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Specific Learning Disabilities in DSM-5: Are the changes for better or worse?[1]

Rosemary Tannock, Professor Emeritus,
Ontario Institute of Studies in Education, University of Toronto, &
Senior Scientist, Neurosciences & Mental Health Research Program,
Research Institute of the Hospital for Sick Children

Abstract

DSM-5, the fifth edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders*, was published in May 2013, amidst a storm of controversy. This article focuses on changes made to the diagnostic criteria for Specific Learning Disorders (SLD). Primary criticisms of the changes in the SLD concern the aggregation of the DSM-IV subtypes into one overarching category, the failure to codify Dyslexia as a distinct type of SLD, and the inclusion of response to intervention as one component of the criteria. This article first summarizes the historical perspectives on SLD. Next, the changes made to the diagnostic criteria are presented, followed by a discussion of the rationale and evidence on which the changes were based. It concludes with a discussion of the possible impact on clinical practice, research and policy.

[1] This invited peer-reviewed article is based on the Cruickshank Memorial Lecture presented by Dr. Tannock at The International Academy for Research on Learning Disabilities, Boston, May 2013. From 2007 to 2013, Dr. Tannock was a member of the DSM-5 Work Group for ADHD and Disruptive Behavior Disorders and a liaison member of the Neurodevelopmental Disorders Work Group to advise on Learning Disabilities. She received funding from the Canada Research Chairs Program to partially support the research for this article.

"You could think of it as the book of our woes."

(Gary Greenberg: *The* **Book of Woe**: *The DSM and the Unmaking of Psychiatry*, 2013)

The DSM-5 is the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* published by the American Psychiatric Association (APA, May, 2013). As with the previous versions, this new volume has received strong criticism from the public, individuals with LD and their families, policy makers, and from clinicians and researchers in the field of mental health. One explanation for the storm of controversy it spawned is the magnitude of its potential impact. Created initially to provide a common language about mental disorders for clinicians, the DSM is now used in the United States and other countries as a universal authority for the diagnosis of mental disorders: what constitutes a mental disorder, how mental disorders are to be conceptualized, and their diagnostic criteria. Thus, the DSM has a broad influence not only on the diagnosis of mental disorders, but also how they are perceived by the public, healthcare personnel, employers, and those in the school and judicial systems; how they are funded by medical insurance agencies; how research agendas are set; and how the public policy for mental health is maintained or changed.

Each new version of the DSM has received strong criticism, including the ongoing concern that each version continues to reify the concept of 'discrete disorders' of the mind, based on various sets of observable signs and symptoms, rather than on specific biological tests or atypical patterns of brain-based states (e.g., Casey et al., 2013; Francis & Nardo, 2013). Notably, each one of these purportedly discrete mental disorders shows marked heterogeneity and high rates of comorbidity (co-occurring disorders in one individual). The DSM-5 presented an opportunity to tackle these overarching concerns, and give careful consideration to the current boundaries drawn between various disorders and their subtypes. Accordingly, sets of guiding principles for making changes to the previous version (DSM-IV-TR) were compiled (e.g., Kendler et al., 2009; Regier, Kuhl, Narrow, & Kupfer, 2010). These guiding principles, as well as the administrative structure and procedures of the DSM-5, have been described elsewhere (e.g., Regier, Kuhl, & Kupfer, 2013; Tannock, 2013). Here, I summarize a few key guidelines and procedures that were particularly pertinent to the conceptualization and diagnosis of Learning Disabilities (LD).[2]

One guiding principle was to be mindful that the DSM is a medical manual designed primarily to be an evidence-based tool to guide clinicians in assessment and diagnosis of mental disorders. This principle was supported by the establishment of an external Scientific Review Committee (SRC), which provided external review of all proposals for diagnostic change (Kendler, 2013). Proposals were reviewed and scored independently by at least two SRC members, using a 6-point scale to evaluate their level of empirical support (Kendler,

[2] The term 'Learning Disabilities' will be used throughout this article, consistent with terminology used by IARLD, rather than the DSM-5 term 'Specific Learning Disorder.' The exception is when referring specifically to the condition as defined by DSM-5. Note that medical conditions are called disorders rather than disabilities: 'Learning Disabilities' is an educational term.

2013).[3] Three clusters of validating evidence were considered (antecedent, concurrent, predictive), as outlined by Robins and Guze (1970). Major changes needed stronger empirical justification in three specified validator categories that include: familial/genetic (antecedent); cognitive and biological factors, comorbidity (concurrent); diagnostic stability, course of illness, and response to treatment (predictive). Thus changes made to the diagnostic criteria for SLD were based on a comprehensive review of empirical and clinical evidence available at the time.

Other guiding principles were the requirements to balance scientific evidence and clinical utility, take a lifespan perspective (developmental continuities/discontinuities), and consider international compatibility and cultural influences on the expression and interpretation of mental disorders, as well as changes that facilitate harmonization of DSM with the International Classification of Diseases (ICD) and its impending 11th edition (World Health Organization, 1992).[4] This meant that the criteria for SLD needed to consider developmental changes in the manifestation of SLD across the lifespan as well as being culturally sensitive and relevant for countries other than the USA or other English-speaking countries, with diverse languages and symbolic systems (transparent versus deep orthography; alphabetic versus nonalphabetic symbol systems; numeral and counting systems). Moreover, since scientific knowledge had not yet advanced enough to use neuroscience and genetics to shape the conceptualization of mental disorders in DSM-5, the diagnostic criteria were to remain as behavioral descriptors.

The DSM-5 Manual advises that the diagnostic criteria "are offered as guidelines for making diagnoses, and their use should be informed by clinical judgment" (APA 2013, p.21). Each chapter has a section, called "Diagnostic Features", designed to help support diagnosis by providing more detailed explanation and discussion of the diagnostic criteria and associated features supporting a diagnosis, along with information about prevalence, developmental course, risk and prognostic factors, culture- and gender-related diagnostic issues, functional consequences of the disorder, differential diagnosis, and comorbidity.

The DSM-IV category of *Learning Disorders* is one of many disorders that underwent major changes in DSM-5 and which unleashed a flood of multi-media protestations, as well as international scientific commentary (e.g., Cavendish, 2013; Scanlon, 2013; Al-Yagon et al., 2013). Before discussing the DSM-5 changes to this diagnostic category, a digression is necessary to set the broader landscape of challenges in the field of

[3] Scoring: 1= strong support; 2 = moderate support (acceptable); 3 = modest support (questionable); 4= limited support (probably not justified); 5 = poor support (do not include); and 6= insufficient data

[4] The World Health Organization (WHO) publishes a manual, the International Classification of Diseases (ICD), that lists specific diagnostic criteria for all medical illnesses, including mental disorders. Each country may publish its own diagnostic manual based on the ICD provided it does not change its intent and must update it in accordance with ICD updates. In the USA, the American Psychiatric Association (APA) was assigned responsibility for updating components related to mental disorders. Thus DSM-IV was based on ICD-9 and DSM-5 was based on ICD-10 but with cognizance of the impending ICD-11.

Learning Disabilities (LD), which faced the Work Group responsible for proposing any changes to its conceptualization or diagnostic criteria in DSM-IV.

Historical Conceptualization and Definition of LD

The field lacks a complete understanding of LD: instead there are burgeoning descriptions, guises, guesses, hypotheses, and controversies. To date, there is no international consensus as to what constitutes LD, its operational definition (diagnostic criteria), or who can or cannot conduct the required assessment or make the diagnosis.

Thus, prior to and throughout the decade-long making of the DSM-5, the field of LD faced substantial challenges at many levels: conceptual (e.g., What constitutes LD?); operational (e.g., How do we define who does and does not have LD?); political (e.g., Who has or should have ownership or responsibility for defining and treating LD? What are the socio-economic costs of LD? What degree of control should be accorded to advocacy groups for specific manifestations of LD?); and legal (What are the laws pertaining to LD in the US and other countries? Should federal law dictate who can assess LD, the assessment process, or its diagnostic criteria?). So one key issue is whether the changes wrought in DSM-5 are for better or for worse. What would 'Bill' Cruickshank have to say about DSM-5's conceptualization and definition of LD? The latter question necessitates a brief detour to summarize historical perspectives on LD. The history of LD has been well-documented by others (e.g., Hallahan & Mercer, 2001) and so will be merely summarized herein. Most notable, however, is that these accounts focus primarily on dyslexia or LD in general, with little or no mention of dyscalculia.

Early perspectives of LD shared some commonalities: a) recognition that impaired academic skills (reading, arithmetic) occur in the context of average or even superior intellectual abilities; and b) a focus on impairments in specific component skills (e.g., word reading, calculation) rather than viewing an academic domain as a unitary construct. Other important insights from these early perspectives include the notion that LD (dyslexia) was congenital, heritable, and manifested primarily by males. However, whether or not LD occurred as an isolated domain-specific deficit or could also be accompanied by deficits in other academic domains remained controversial, as it does today (e.g., as defined in the ICD taxonomy).

Underlying cognitive deficits (possible causal factors) focused initially on visual problems. For example, Hinshelwood (1917) postulated that the primary disability of children with word blindness was in visual memory for letters and words and that it was an inherited condition. Orton (1925) continued to emphasize visual problems and used the Greek term, strephosymbolia, to capture the frequently observed letter reversal that he attributed to mixed cerebral dominance. The advent of IQ tests (i.e., Standford-Binet, 1916) allowed Orton to directly evaluate the observed difference in a person's academic skills and intellectual ability. However, the notion of a discrepancy between measured IQ and achievement has been attributed to Monroe (1932), who used this criterion to identify

students with reading disabilities. Nonetheless, although Orton (1925), Monroe (1932), Kirk (1976) and others espoused an hypothesis of visually-based deficits and mixed cerebral dominance, they focused on phonics and sound blending techniques as instructional techniques, thereby paving the way for the prevailing view of reading disabilities as a language-based disorder.

The 1940s constituted the era of the 'brain-damaged child', which incorporated a broader array of cognitive deficits, including perceptual, perceptual-motor, and attention difficulties (e.g., Strauss & Kephart, 1955; Strauss & Lehtinen, 1947). However, it was not until the 1960s that LD emerged as a formal category – a term accredited to Kirk (1962) − and the notion of a discrepancy between IQ and achievement prevailed as a defining feature of LD. Likewise, Cruickshank incorporated the IQ-achievement discrepancy criterion in his definition of LD: "an inherent dysfunction in the learning process which is manifested in deficiencies in one or more academic skill subjects, language or communication problems and/or social adaptation problems," but also that was characterized by a "significant discrepancy between measured potential and measured performance of both an academic and social nature" (Cruickshank, 1984, p.7). Cruickshank also expanded the concept of LD, defining it as "an inherent dysfunction in the learning process which is manifested in deficiencies in one or more academic skill subjects, language or communication problems and or social/adaptation problems" (Cruickshank, 1984, p.7). He also proposed that these learning difficulties were the result of perceptual as well as linguistic processing deficits.

In the USA, the conceptualization of LD was consolidated in the federal definition (United States Office of Education, 1977) and in the definitions of professional organizations (e.g., National Joint Committee on Learning Disabilities, 1978), and LD achieved official federal status as an eligible category for direct services (Education for All Handicapped Children Act, 1975). According to the U.S. Federal Law (IDEA, 2004, LD is defined as "a disorder in one or more basic psychological processes involved in understanding or using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do arithmetical calculations." Thus the notion of underlying deficits in cognitive processing as causal factors was instantiated in the conceptualization of LD. Moreover, LD was stated to include conditions such as perceptual disabilities, brain-injury, minimal brain dysfunction, dyslexia, and developmental dysphasia (thereby continuing its earlier conceptualizations), but excludes learning problems resulting from visual, hearing, or motor disabilities, mental retardation, emotional disturbance, or environmental, cultural or economic disadvantage. Thus this prevailing legal definition restricts the concept of LD to a language-based disorder, but does not include non-language-based learning difficulties, such as dyscalculia, as defined by some researchers. In other words, speech and oral language problems are included in the federal LD category (which are coded separately as Communication Disorders in ICD and DSM taxonomies), but neither learning difficulties in a basic sense (a.k.a., dyscalculia) nor motor skills are included. Thus, the federal/legal and medical categories of LD differ in the range of learning difficulties they

encompass as well as in the imputed boundaries between disabilities/disorders. Ongoing concerns about the DSM approach to nosology (e.g., Casey et al., 2013; Greenberg, 2013) have spurred in part a recent initiative by the US National Institute of Mental Health to focus on alterations in the brain and its substrates that might signal the location and source of human mental stresses or woes (RDoC: Research Domain Criteria Project; Cuthbert & Insel, 2013).

What is SLD according to DSM-5?

Many children experience difficulties learning in school, but not all such difficulties constitute SLD, as conceptualized in DSM-5. According to DSM-5, SLD is a type of Neurodevelopmental Disorder that impedes the ability to learn or use specific academic skills, such as reading, writing, or arithmetic, which serve as the foundation for other academic learning. Typically, academic skills do not simply 'emerge' with caregiver support and encouragement, as do talking or walking, but rather must be taught. The learning difficulties are 'unexpected' in that other aspects of development seem to follow a typical trajectory, or are only minimally delayed (e.g., grasping, walking, talking). Early signs of learning difficulties may be discernible in the preschool years (e.g., difficulty learning names of letters or to count objects), but they can only be diagnosed reliably after starting formal education. Within the meta-structure or organizational framework of DSM-5, SLD is located within the first chapter – Neurodevelopmental Disorders – alongside autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), as well as communication disorders, developmental coordination disorder, and intellectual disabilities.

SLD is a clinical diagnosis that is not necessarily synonymous with 'learning disabilities' as identified within the education system: that is, not all children with learning disabilities or difficulties identified by the school system would meet a DSM-5 clinical diagnosis of SLD (although all those with a DSM-5 diagnosis of SLD would be expected to meet the educational definition of learning difficulties/disabilities). The two classification systems differ in their underlying purpose of identification, as well as in frequency, degree, intensity, persistence of symptoms, and impairments. That is, the DSM is a medical manual, designed to provide clear descriptions of and diagnostic criteria for psychiatric disorders to enable clinicians, researchers, and others to communicate about, study and treat people with these disorders, in a reliable manner. Thus, diagnosis does not necessarily dictate the need for intervention. By contrast, in the field of education, eligibility criteria define who needs access to special education and other related resources.

In DSM-5, SLD is understood to be a chronic condition that typically persists into adulthood, albeit with changes in the way the learning difficulties manifest (e.g., read slowly and with effort). In part, this is because adults learn compensatory strategies (e.g., avoid reading by using other media to obtain information or for calculation; use specialized software to assist with reading/writing activities or calculators to assist with numerical activities). Thus the diagnostic criteria for SLD also needed to be relevant for adults with

persisting learning difficulties, but who had never been formally recognized or diagnosed and seek help for their ongoing difficulties as an adult.

The causes of SLD are unknown, but research suggests that learning difficulties run in families, are heritable, and involve interplay of both genetic anomalies and environmental factors (e.g., prematurity, prenatal exposure to neurotoxins from tobacco, alcohol, street drugs, or other environmental toxins). Neither are the underlying mechanisms of SLD known, although both neural and psychological accounts exist, particularly for difficulties learning to decode words (e.g., Soltesz et al., 2013). Neuroimaging studies have revealed alterations in both structure and function, but it is unclear whether these brain differences are a cause, consequence or correlate of SLD (e.g., Butterworth & Kovas, 2013; Grigorenko, 2001). Hence, neuroscientific findings are considered in text discussions that accompany the DSM-5 framework, with the intent to update DSM-5 electronically as new diagnostically useful information from neuroscience or genetics becomes available (Kupfer, Kuhl, & Regier, 2013).

What changed from DSM-IV to DSM-5?

Two major changes were made, each of which contributed to what might appear as multiple changes: 1) one overarching category of learning disabilities (SLD) is defined, which is then characterized more precisely through the use of "specifiers" to provide a comprehensive description of its manifestations in the domains of reading, writing, and arithmetic, as presenting at the time of assessment; and 2) the IQ-achievement discrepancy criterion, which was the primary diagnostic criterion in the previous versions of DSM, was eliminated and is now replaced by four criteria in DSM-5.

Whereas previous versions of DSM differentiated various subtypes of LD (e.g., Reading Disorder, Disorder of Written Expression, Mathematics Disorder), DSM-5 conceptualizes these 'subtypes' as 'specifiers' for various manifestations of a single disorder that renders learning very difficult and effortful, despite at least average intellectual abilities, and which gives rise to marked impairment at home, school, work, and in daily activities. Whereas subtypes define mutually exclusive and jointly exhaustive phenomenological subgroupings, specifiers are not intended to be mutually exclusive or jointly exhaustive, so that more than one specifier may be coded. Specifiers are designed to afford an opportunity to define a more homogeneous subgrouping of individuals with the disorder (in this case, with SLD), who share some key features, and to inform clinical management. Importantly, specifiers refer to the current clinical manifestation at the time of assessment and are not intended to imply a permanent manifestation or condition. Three major specifiers are listed for SLD that are to be coded, each with examples of components that are commonly impaired in learning disabilities:

1. *Specific Learning Disorder With impairment in reading*: word reading accuracy, reading rate or fluency, reading comprehension;

2. *Specific Learning Disorder With impairment in written expression*: spelling accuracy, grammar & punctuation accuracy, clarity or organization of written expression; and
3. *Specific Learning Disorder With impairment in mathematics:* number sense, memorization of math facts, accurate or fluent calculation, accurate math reasoning.

Alternate terms, '*Dyslexia*' or '*Dyscalculia*' may be used as per clinician and client/family preference to specify 'With impairment in reading' or 'With impairment in mathematics', respectively. However, in this scenario, clinicians are advised to list the full range of difficulties that are currently manifest in learning, as well as the term 'dyslexia' or 'dyscalculia'. For example, for a child with marked difficulties in single word reading, spelling and in learning basic number facts, a clinician would code: 315.00 (F81.0) Specific Learning Disorder With Dyslexia (word reading accuracy, reading rate), and 315.2 (F81.1) With impairment in written expression (spelling accuracy), and 315.1 (F81.2) With impairment in mathematics (memorization of math facts).

As noted above, the second major change was to eliminate the DSM-IV requirement for an IQ-Achievement discrepancy as the primary diagnostic criterion for SLD. This former criterion has now been replaced with 4 specific criteria that delineate: A) the key behavioral characteristics of SLD; B) measurement of these characteristics; C) the individual's age at their onset; and D) exclusion criteria.

Criterion A provides a list of 6 typical manifestations of learning difficulties (with examples). One of the following symptoms must be present and persisted for at least 6 months despite the provision of intervention that targets the difficulties: i) inaccurate or slow and effortful word reading; ii) difficulty understanding what is read; iii) spelling difficulties; iv) difficulties with written expression; v) difficulties mastering number sense, number facts, or calculation; or vi) difficulties with mathematical reasoning. Criterion A incorporates the concept of 'response to intervention', but it is not meant to refer to the formal process or documentation as in current use in many state school systems in the USA (e.g., Fuchs & Vaughn, 2012; Mastopieri & Scruggs, 2005). Instead, it requires some evidence derived from the clinical interview and school reports that the learning difficulties persist despite the provision of some form of extra help, support or intervention for those difficulties (e.g., in the case of problems with reading comprehension, some attempt has been made to teach comprehension strategies or to enhance word reading fluency or related language skills that contribute to reading comprehension). The 6-month duration requirement is somewhat arbitrary, but is consistent with operationalization of 'symptom persistence' used for other DSM-5 diagnostic categories (e.g., ADHD, Oppositional Defiant Disorder, Schizophrenia) and is designed to help distinguish atypical from typical learning.

Criterion B requires that the affected academic skills be confirmed and quantified as being below those expected for chronological age (i.e., low academic achievement) and cause significant impairment in academic or occupational performance or in activities of

daily living. This is to be done by means of both clinical assessment and individualized, standardized academic testing. No specific scores are included in this diagnostic criterion, but guiding principles are presented in the section on 'Diagnostic Features' in the accompanying text in DSM-5. One guiding principle advises clinicians to consider both the clinical indicators of learning difficulties (low academic achievement for age or average achievement that is sustainable only with extraordinarily high levels of support or effort) and psychometric evidence from individually administered, psychometrically sound and culturally appropriate, standardized tests of academic achievement. In countries or situations in which standardized tests are not available or relevant, then the clinician needs to review any available documentation of scores or reports. Another guiding principle is for clinicians to keep in mind that academic skills are distributed continuously in the population, so that there is no natural cut-point that can be used to differentiate individuals with and without SLD. Thus any threshold score used to signify low academic achievement is somewhat arbitrary and might vary across tests. A threshold score for low academic achievement is proposed (e.g., at least 1.5 standard deviations below the mean for age, which translates to a standard score ≤ 78, which is below the 7^{th} percentile), but clinicians are advised that clinical judgment might support a more lenient cut-off in some circumstances (e.g., 1.0 to 1.5 standard deviations below the mean for age).

Criterion C specifies the age at onset of the learning difficulties: namely that they begin during the years of formal schooling. However, clinicians are advised that for some individuals, their learning difficulties may not fully manifest until later years (e.g., high school, post-secondary education, adulthood) when the demands for the affected academic skills exceed the individual's limited or compensatory capacities. For instance, demands for timed tests, reading or writing lengthy reports within a tight deadline, or excessively heavy academic or occupational workloads may exceed the individual's coping strategies, especially under situations in which support or accommodations that were provided in earlier years are no longer available.

Criterion D requires evidence that the learning difficulties are 'specific' in that they are not attributable to Intellectual Disabilities, uncorrected auditory or visual acuity deficits, other major psychiatric or neurological disorders, severe psychosocial adversity, lack of proficiency in the language of educational instruction, or absence or inadequacy of educational instruction. The DSM-5 definition of Intellectual Disabilities must be taken into account for the diagnosis of SLD: deficits in both intellectual and adaptive functioning that have an onset during the developmental period. According to DSM-5, individuals with Intellectual Disability have scores of approximately 2 or more standard deviations below the population mean, allowing a margin for measurement error (i.e., on IQ tests with a SD of 15 and a mean of 100, this involves scores at or below 65-75 [70 ± 5].

Also, clinicians are required to specify the current severity of the learning disabilities (mild, moderate, severe). Severity specifiers for SLD are based on an admixture of the range of learning difficulties and the likelihood of gaining proficiency in the academic skills given

specialized teaching, accommodations, or support services (at school, home, or workplace). For example, SLD of 'moderate' severity is described as having marked difficulties learning academic skills in one or more domains, so that some intervals of intensive and specialized teaching (in the school years) and some accommodations or support services (in home, school or work place) are likely to be required to acquire and use the academic skills proficiently. It should be noted that the severity specifiers were developed in response to the APA requirement to develop disorder-specific severity ratings: these severity ratings for SLD have yet to be validated.

What was the rationale and evidence base for these changes?

Rationale and evidence for a single overarching diagnostic category

The decision to define a single overarching diagnostic category, called 'Specific Learning Disorder' with specifiers for its various manifestations, was based on a comprehensive review of the empirical literature (prior to May, 2012) on antecedent, concurrent, and predictive validators.

Most of the evidence for antecedent validators that came from twin and family studies, supported the aggregation of DSM-IV-TR categories into one single category. For instance, although one large-scale family study found evidence of both disorder-specific familial transmission and co-segregation of arithmetic and reading/spelling difficulties (Landerl & Moll, 2010), twin studies consistently find significant genetic and shared environmental overlap amongst reading, mathematics, and written expression disorders (as well as with Attention-Deficit/Hyperactivity Disorder (Willcutt et al., 2010), suggesting that these purportedly distinct Learning Disorders have a common genetic etiology (Hart, Petrill, Thompson, & Plomin, 2009; Haworth et al., 2009; Kovas, Haworth, Dale, & Plomin, 2007; Olson et al., 2013; Willcutt et al., 2010). However, some studies measuring different components of reading, writing, or mathematics, found evidence of some unique genetic influences on math fluency and speeded writing copy (Olson et al., 2013.) Moreover, the review of environmental risk factors revealed robust evidence from meta-analyses, large-scale prospective studies, and systematic reviews, that prematurity or very low birth weight increases the risk for LD across all academic domains in childhood (Aarnouds-Moens, Weisglas-Kuperis, van Goudoever, & Oosterlaan, 2009; Johnson, Wolke, Hennessy, & Marlow, 2011; McGowan, Alderdice, Holmes, & Johnstin, 2011), as does prenatal exposure to nicotine (Anderko, Braun, & Auinger, 2010, Batstra, Hadders-Algra, & Neeleman, 2003;O'Callaghan et al., 2010; Yolton, Dietrich, Auinger, Lanphear, & Hornung, 2005). Similarly, studies of prior psychiatric history also supported one overarching category. For example, developmental history of Communication Disorders (Speech Sound Disorder, Specific Language Impairments, alone or in combination) in preschool years is a common precursor of all three LD categories listed in DSM-IV-TR, but particularly for poor skills in reading comprehension, spelling, arithmetic fact retrieval, and calculation (Anthony et al., 2011; Jordon, Wyllie, & Mulhern, 2010; Lewis et al., 2011). Moreover, one longitudinal

study of a community-based sample of children identified with pervasive speech/language disorders in kindergarten were found to have an estimated 3- to 6-fold greater risk for LD (all categories alone or in combination) in young adulthood compared to typically-developing youngsters (Young et al., 2002).

By contrast to the evidence from studies of antecedent validators, the literature on concurrent validators provided mixed findings with respect to 'lumping' versus 'splitting' LD. On the one hand, high rates of comorbidity amongst the various categories of LD across the lifespan and across divergent cultural/linguistic groups challenge their discreteness (Hart et al., 2009; Katusic, Colligan, Weaver, & Barbaresi, 2009; Kovas, Haworth, Harlaar, et al., 2007). For instance, a US epidemiological study revealed that about 75% of youth with Written Expression Disorder also meet criteria for Reading Disorder, and that about 50% with a Mathematics Disorder have comorbid Reading Disorder (Barbaresi, Katusic, Colligan, Weaver, & Jacobsen, 2005; Katusic et al., 2009). Moreover, most studies found that the academic impairments associated with one of the DSM-IV-TR disorders (e.g., reading disorder) extend far beyond those expected – for example, include deficits in those aspects of mathematics that require manipulation of the verbal code (Boets & De Smedt, 2010; De Smedt & Boets, 2010; Gobel & Snowling, 2010, Raghubar et al., 2009). On the other hand, however, this literature also confirmed that deficits can occur in just one academic domain (e.g., in written language but not in reading, or in math but not in reading (Barbaresi et al., 2005; Davis, Haworth, & Plomin, 2009; Katusic et al., 2009) or even in one academic skill within one academic domain, such as in word identification but not reading comprehension or vice versa (Snowling & Hulme, 2011). Likewise, studies of cognitive factors have provided mixed evidence. Small-scale studies indicate both shared and unique cognitive features amongst the DSM-IV-TR LD categories (Landerl, Fussenegger, Moll, & Willburger, 2009; Schuchardt, Maehler, & Hasselhorn, 2008; van der Sluis, van der Leij, & de Jong, 2005). In contrast, a large scale investigation of cognitive correlates of Reading Disorder in twins concluded that although this type of LD was typically associated with cognitive deficits in the phonological domain, not all of those affected manifest the same pattern or same number of deficits (Pennington et al., 2012). Moreover, findings from various twin studies of ADHD, and LD in Mathematics or in Reading, suggest that the cognitive profiles of these disorders differ only in subtle ways, mainly in terms of severity, and that the comorbidity between these disorders may be due to a common genetic risk factor leading to slow processing speed (Willcutt et al., 2010).

Studies of predictive validators have also provided mixed evidence for 'lumping' versus 'splitting'. On the one hand, there is evidence for the diagnostic stability of the various DSM-IV categories of LD, provided the same definition of LD was used across the various assessment points (Astrom, Wadsworth, & DeFries, 2007; Shalev, Manor, Auerbach, & Gross-Tsur, 1998; Shalev, Manor, & Gross-Tsur, 2005; Wadsworth, DeFries, Olson, & Willcutt, 2007). On the other hand, longitudinal studies provide strong evidence of a developmental accumulation of learning difficulties with increasing cognitive demands of the

curriculum. For instance, children with speech sound disorders in early childhood, later manifest difficulties learning to read, spell, and write in the school years (Lewis et al., 2011). Also, over 50% of children with phonologically-based reading difficulties but no apparent difficulties in learning basic arithmetic at age 5 years, manifest learning difficulties in mathematics as well as continued problems in reading at age 7 (Jordon et al., 2010). However, intervention outcome studies provide no evidence that intervention for one academic domain or its subskills transfers to other academic domains. In other words, the different subtypes of LD recognized by DSM-IV require and respond to different interventions (Lovett, Steinbach, & Frijters, 2000; Morris et al., 2010; Solis et al., 2012; Wilson, Revkin, Cohen, Cohen, & Dehaene, 2006).

In summary, the literature provided stronger support for "lumping" (cluster all manifestations of LD across the academic domains of reading, writing, arithmetic, under one diagnostic category with specifiers for current presentations) than for "splitting" (retain or expand the DSM-IV subtypes). Accordingly, to balance scientific integrity with clinical utility, the DSM-5 Work Group recommended (and the SRC approved) that the various types of DSM-IV-TR LD should be subsumed under a single category, and that the developmental distinctions and continuities amongst the DSM-IV-TR categories should be preserved by marking them as 'current presentation' using *specifiers* to code the various manifestations at the time of assessment. The Work Group had also considered the inclusion of an additional presentation of SLD – namely that of the purported 'non-verbal LD', but we concurred with the conclusion of a recent review of this entity, "there is little evidence to support its use in clinical practice (Spreen, 2011). This conclusion was based on the lack of reliable data on the prevalence of non-verbal LD and on its purported socio-emotional and neurological basis. Moreover, its diagnostic reliability, coverage, descriptive validity, and predictive validity have yet to be tested.

Rationale and evidence for eliminating the IQ-Achievement discrepancy criterion

The primary diagnostic criterion specified for each of the DSM-IV subtypes of LD was the requirement for a substantial discrepancy between IQ and academic achievement. The logic behind the IQ-discrepancy definition is that the cause of the learning difficulties would differ between those with and without IQ-achievement discrepancy. Thus, we sought evidence to support or refute the notion that individuals with learning difficulties with and without an IQ-achievement discrepancy differ in clinically meaningful ways (i.e., in antecedent, concurrent, and predictive validators).

The research indicates that poor readers of at least average intelligence (e.g., IQ $\geq$ 80) with and without an IQ-achievement discrepancy do not differ reliably in clinically meaningful ways. For example, in terms of antecedent validators, the single available study that compared the effects of different diagnostic criteria on familial aggregation of SLD in spelling found no evidence that the diagnostic criteria (regression-based IQ-achievement discrepancy v. low achievement) had any influence on the rate of family member affectedness (Schulte-Korne, Deimal, Müller, Gutenbrunner, & Remschmidt, 1996). By

contrast to the limited evidence for antecedent validators, numerous studies (e.g., Fletcher, Denton, & Francis, 2005; Francis et al., 2005; Siegel, 1992) and meta-analyses (Hoskyn, 2000; Maehler & Schuchardt, 2009; Stuebing et al., 2002) have been conducted to test for differences between discrepant and non-discrepant groups of children with LD in terms of cognitive processes that contribute to learning. Findings are consistent: the two groups do not differ in their cognitive processing skills. However, a recent and innovative taxometric analysis of cognitive processes in individuals with DSM-IV Reading Disorder did find some differences between discrepant and non-discrepant readers (O'Brien, Wolf, & Lovett, 2012). Yet, a recent neuroimaging study failed to find any differences in brain activation patterns in discrepant and non-discrepant readers: both groups showed the characteristic pattern of reduced brain activation in left parietotemporal and occipitotemporal regions (Tanaka et al., 2011). Moreover, Skiba, Landi, Wagner, & Grigorenko (2011) found no systematic effect of IQ-discrepancy or Low-Achievement definitions of SLD on candidate genes, suggesting that individuals with discrepant and non-discrepant IQ-achievement scores do not differ in terms of the biological basis of their LD. Furthermore, our review of studies of predictive validators also failed to find robust evidence of difference between those with and without an IQ-achievement discrepancy. The groups do not differ in long-term prognosis (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Share, McGee, & Silva, 1989), nor do they differ in terms of response to intervention (Hatcher & Hulme, 1999; Stuebing, Barth, Molfese, Weiss, & Fletcher, 2009; Vellutino, Scanlon, & Lyon, 2000).

It was clear that the literature does not support the external validity of the distinction between age-referenced and IQ-referenced definitions of SLD, although it should be noted that most of the research has focused on SLD in reading (DSM-IV Reading Disorder, a.k.a. Dyslexia), which is the most extensively researched manifestation of SLD. Thus, our review of literature from the past two decades concurred with several previous reviews (e.g., Francis et al., 2005; Cahan et al., 2012): there is no robust evidence to support the validity of this criterion. The criterion is conceptually and statistically flawed.

It was not surprising, therefore, that recent roundtable reports (e.g., President's Commission on Excellence in Special Education, 2002), articles (e.g., Stanovich, 2005; Sternberg & Grigorenko, 2002), and the Individuals with Disabilities in Education Act (IDEA, 2004) that governs the provision of special education services in U.S. public schools, all recommend the abandonment of the discrepancy model. However, none of these reports address the major residual problem: namely, with what should the IQ-achievement discrepancy criterion be replaced? Thus, the Work Group reviewed the literature to seek validation of three major approaches that have been proposed: i) inclusion of cognitive processing deficits (e.g., Hale, 2010; Kavale & Forness, 2000); ii) 'response-to-intervention' criterion (e.g., US Department of Education, 2004; Vaughn & Fuchs, 2003); and iii) augmentation of the low-achievement-for-age component of the DSM-IV criterion (e.g., Dombrowski, Kamphaus, & Reynolds, 2004; Tunmer & Greaney, 2009).

Cognitive processing deficits as a possible diagnostic criterion

The underlying premise is that various cognitive (psychological) processing deficits play a causal role in SLD and therefore would serve as valid indicators of SLD. The presumption of underlying cognitive processing deficits is part of the IDEA (2004) definition of SLD, and this approach is strongly supported in the field of neuropsychology as well as by advocacy groups (e.g., Hale et al., 2010).

One major critique of this approach is that 'processing deficits' are rarely measured directly, but inferred from scores on various neuropsychological tests, which in turn measure a complex web of cognitive, behavioral, and motivational processes (Ramus & Ahissar, 2012). A second major critique is the limited empirical support for the inclusion of cognitive processing deficits in the diagnostic criteria for SLD. For instance, although a meta-analysis found moderate to large effect sizes for differences in cognitive processing between children with SLD and typical development, there was no evidence that cognitive deficits contributed to differential diagnosis of SLD (Johnson et al., 2010). Also, a large-scale investigation of two population-based samples, from a US-based cross-sectional study and an international longitudinal study, found that cognitive predictors believed to have a causal role in dyslexia were neither necessary nor sufficient for the diagnosis of SLD in reading (Pennington et al., 2012). Cognitive processing skills cannot be used to rule in or rule out a diagnosis of RD, because the relationship between the cognitive processing skills and reading skill is probabilistic and not deterministic (i.e., not diagnostic).

By contrast, the Work Group's review of the literature on predictive validators revealed quite strong support for the inclusion of cognitive processing deficits as a diagnostic criterion for SLD. For example, several studies report that measures of cognitive processing skills associated with reading (e.g., phonological awareness, naming speed) predicted response to intervention in children with RD (Al Otaiba & Fuchs, 2002; Frijters et al., 2011; Fuchs, Fuchs, & Compton, 2012). However, counter arguments include: i) cognitive deficits associated with RD are not unique to this disorder but are shared with other neurodevelopmental disorders, such as ASD, ADHD, and developmental coordination disorder (e.g., Willcutt et al., 2010); ii) cognitive processing deficits that underlie other manifestations of SLD (mathematics, written expression) remain unclear (Geary, 2010; Ramus & Ahissar, 2012); and iii) the required assessment of cognitive processing skills may be prohibitively expensive and waiting lists are often long (Compton, Fuchs, Fuchs, Lambert, & Hamlett, 2012). Thus the Work Group ruled out cognitive processing deficits as a possible diagnostic criterion for SLD based on consideration of its empirical evidence and clinical utility.

Response-to-Intervention (RTI) as a diagnostic criterion for SLD

A central premise of the RTI approach to the identification of students with SLD is that by providing evidence-based instruction, the possibility that the learning difficulties are a result of inadequate instruction is ruled out. That is, the RTI model assumes that it will differentiate children with SLD from those who are low achieving because of inadequate

educational instruction. RTI has been integrated into US federal law (IDEA, 2004), with all 50 states permitting RTI in SLD identification (Fuchs & Vaughn, 2012). Accordingly, the Work Group reviewed the literature to seek answers to two key questions. First, is diagnostic intervention necessary for the identification of SLD? Diagnostic intervention is defined as evidence-based, small-group instruction for a specified and limited duration, in terms of weeks. Second, does RTI reduce the number of false positives and thereby reduce the prevalence of SLD?

The limited available evidence indicated that an extensive period of diagnostic intervention is not necessary, provided that initial screening is supplemented with standardized testing and a requirement of persisting learning difficulties (Fuchs & Vaughn, 2012; Fuchs et al., 2012; Compton et al., 2012). Studies of the impact of RTI on the prevalence of SLD yield mixed findings: one study reported a substantial drop in the percentage of students meeting criteria for RD after RTI (Torgeson, 2009), whereas more recent studies found only small and negligible reductions on the prevalence of SLD (e.g., Fuchs et al., 2012). One confounding factor is that the overall prevalence of SLD has decreased in the US over the past decade due to other factors (political, administrative changes in the accountability framework in education; economic recession reducing special education services). Moreover, there are several major inherent problems with the use of RTI to identify individuals with SLD, including: i) RTI-based definitions of SLD have a very high rate of false positives (students who do not have SLD) (Fuchs et al., 2012); ii) It remains unclear what constitutes effective evidence-based instruction for the various academic domains, particularly math, written expression, and reading comprehension, and particularly for adolescents; iii) training of teachers in such methods is also lacking (e.g., Scanlon, Gelzheiser, Vellutino, Schatschneider, & Sweeney, 2008); iv) there is an implicit requirement to use 'cut-points' to establish response or non-response to instruction, but such cut-points have not yet been established or validated and response to instruction most likely exists on a continuum, so any cut-point will be arbitrary (Fletcher & Vaughn, 2009); v) it remains unclear how RTI can differentiate those with learning difficulties from those with problems associated with other disorders (e.g., ASD, ADHD, emotional problems), who may also exhibit poor responsiveness to intervention for reasons other than SLD (Mastropieri & Scruggs, 2005); vi) the RTI approach to SLD identification is causing considerable confusion in USA Case Law and the Courts (e.g., Daves & Walker, 2012; Zirkel, 2011, 2012); and vii) the use of formalized RTI intervention would increases expenses for educational systems that are already facing significant challenges and would not be applicable in countries other than the USA, nor is it relevant for adults.

Accordingly, the Work Group ruled out the inclusion of a formalized RTI-based approach as used in the USA, as a diagnostic criterion for SLD. However, an important premise of the RTI approach is the persistence of learning difficulties despite the provision of appropriate instruction. Symptom persistence as a diagnostic criterion is common in many disorders defined in DSM-IV (e.g., ADHD, Oppositional Defiant Disorder, Schizophrenia),

but has never been included in the diagnostic criteria for LD in any previous version of DSM. Moreover, a scan of the literature revealed that whereas the defining criteria for SLD in mathematics (or dyscalculia) typically require evidence of persisting difficulties over two years, such a requirement is rarely if ever required for RD (Geary, 2011a). Outside the USA, RTI has not been embedded in law, but several countries embrace the principle of RTI in their defining criteria for SLD (e.g., Belgium, Netherlands, New Zealand: Gersons-Wolfensberger & Ruijssenaars, 1997; Tunmer & Greaney, 2009).Thus, as recommended by the DSM-5 Work Group and approved by the SRC, the concept of symptom persistence despite the provision of support, extra help, or intervention, was incorporated into one of the diagnostic criteria for SLD (Criterion A).

Augmented low-achievement as a potential diagnostic criterion

There is general agreement that a low-achievement (LA) criterion is a necessary criterion for SLD, but that it is not sufficient as the sole criterion, because there are many factors other than SLD that contribute to low achievement (Chiu, McBride-Chang, & Dan, 2012). Moreover, when used as the sole criterion it yields a higher prevalence rate than the IQ-achievement criterion (particularly when using a liberal cut-off point as is common in the research literature − such as the 90th percentile or 0.75 SD below mean for age) and has insufficient discriminant validity for the identification or diagnosis of SLD (Barbaresi et al., 2005; Hale et al., 2010; National Joint Committee on Learning Disabilities, 2011; Stuebing et al., 2009). However, there remains heated debate and ongoing controversy, particularly in the USA, as to how best to augment the LA criterion to replace the IQ-achievement discrepancy criterion.

Key issues included in the Work Group's review of the literature were: i) the specific cut-off scores used to indicate LA; ii) the impact of also requiring persistence of symptoms or impairment; and iii) the impact of excluding various disorders (particularly, Intellectual Disabilities). As summarized below, this review of antecedent, concurrent and predictive validators provided moderate but not unequivocal support for including a modified LA criterion in the diagnostic criteria for SLD.

In general, evidence for an augmented LA criterion was strongest when a fairly stringent cut-off score was used to index low achievement (i.e., achievement scores ≤ 1.5 SD below the population mean), combined with a requirement for average IQ (or exclusion of Intellectual Disabilities). For example, these combined criteria were used in a study that found familial transmission of SLD (Landerl & Moll, 2010) and moderate heritability of SLD in reading, math, and language, as well as marked overlap in genetic influences on these seemingly diverse academic skills (Kovas, Haworth, Dale et al., 2007; Kovas, Haworth, Harlaar et al., 2007; Haworth et al, 2009). Also, large-scale longitudinal studies of children with SLD in math revealed distinct and persistent difficulties, with the severity of problems varying as a function of the LA cut-off score, with more severe problems associated with scores < 10th percentile, corresponding to ≤ 1.5 SD below the population mean (Geary, 2011a). The use of an augmented LA criterion of SLD has been found to be applicable to

college students (Callens, Tops, & Brysbaert, 2012) and adults with SLD, including those with high IQ (Swanson, 2012). Both studies used low IQ as an exclusionary criterion and required a history of persisting symptoms, but used different LA cut-off scores (Callens: < 10^{th} percentile; Swanson: < 25^{th} percentile). Moreover, a review of case-selection criteria used in 13 major DNA collections for SLD in reading revealed that the majority used an LA criterion augmented with an exclusionary criterion for Intellectual Disabilities (Skiba et al., 2011). Once again, those studies using more stringent LA cut-offs to define the phenotype yielded more significant findings. Importantly, large-scale studies that used stringent cut-off scores (≤ 1.5 SD below the population mean) plus a requirement for at least average IQ (or exclusion of Intellectual Disabilities), found evidence of longitudinal stability of SLD in reading or mathematics (Astrom et al., 2011; Auerbach, Gross-Tsur, Manor, Shaelv, 2008; Geary, 2011b; Stock et al., 2010).

Accordingly, based on the comprehensive review of the available literature (as of May 2012), the Work Group recommended the use of an augmented LA criterion with guidelines for what constitutes low achievement, persistence of symptoms, and what conditions or disorders should be excluded. Thus the text explains that low achievement needs to be operationalized based on the severity of scores on several standardized achievement tests. Most evidence supports the use of a fairly stringent cut-off of at least 1.5 SD below the population mean for age – but a more lenient cut-off score (e.g., 1 to 1.5 SD) might be appropriate given strong clinical evidence of learning difficulties (e.g., family history of SLD, lack of progress in learning over the academic year, etc.). In addition, evidence of persistence of learning difficulties is required. There is little evidence on which to base decisions as to the period of time required for "persistence." Data from the literature on SLD in mathematics would suggest a period of about 2 years; the literature on SLD in reading provides no guidelines. We proposed that a period of at least 6 months would be reasonable, based on criteria used in Belgium and the Netherlands and the Health Council of the Netherlands report (Gersons-Wolfensberger & Ruijssenaars, 1997). Consistent with this report, an additional requirement during this 6-month period is the provision of academic instruction that targets the learning difficulty (e.g., Callens et al., 2012). Also, confounding factors, such Intellectual Disability or borderline IQ, should be taken into consideration, as well as other mental disorders and sensory impairments in vision and hearing. Finally, our proposal was to link response-to-intervention with the requirement for persistence of the learning difficulties (new Criterion A), rather than as a separate and additional criterion. The rationale for this decision is to avoid misinterpretation of 'response to instruction' as requiring extensive documentation of the various tiers of intervention provided and quantification of non-response, all of which might serve to delay diagnosis and access to services. The intent of its use as a qualifier of 'persistence' is to ensure that clinicians (and schools) check to make sure that the individual has received academic instruction that focuses on the area of academic difficulty, and that the individual still manifests learning difficulties.

Implications for Clinical Practice, Education, and Research

The DSM-5 diagnostic criteria for SLD reflects two major changes, each of which necessitated other changes: 1) one overarching category of SLD with specifiers to characterize the specific manifestations of learning difficulties in three major academic domains (reading, writing, mathematics) at the time of assessment; and 2) elimination of the IQ-achievement discrepancy requirement that was replaced by an augmented low-achievement criterion. Four diagnostic criteria must be met: i) at least one of six symptoms of learning difficulties that have persisted for at least 6 months despite the provision of extra help or targeted instruction; ii) confirmation and quantification of low achievement for age that causes impairment in academic or occupational performance, or in activities of daily living, using comprehensive clinical assessment plus individually-administered standardized tests of academic achievement; iii) onset of learning difficulties during the school-age years, although they may not fully manifest until young adulthood in some individuals; and iv) learning difficulties not attributable primarily to other disorders (Intellectual Disabilities, uncorrected auditory or visual acuity problems, other mental or neurological disorders) or adverse conditions (psychosocial adversity, lack of proficiency in the language of instruction, inadequate instruction). These changes are likely to have some impact on daily clinical practice, clinical research, the educational system, professional organizations and advocacy groups for LD, as well as on individuals with LD, their families, community perspectives of LD, and funding agendas. Implications of the required shifts in practice are discussed below.

One substantial practice shift is necessitated by the change from subtypes of LD (Reading Disorder, Mathematics Disorder, Written Expression Disorder) to one overarching category of SLD. For clinicians and researchers, the change will require comprehensive assessment of academic skills, and may reduce the challenges associated with defining the subtype of LD (especially when test scores vary across academic domains, with some falling just below clinical threshold). Instead, specifiers may be used to more precisely characterize the range of problems manifesting at the time of assessment. The identification of a single overarching category of LD is consistent with the US federal law (IDEA 2004), and many educational systems in which LD is delineated as an eligible category for special education, other services, and specific funding. This change may help reduce the confusion of parents and educators when 'additional' LDs are identified in later school years, and help them better understand the developmental changes in manifestation of SLD, which are in part triggered by the increasing learning demands of the curriculum (e.g., early struggles to read single words are often followed by difficulties learning math facts, spelling problems, and difficulties understanding what is read, including mathematical word problems). However, this change also may require retraining of clinicians, school psychologists, and educators to identify and understand this conceptualization of LD and how to design learning pathways for each student with LD, who will have divergent and changing manifestations of their learning difficulties. Hopefully, this change might lead to better alignment of practice between clinical and educational communities. However, the impact on research funding is

unknown: currently US federal funding (NIH) is higher for ASD than for dyslexia and that for dyslexia is substantially greater than for dyscalculia (e.g., Bishop, 2010). Will this change have a negative impact on individuals with a diagnosis of dyslexia or dyscalculia (who often refer to themselves as 'dyslexic' or 'dyscalculic') or on dedicated professional organizations or advocacy groups (e.g., International Dyslexia Association)? It should not, since these terms may be used to specify the nature of their SLD, according to individual preference. Moreover, the requirement to use specifiers to characterize the range of academic skills affected by dyslexia might increase awareness that 'dyslexia' typically encompasses far more difficulties than those related to decoding and spelling words.

A second practice shift is indicated by the abandonment of the IQ-achievement discrepancy criterion as well as the omission of cognitive processing deficits in the diagnostic criteria. The discrepancy model has served as the fundamental conceptualization of LD for decades, despite robust evidence that it is conceptually and statistically flawed. Thus, intellectual assessments have been the core of assessment for LD: they will no longer be required for a DSM-5 diagnosis of SLD, except when Intellectual Disabilities are suspected. Similarly, the notion of underlying cognitive processing deficits as causal to the academic learning difficulties is a widely held postulate, despite ongoing controversy as to which specific processes define LD, and which neural anomalies are related to it (e.g., Rumsey, 2006; Swanson, 2008). In DSM-5, there is no requirement for lengthy and costly neuropsychological assessment of cognitive processing skills for a diagnosis of SLD: such assessment might inform intervention plans but is not required for diagnosis.

A third and related shift will be needed by the new criteria (particularly Criteria A and B), which call for evidence of symptom persistence and the use of a wider array of data that may be used to confirm and quantify low academic achievement. By contrast to the DSM-IV category of LD, psychometric data alone are insufficient for a DSM-5 diagnosis of SLD. Moreover, the need to demonstrate persistence of symptoms despite the provision of extra help or instruction means that evaluations cannot be completed in isolation from the instructional context. These changes will necessitate a much closer collaboration between educators, clinicians, and parents, to provide access to formal and informal school records, academic portfolios and instructional history, as well as information from psychoeducational and clinical assessments. Closer and ongoing collaboration between clinicians, educators, parents, and the individual with SLD might lead to less confusion and frustration while navigating both worlds (educational, clinical) and better outcomes.

The hope is that the DSM-5 criteria for SLD will be reflected in educational and healthcare policies. However, the full impact of the substantial changes made in the DSM-5 diagnostic criteria for SLD must await their international use and validation in epidemiological, longitudinal, neurobiological, and controlled treatment-outcome studies, and feedback from their use in clinical and educational practice, and from individuals with SLD and their families.

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