were reviewed. Frequency counts were made for 5-year increments in journal articles before 2004 and after 2004 because that was the year it was written into federal law. Searches were conducted in each journal's respective online database (see Figure 1 for results).

As suggested by results in Figure 1, research on RTI was nearly absent before the Individuals With Disabilities Education Act of 2004 and escalated dramatically after it was implemented. It should be noted that many articles identified before the Act, in the interval of 1981–1985, used the term *response to intervention* but not as it is used in today's context (although these instances are still included in the frequency count). A similar pattern can be found in more comprehensive reviews of research. For example, in a meta-analytic review of research in 2005 from PsycINFO, ERIC, and Education Abstracts databases that included not only the terms *RTI* or *response to intervention* but also more inclusive terms such as *intervention-based*, *Heartland*, *problem-solving*, *responsiveness*, *Minneapolis problem-solving*, *instructional support team*, and *intervention-based assessment*, only 21 articles were found (Burns, Appleton, & Stehouwer, 2005), which is arguably small considering RTI's wide effect on federal law and local educational agencies. As noted in this study, there were considerable differences in the methods and procedures across different RTI models (see Fuchs et al., 2003, for a review of differences across RTI models).

Similarly, the National Center for Learning Disabilities RTI Action Network website provided a review of RTI literature again using search terms

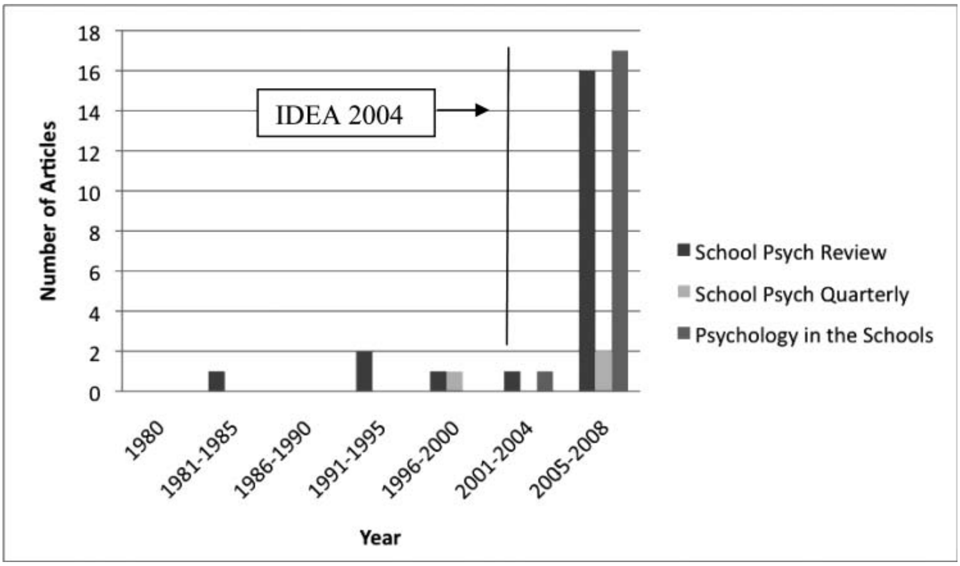

FIGURE 1 Results from keyword search "response to intervention" or "RTI" by year, pre- and post-Individuals With Disabilities Education Act (IDEA) 2004.

from the Burns et al. (2005) study but included more recent research (up to 2008). However, unlike the previous study, only articles that included quantifiable measures and transparency in data analysis were included. Eleven total studies were identified. Of greater relevance was the average year of the study ($M = 2004$, $SD = 2.9$), with 63% of the studies occurring after 2004.

Many factors may have influenced the evolving heterogeneity of RTI models. It is likely that many prereferral models used in schools were retrofitted and renamed as RTI to satisfy requirements in the 2004 federal guidelines. As a consequence, the models appear to differ widely on goals and implementation specifications (D. Fuchs et al., 2003). More specifically, such models may create significant confusion in that they do not appear to have been originally developed with the intended goal of improving categorical identification of SLD but are now being used for such purposes (Fuchs et al., 2003; Hale, Naglieri, Kauffman, & Kavale, 2004; Kavale et al., 2008).

CHALLENGES TO INTEGRATING SLD IDENTIFICATION METHODS

As a consequence of the emerging problems in RTI implementation, many practitioners may maintain or revert back to a reliance on the severe discrepancy criteria, still deemed permissible within federal guidelines. However, practices associated with severe discrepancy are difficult to justify. Discrepancy approaches suffer from a similar lack of consensus of definitions and arbitrariness of decision making as is found in many RTI models (Fletcher et al., 2007). Inherent problems with IQ-Achievement discrepancy approaches was a primary rationale for supporting RTI (Brown-Chidsey, 2005a; Brown-Chidsey & Steege, 2005; D. Fuchs et al., 2003; Gresham, 2002; Reschly, 1988, 2003; Reschly & Grimes, 2002; Reschly & Ysseldyke, 2002; Siegel, 1989; VanDerHeyden et al., 2005; Ysseldyke et al., 1997) or alternative services delivery models (Fiorello, Hale, & Snyder, 2006; Fletcher et al., 2007; D. Fuchs & Young, 2006; MacMillan & Siperstein, 2001; Mather & Kaufman, 2006; VanDerHeyden et al., 2005; Ysseldyke et al., 1997). These problems were noted in the congressional testimony that led to the change in federal guidelines (H.R. Rep. No. 108-077, 2003). The technical issues in discrepancy approaches have been well represented in the literature and, thus, will not be repeated here (for a review, see Fletcher et al., 2007; Gresham, 2002; Kavele & Forness, 2000). Nonetheless, reverting back to a simple IQ-Achievement discrepancy model, although permitted in the current federal, is unlikely to represent a creditable solution for those seeking to avoid problems with RTI.

The flaws of IQ-Achievement discrepancy approaches in conjunction with the problems of RTI as a method for identifying learning disabilities (Decker, 2008b; D. Fuchs et al., 2004; D. Fuchs et al., 2003; D. Fuchs & Young, 2006; Hale & Fiorello, 2004; Hale et al., 2004; Kavale & Forness, 2000; Mastropieri, 2001; McLaughlin et al., 2006; Naglieri & Crockett, 2005; Scruggs & Mastropieri, 2002) indicate two out of the three methods permitted to identifying children as SLD are seriously flawed. At the same time, legal issues (such as the 2009 Forest Grove School District *v.* T.A. case) are mandating comprehensive evaluations that include measures of cognition to assess "all areas of suspected disability" (Dixon, Eusebio, Turton, Wright, & Hale, 2010), which would seem to leave RTI and IQ-Achievement assessment insufficient. As a concrete example, the Office of Special Education Programs recently released a memo admonishing schools that they cannot use RTI, and the time needed to determine whether a student is responding, to delay detailed disability evaluations of individual students (Office of Special Education Programs, 2011).

As a consequence of these factors, it is unlikely that either the first option for identifying children with SLD in the federal guidelines (IQ-Achievement discrepancy) or second (RTI) option will have long-term prominence. As a likely future, SLD identification models in schools will include some particular components of RTI models, but also components of traditional cognitive assessment with normative measures. Such hybrid models have been described as accruing momentum in part because they are less polarizing than either model alone (Goyette-Ewing & Stahl, 2008). Some hybrid models primarily consist of an RTI model but also includes standardized academic assessments (Fletcher et al., 2007). Other such models include the aforementioned components (i.e., RTI and academic assessments) and measures of cognitive functioning (Flanagan, Ortiz, & Alfonso, 2007; Hale et al., 2004; Miller, 2008). In addition, the solution to the SLD problem requires a more comprehensive framework than that provided by either the discrepancy or RTI approaches because of the inherent problems in both methods (Kavale & Forness, 2000).

Although various hybrid models of RTI have previously been proposed (Fletcher & Francis, 2005), the problem of heterogeneity in RTI, as outlined in this article, still remains. Also, the problem of integrating various forms of RTI with standardized assessment procedures (i.e., academic and cognitive measures) becomes an additional problem for hybrid models. In anticipation for these problems, a model is presented here that addresses, and seeks to clarify, some conceptual and theoretical issues likely to emerge with hybrid models of SLD identification.

INTEGRATING THEORETICAL DIFFERENT APPROACHES TO SLD IDENTIFICATION

Applied practice in school psychology benefits from unified, as opposed to fragmented, model of psychological science (Fagan & Wise, 2007). Similarly, a unified approach is needed for SLD methodology in which procedural variations are understood within a conceptual umbrella (L. S. Fuchs & Fuchs, 2009). The difficulty in integrating SLD procedures can only be understood in terms of understanding the broad theoretical assumptions inherent in various procedures currently being used as part of the SLD eligibility process.

One broad theoretical assumption of some SLD procedures are based on the theoretical assumptions of behavioral psychology. RTI methodology, at its core, is based on principles of behaviorism. In accordance with behavioral theory, the intent of measurement within an RTI procedure is to record a change in behavior in conjunction with a purposeful change in the child's context or environment (e.g., intervention, instruction, reward). This is primarily accomplished by a single-subject design method in which a baseline recording precedes the environmental manipulation. The basis of RTI in behavioral methodology is well-known (Reschly, 2004; Ysseldyke et al., 2008) and explicitly stated by Reschly (2004): "It is no exaggeration to say that much of the foundation for school psychology applications of outcomes criteria, response to intervention, and problem solving are deeply rooted in behavioral interventions." (p. 413). One other theme of RTI is "academic instruction and academic curriculum," as RTI models do not promote the general use of behavioral approaches but rather the use of behavioral approaches to the specific domain of academic instruction. This theme was previously described as "response to intervention instructional models" (Torgesen, 2007). Given that these two themes are common across all RTI models, the term *instructional behavioral approach* is offered as a global category in which to describe various RTI procedures, as all RTI models serve the purpose of recording behavioral responses in correspondence to changes in an environmental or a contextual event. To date, and consistent with this assertion, no cognitive RTI models have been offered.

As previously reviewed, operationally defining RTI as a method of determining whether or not a child has a disorder in one or more of the basic psychological processes characteristic of children with SLD has been a challenge (Kavale et al., 2008; Willis & Dumont, 2006). Part of the challenge may result from the inherent contradiction of using behavioral approaches to measure nonbehavioral attributes (psychological processes). As a limitation of an instructional behavioral approach, interpretive conclusions of intervention failure are limited to three general categories: (a) ineffective manipulation of an environmental variable or insufficient implementation of the intervention (i.e., intervention fidelity or integrity, see Kazdin [2003] for in-depth review), (b) wrong environmental variable was selected for manipulation (specification error), and (c) behavior is insensitive to changes in environmental variables. As such, permissible interpretations of RTI outcomes may have multiple causes and are limited to contextual-behavioral recordings.

In contrast with contextual-behavioral relationships, there are a host of other approaches that focus on behavioral measurement in order to understand internal or intrinsic qualities of the child (e.g., intelligence, cognition, personality). These approaches interpret behavioral responses, not as a result of an environmental cause, but rather as a cause of an internal attribute or trait. Psychometric approaches, for example, statistical link behavioral responses to a latent variable to describe individual differences on a theoretically based attribute (Embretson, 1999; Embretson & Reise, 2000). Although the terms *traditional*, *psychometric*, or *cognitive* have been used to categorize these approaches, these terms are inadequate because they fail to describe a commonality across all the approaches (i.e., not all cognitive approaches are psychometric and not all psychometric approaches are cognitive). The term *person attribute approach* is offered to provide a conceptual umbrella for these various approaches because they all share the commonality of measuring behavior for the purpose of describing an underlying attribute of the individual person.

Various person attribute approaches, namely psychometric, have been historically prevalent as methods of identifying children with SLD (Fletcher et al., 2007). IQ is a quintessential example of an attribute inferred that is based on a complex measurement of behavioral responses. Other approaches that have been proposed for the use of SLD identification include cross-battery assessment (Flanagan et al., 2007), the concordance-disconcordance model (Hale & Fiorello, 2004), the discrepancy/consistency model (Naglieri, 2008), and the double-deficit hypothesis (Wolf et al., 2002). The component model of reading (Aaron & Joshi, 2009) also postulates cognitive and psychological attributes as important variables in an SLD model. Similarly, numerous neuropsychological approaches have also been offered to identify children with SLD (Decker, 2008a; Feifer, 2008; Miller, 2008). Many prominent neuropsychological theories of SLD, whether based on phonological processing (Morris et al., 1998) phonology and rapid naming (Wolf et al., 2002), or automatized learning (Nicolson & Fawcett, 1990), all share an assumption that the etiological basis of learning problems is a result of brain functioning, which is considered an attribute of a specific person.

The difficulty in building an integrative or hybrid model of service delivery system for identifying children with SLD can only be understood in terms of understanding the differences in the broad theoretical assumptions inherent in the various procedures used for this purpose, in this case instructional behavioral approach and a person attribute approach. Connecting these two approaches may seem impossible (Willis & Dumont, 2006), especially given this task was recognized almost a half-century ago by Cronbach, who stated "... psychology requires combined, not parallel, labors from our two historic disciplines" (Cronbach, 1975, p. 125) but later conceded to the difficulties of this task.

Nonetheless, the current reality of educational law for identifying children with SLD requires diagnostic classification as well as intervention monitoring, which must also be aligned and function within a general special education classification schema. The solution for this problem requires a direct link between the two approaches that incorporates the use of intervention methodology (Gresham, 2000; Reschly, 2002) as well as classification distinctions (Mather & Kaufman, 2006) and dimensional representations of disability across different domains of functioning (Kamphaus & Campbell, 2006).

Recommendation for Linking SLD Procedures

The Integrated Assessment Intervention Model (IAIM) is presented as a method of linking SLD identification methods that include disability assessment (person attribute approach) and intervention (instructional behavioral approach) methodologies. IAIM is consistent with special education reform initiatives, which predated but provided an initial impetus for RTI (Parrish & Chambers, 1996), seeking dimensional classification system that provides a continuum of services in which children with more severe problems receive more intense services (Reschly, 1996). In addition, it explicitly integrates the number of measured deficits, the degree of discrepancy in deficits, intervention complexity, and intervention intensity along a continuous dimension, which has been stated as a prerequisite for a reformed special education system (Reschly, 1996).

In IAIM, identifiable conditions and disability categories are heuristically ordered along a dimension that represents the severity of the condition.

Similarly, intervention treatments are ordered by intervention intensity. The number of measured deficits within a particular domain determines disability severity. The domains used here are limited to academic (specified in the Individuals With Disabilities Education Act of 2004), cognitive (attention, memory, phonological processing, executive functions) and social-emotional (externalizing, depression, anxiety) domains, which are standard for SLD evaluations. However, these domains could be easily changed or expanded. The only prerequisite for assessment methods used in a domain is that explicit criteria for determining deficit performance is required. Numerous methods currently exist for making this determination and, thus, numerous methods could be integrated into this system. For example, deficits within the academic domain could be based on curriculum-based measurement (Fuchs, Deschler, & Reschly, 2004), normative measures (Flanagan et al., 2007) or a mixture of different approaches that include normative cutoff scores (Fletcher et al., 2007). Similarly, criteria for determining cognitive and social-emotional deficits can be done using standard assessment methodology.

To provide a continuous dimension of classification, the number of deficits in each domain is coded with a three-digit outcome coding scheme. For example, the first digit represents the number of academic deficits, the second represents the number of cognitive deficits, and the third represents the number of social-emotional deficits. For simplicity, the number of deficits in each domain will be limited to three categories ranging from 0 (*no deficits*) to 3 (*three deficits*). For example, if a child with word reading problems has one deficit in the academic domain, he or she would be assigned a 1 in the academic domain. A child with word reading and math calculation deficits would be assigned a 2 in the academic domain. Similar assignments are made for cognitive and social-emotional domains. The number of deficits across all domains is represented by a three-digit outcome code. For example, a child with one deficit in the academic domain (word reading), one deficit in the cognitive domain (phonological processing), and no deficits in the social-emotional domain would be represented with the code (110), indicating one academic deficit, one cognitive deficit, and no social-emotional deficits. Using a similar convention, Table 1 provides three-digit outcome codes for most assessment outcomes of an SLD evaluation using the specified three domains.

It is important to note that not all possible numeric codes are listed because SLD identification requires documentation of at least one academic impairment (Fletcher et al., 2007; Kavale & Spaulding, 2008), which excludes codes representing no deficits in the academic domain (010, 020, 011, 021, 022). Similarly, codes (101) and (102), were also omitted in that they better represent a child with emotional-behavioral disorders rather than SLD (i.e., deficits in achievement and social-emotion not explained by cognitive deficits).

TABLE 1 Diagnostic Coding Scheme for Linking Assessment and Intervention Outcomes Along a Continuous Dimension

Domain coding	Outcome code score	Number of deficits	Severity	Intervention level
000	0	No academic, cognitive, or social-emotional	Within normal limits	Level 0
100	1	One academic deficit	Mild	Level 1
200	2	Two or more academic deficits	Mild	Level 1
110	2	One academic, one cognitive deficit	Mild to moderate	Level 1–2
120	3	One academic, two cognitive deficits	Moderate	Level 2
111	3	One academic, cognitive, and social-emotional deficit	Moderate	Level 2
112	4	One academic, one cognitive, two social-emotional	Moderate	Level 2
121	4	One academic, two cognitive, one social-emotional	Moderate	Level 2
211	4	Two academic, one cognitive, one social-emotional	Moderate	Level 2
220	4	Two academic, two cognitive	Moderate to severe	Level 2–3
122	5	One academic, two cognitive, two social-emotional	Severe	Level 3
212	5	Two academic, one cognitive, one social-emotional	Severe	Level 3
221	5	Two academic, two cognitive, one social-emotional	Severe	Level 3
222	6	Two Academic, two cognitive, two social-emotional	Severe	Level 3

Note. 0 = no deficit, 1 = one deficit, 2 = two or more deficits.

As noted in Table 1, the codes provide a heuristic ordering of disability severity. Disability, or condition, severity is represented by the sum of the 3 digit code (e.g., 200 = 2+0+0 = 2, 210 = 3), referred to as the "outcome code score" or just "code score." In general, the code score increases in value as the severity of the condition increases. For example, children with no documented deficits in any domain have the least severe conditions, obviously, and the lowest coding score (000 = 0). In contrast, children with multiple deficits in each domain have the most severe deficits and the highest code score (222 = 6). Similarly, the code score adequately provides a numeric value in-between these two extremes to represent gradations in disability severity.

IAIM accurately represents disability severity along a continuous dimension, as demonstrated by the code score, and also accurately reflects measured person deficits. Representation of disability severity along a continuous dimension provides an important step in linking assessment outcomes to intervention services. Similarly to assessment outcomes, IAIM orders interventions along a continuous dimension with different levels. Levels are defined by the degree of support and resources needed to implement the intervention, and, in practice, can be flexibly defined based on contextual resources. For demonstration purposes, levels will primarily be defined as the degree of deviation in general instruction required to implement the intervention. Table 2 provides descriptions of intervention services across four levels, although this could be reduced or expanded based on contextual resources. The levels are listed as a continuum and range from Level 0 (*no deviation from general education*) to Level 3 (*drastic deviation from general education*).

Level 0 intervention services represent general education and would include all children of which no evidence is available to indicate any type of academic deficit. Level 1 services are designated for children with documented academic impairment in at least one or more academic domains (e.g., screening, teacher concern, failed high-stakes test). Level 1 services may include accommodations in general education, progress monitoring, or minor adaptations to the general curriculum or classroom environment. Level 1 service may include any minor change to a child's educational environment that could be implemented easily and without much expense.

Level 2 interventions are provided for children with documented academic deficits but also one or more measured deficits in cognitive processing. Level 2 services are typical for SLD children who exhibit not only academic deficits but also one or more deficits in cognitive processing, such as phonological awareness (represented by a code of 110, 210, or 220 in Table 1). At this level, children may receive, or be entitled to receive intervention services that require partial resource room or specialized interventions (e.g., phonological processing). More intervention services are justified at Level 2 than

TABLE 2 Levels of Intervention Services Based on a Continuum of Intervention Severity

Level	Instruction	Context	Deviation from general education	Special personnel	Hours in per week
0	General education	General education	0%	None	0
1	Academic support-modification	General education	Less than 25%	None	1–3
2	Specialized intervention	Partial special education	25 to 75%	Special Education small group	4–8
3	Multiple specialized interventions	Full special education	Greater than 75%	Specialized one-to-one	9+

Level 1 because of evidence of greater functional impairment as measured in domains beyond academic achievement.

Level 3 intervention services include the most intense intervention and are provided to children with the most severe learning problems. This level is reserved for children who require multiple intervention support services and instruction primarily in a non–general education setting. Similar to Levels 1 and 2, more intervention services are justified at this level because of greater evidence of functional impairment in domains beyond academic achievement.

IAIM links assessment and intervention by connecting children with more severe deficits, indicated by different code scores, with more intense interventions. For example, children with documented one or more deficits in the academic domain would have code scores ranging from 1 to 2 (100 = 1, 200 = 2). This range of code scores would link to Level 1 (mild interventions), which appropriately provides instructional support for children with only documented evidence of minor academic problems. Similarly, Level 2 interventions, in general, correspond to conditions with a sum score of 3–4 (110, 120, 111, 112, 121, 211, 220) and include not only one or more academic deficits but also at least one or more cognitive deficits and possibly deficits in the social-emotional domain. Last, children with the largest number of measured deficits (e.g., multiple deficits in multiple domains), as indicated with a code score of 5–6, would receive the highest level of services (Level 3). Again, Level 3 intervention services require are more intensive intervention services as well as more resources to implement, which is justified on the basis of available evidence.

Children may transition between levels on the basis of evidence of greater functional impairment as measured across different domains and represented by different code scores. For example, children receiving Level 1 services, by definition, have demonstrated some evidence of academic problems. When children fail to respond to Level 1 interventions, Level 2 services may be obtained by collecting additional evidence of functional impairment beyond the academic domain. This process not only ensures children with the most severe problems are matched with the appropriate resources, but also prompts an evaluation to better understand "why" a child is not responding. As a further example, a child with specific reading problems and two cognitive deficits (e.g., phonological deficits and deficits in verbal comprehension) may be considered for Level 2 services according to Table 1. This condition would be represented with the code (120) and a code score of (3), which corresponds to Level 2 services. However, if the child's verbal comprehension deficits also affected scores in the academic domains of listening comprehension, which is part of the Individuals With Disabilities Education Act of 2004, then the child would have 2 academic deficits and two cognitive deficits (220 = 4). In this case, the child would still qualify for Level 2 intervention services but may be programmed to receive the upper range of services within this Level because intervention services are described as a range of services and a code score of 4 represents the upper range. Here again, the code score accurately represent disability severity along a dimension and provides a link to the appropriate level of intervention support, even for interventions under the same level.

Generalization of IAIM

As previously mentioned, SLD identification methods must interface with more general special education classification systems. IAIM can be easily generalized to conditions beyond SLD. For example, the Wodrich and Schmitt (2006) model provides diagnostic criteria for a variety of identifiable behavioral conditions frequently of concern to school personnel and provides empirically validated interventions for each condition. Two conditions specified in the Wodrich and Schmitt (2006) model, and many other models, are mild mental retardation and nonverbal learning disability. The criteria for mild mental retardation include multiple deficits in academic, cognitive, adaptive, social skills, and several other domains of functioning. Criteria for nonverbal learning disability include a mixed profile of academic strengths and weakness that most typically results in a weakness in math, specific visual-perceptual deficits in the cognitive domain, and some social deficits. Generalizing IAIM, mental retardation involves multiple deficits in at least 4 domains so an additional digit to the code score would be added (coded as 2222 = 8). Nonverbal learning disabilities are described as single deficits across three domains (111 = 3), so only a three-digit code is used. As illustrated, IAIM indicates children with mental retardation generally require more intense levels of intervention services than children with nonverbal learning disability, which is intuitively accurate. In addition, the code score for nonverbal learning disability is in the range of other conditions characterized by specific learning impairments (Wodrich & Schmitt, 2006). Table 3 provides a more comprehensive listing of various other conditions in the Wodrich and Schmitt model with corresponding coding schemes and levels of interventions.

SUMMARY

This article has argued for a critical need to integrate different procedures for SLD identification permitted within the Individuals With Disabilities Education Act of 2004 guideline. A difference in theoretical assumptions across SLD procedures was identified as a considerable barrier in achieving this goal. Two theoretical approaches to SLD procedures were also identified. The term *instructional behavioral approach* was used to

TABLE 3 Code and Intervention Levels for a Variety of Disabilities and Learning Problems

Condition or disability	Codes	Code score range	Intervention level	Intervention type
No problem	000	0	0	Instructional support
Ability-experience mismatch	000, 100, 200	0-2	1	Instructional support
Slow learner	000, 100, 200	0-2	1	Instructional support
Phonological reading disability, graphomotor disability	110, 210, 120, 220	2-4	2	Targeted interventions
Nonverbal learning disability	110, 120, 220, 121	2-4	2	Targeted interventions
Attention deficit hyperactive disorder	110, 120, 210, 220, 221, 222, 111, 112	2-4	2	Targeted interventions
Mental retardation*	2212, 2222	5-8	3	Multitargeted Interventions
Autism*	2212, 2222	5-8	3	Multitargeted Interventions

*Based on four domains of functioning.

describe SLD procedures that focus on recording behavioral responses based on manipulating variables related to academic instruction delivery. In contrast, the term *person attribute approach* was used to describe SLD procedures that focus on measuring attributes internal to the person (e.g., cognition, cognitive processing, intelligence) that are inferred based on behavioral responses to theoretically designed measures. IAIM was presented as a conceptual unification to these two different approaches. It is based on a coding scheme that adequately represents disability severity along a continuous dimension on the basis of empirical evidence across multiple domains of functioning (e.g., academic, cognitive, social-emotional). Similarly, interventions are represented along a continuous dimension and linked to disability severity through specification of intervention levels. IAIM was demonstrated to adequately capture a range of learning problems that require academic support as well as intense accommodations. Similarly, IAIM was demonstrated to generalize to conditions and disabilities beyond SLD identification.

A benefit of IAIM is that the identification of children with disabilities is simplified. There is no need for complex discrepancy formula or sophisticated profile analysis. Assessment results are directly tied to interventions through an evidence-base of functional impairment. A variety of assessment methods (Flanagan et al., 2007; Fletcher et al., 2007; Hale & Fiorello, 2004; Pennington, 2009) may be used with this scheme. Similarly, it incorporates the importance of a continous levels of intervention support, which is an important component of most RTI intervention models. IAIM directly links assessment outcomes with intervention supports. Intervention levels may be contextually defined in particular schools or school districts, professional judgment is still needed to select appropriate interventions within levels. IAIM provides a simple method to provide a general link between a child's assessment outcomes and the corresponding intervention services, which could be easily automated through computer software that links a code score with intervention resources.

IAIM is based on a multidimensional, or multidomain, evaluation process that includes domains beyond academic achievement, which is strongly supported by research. Cognitive deficits in phonological awareness have been clearly linked to reading problems (Vellutino et al., 1996). In addition, neurocognitive variables predict reading outcomes beyond phonological awareness (Frijters et al., 2011). Swanson's (1999) synthesis of the intervention literature for children with learning disabilities found interactions between cognitive strategies and direct instruction. Similar child-by-instruction interactions were found in a study examining the effects of teacher-managed code-focused instruction along with child-managed meaning-focused instruction (Connor, Morrison, & Underwood, 2007). There is a strong empirical basis for using cognitive ability to predict academic achievement (Deary, Strand, Smith, & Fernandes, 2007) as well as intervention outcomes (Fuchs & Young, 2006) and how specific cognitive weakness contribute to specific academic deficits (Berninger & Richards, 2002; Hale & Fiorello, 2004; Johnson & Swanson, 2010; Naglieri & Pickering, 2003; Wolf et al., 2002). IAIM provides a general framework for how cognitive assessment results may be incorporated and used to inform intervention efforts, which has previously been disregarded or unspecified.

Future research is clearly needed. The number of domains and the evidence required within each domain was not definitively specified in this manuscript but would need to be prior to implementation at the school level. Future research is needed to equate constructs across different test batteries. For example, a child exhibiting deficits in *Ga* (general auditory processing) on the Woodcock-Johnson Third Edition (Woodcock, Mather, & McGrew 2001) as well as phonological awareness deficits on the Comprehensive Test of Phonological Processing (Wagner, Torgesen, & Rashotte, 1999) should not be considered to have two cognitive deficits, as both tests are measuring a similar cognitive construct. Cross-battery assessment research has already made considerable steps toward resolving this problem (Flanagan et al., 2007), but additional work is needed. Similarly, specification of intervention levels is needed. Research and consensus on how interventions may be described with a few abstract variables (e.g., deviation from curriculum, expense, time) is critically needed. Future research is needed to validate the use of the outcome code score to verify children with higher scores have greater need for more intense interventions. However, deductive arguments that reflect clinical experience and known research already suggest children with more severe disabilities have more measured deficits and require more intervention services. Nonetheless, more empirical verification specifically using IAIM is needed.

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