An examination of psychologists' assessment practices for learning disabilities in Nova Scotia

by

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TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

Learning disabilities are prevalent among school-aged students, yet the practices of psychologists who carry out the assessments have not frequently been documented or examined in Canada. This study explored the practices used by school psychologists to diagnose learning disabilities in Nova Scotia. Sixty-one school psychologists participated by completing the multidimensional survey. A large proportion (39%) of participants endorsed diagnostic practices that aligned with the Learning Disabilities Association of Canada's framework, which requires the measurement of intelligence and cognitive processes. The remaining participants' (61%) practices aligned better with the Diagnostic and Statistical Manual of Mental Disorders (DSM-5); however, 57% of psychologists agreed that IQ tests should be a routine part of these assessments and 85% agreed that IQ tests provide qualitative information about how a student learns. Results showed that as psychologists had more positive endorsements of the usefulness of intelligence tests, and had higher beliefs concerning the biological causes of learning disabilities, they were less likely to follow practices most supported by current research as evidence-based. This study also found that psychologists reported using various methods to operationalize diagnostic reasoning at differing rates: intelligence-achievement discrepancy methods (13.1%), processing strengths and weaknesses methods (21.7%), response to intervention methods (63.3%), and low achievement methods (80.3%). Overall, it appears that psychologists are embracing more practices aligned with the evidence; however, intelligence tests seemingly continue to be used, or endorsed, in ways that do not align well with evidence.

Keywords: learning disabilities, specific learning disorder, psychological assessment, diagnostic practices, evidence-based assessment.

Introduction

Learning disabilities, also known as specific learning disorders, are a group of challenges commonly identified in school-age students. These disabilities are characterized by significant difficulties in acquiring skills in key academic areas such as reading, writing, or math (5th ed. revised; DSM-5-TR; American Psychiatric Association [APA], 2022). Given this high incidence and recognition of academic skills as a social determinant of health (see Ontario Human Rights Commission [OHRC], 2022), it is imperative that the psychologists responsible for assessing students for potential learning disabilities follow practices backed by evidence. There is mounting research on which practices should, and should not, be used when assessing students for potential learning disabilities (Fletcher & Miciak, 2019). However, there has been a significant gap reported between this research and its adoption in the field (Farmer et al., 2021; Lyon et al., 2001; Maki & Adams, 2018; Sadusky et al., 2021; Stanovich, 1999). The use of differing diagnostic criteria, methods, policies, and the beliefs of psychologists, each influence the practices employed for assessing and identifying students with a learning disability. This is problematic because inconsistencies in diagnostic approaches may be harmful to the individuals being assessed, in terms of which students do or do not qualify across different regions or even between schools (Schroeder et al., 2020). Furthermore, the school systems within which assessments take place may be impacted by differing practices, in terms of the varying associated costs (Williams & Miciak, 2018). Despite the importance of research-informed practices to support the best outcomes for individuals (Fletcher et al., 2005; Gross, Farmer & Ochs, 2019) and for systems (Williams & Miciak, 2018), data from the United States indicates that non-evidence-based practices continue (Sadusky et al., 2020). Comparatively, relatively little is known about the prevalence of various assessment and diagnostic practices adopted in Canada.

This study begins to address this gap in our current understanding in the field regarding the assessment and diagnostic practices of psychologists responsible for diagnosing learning disabilities in Canada. The study focuses on one province, Nova Scotia, as education and psychology are provincially governed, and practices may vary across provinces. Within Nova Scotia, the potential for variability of diagnostic practices across districts, practice settings, and individual professionals, leads to uncertainty in how diagnosis is being approached in practice. Thus, it is important not only to review what current research supports as evidence-based practices but also to explore and contrast these findings with diagnostic practices presently occurring within the province. In reviewing the current evidence, I first give a brief overview of the characteristics of learning disabilities. This is followed by an examination of different frameworks and models that psychologists may use in assessing and diagnosing learning disabilities, as well as an overview of the parameters of measurement tools used in assessment. Finally, a summary of knowledge pertaining to current diagnostic practices is provided. Beyond this literature review, the present study is detailed, including an overview of the survey methodology used to answer specific research questions, the results from data collection, and a discussion that positions results from the current study within the larger body of research.

Overview of Learning Disabilities

Learning disabilities, also known as specific learning disorders, are a group of disabilities characterized by an individual's significant difficulty in one or more of the academic domains of either reading, writing, or math (APA, 2022). These domains are often viewed as made up of subdomains that are further delineated to the specific area of academic deficit (Fletcher et al., 2004; Grigorenko et al., 2020; Rutter, 1982). Common Canadian diagnostic frameworks include word-level reading, reading comprehension, mathematic calculations, mathematic problem-

solving, spelling, and written expression as specific areas that may be impaired (APA, 2022; Learning Disabilities Association of Canada [LDAC], 2002), although some have found that spelling ability most frequently co-occurs with word-level reading skills than as its own skill domain (Peterson et al., 2021).

Estimates of the number of school-age students diagnosed with a learning disability range from about 5-10% (Al-Shidhani & Arora, 2012; LDAC, 2007). A larger proportion may be affected by learning disabilities, as these estimates do not account for individuals who have not received an assessment or those who have not identified themselves or their children in Canadian surveys. On a provincial level, a substantial number of Nova Scotia's students are currently leaving elementary school without foundational reading (an estimated 28%), writing (an estimated 49%), and math skills (e.g., an estimated 36%; Nova Scotia Department of Education and Early Childhood Development, 2023). It appears that many of these students could meet the central learning disability diagnostic requirement of a significantly below-average academic skill (APA, 2022). Indeed, some research estimates of the prevalence of reading disabilities alone range from about 5% (Al-Shidhani & Arora, 2012) up to about 15-20% (Katusic et al., 2001; Moll et al., 2014).

Given the number of students affected, it is necessary to consider the potential for negative developmental and life outcomes associated with learning disabilities (Livingston et al., 2018). Early years in school and individual differences in the proficiency with which foundational skills are mastered can have lifelong influences on academic success (e.g., Partanen & Siegel, 2014). Students who begin their elementary school years by experiencing hardship in learning foundational skills, such as word-reading, are likely to continue to experience difficulties in building subsequent skills. This early gap in academic performance

may widen as the years go on and serve to further distance students academically from their peers (e.g., "the Matthew effect"; for review, see Stanovich, 1986). As they progress through their school years, students with learning disabilities are more likely to drop out of school (Partanen & Siegel, 2014), and less likely to further their education beyond high school (Learning Disabilities Association of Canada, 2005). This increases the likelihood that students will experience unemployment (Community Literacy of Ontario, 2013), lifelong socioeconomic disadvantage (World Literacy Foundation, 2018), and homelessness (Barwick & Siegel, 1996; Mishna, 2003).

The socio-emotional well-being of students who struggle academically can also be negatively impacted by the challenges they experience (Livingston et al., 2018). Unfortunately, the first few school years for students who struggle academically are often marked by feelings of failure (Riddick, 2010) and the development of poor self-esteem (Nalavany et al., 2011). Students with learning disabilities are at an increased risk of being stereotyped by educators and peers as 'lazy' or 'stupid' before their disability is identified (McNulty, 2016; Kuhne & Wiener, 2000), and may have a higher risk of negative social outcomes, such as being bullied, rejected, and socially isolated (Integra, 2009; for discussion, see OHRC, 2022). Difficulties may also be exacerbated by the high likelihood of a comorbid diagnosis. Learning disabilities in reading, writing, and math often co-occur in the same child and 25-50% of children with a reading disability will also be diagnosed with attention-deficit/hyperactivity disorder (Langer et al., 2019; Pennington et al., 2009).

Unsurprisingly, mental health outcomes and adult quality of life are also adversely impacted within this population. Individuals with learning disabilities are over two times as likely as their peers to report high levels of distress, depression, and anxiety (Klassen et al.,

2013; Wilson et al., 2009). Moreover, Canadians diagnosed with a learning disability are at an increased risk of experiencing suicidal thoughts and suicide attempts when compared with their non-learning-disabled counterparts (Fuller-Thomson et al., 2018).

Etiology of Learning Disabilities

Contributing factors to learning disabilities have been extensively studied and support an interactive perspective of biological and environmental influences (Cottrell & Barrett, 2017; Lyon et al., 2001; Catts & Petscher, 2022; Vellutino et al., 2004). On the one hand, there is a role for biological factors in the manifestation of learning disabilities; that is, there is an inherited susceptibility, or genetic predisposition toward an individual having a learning disability (Olson, 2002; for discussion, see Catts & Petscher, 2022). These heritable components have been observed in terms of some cognitive abilities related to reading skills (e.g., phonemic awareness and orthographic processing; Olson, 2002) and may be best thought of as 'risk factors' that interact with environmental factors in the manifestation of a learning disability (Catts et al., 2015). Environmental factors, when negative, can also increase the risk of a learning disability (e.g., lack of exposure to literacy materials prior to starting school). However, when environmental factors are positive (e.g., early evidence-based literacy instruction and interventions), these contribute to resilience against the manifestation of a learning disability (Catts & Petscher, 2022). We know, for example, that there is a heritable component to word reading disabilities; at the same time, we know that evidence-based instruction and early intervention can prevent the vast majority of reading disabilities (for discussion, see Moats, 2020).

Proponents of a primarily biological cause of learning disabilities posit that these are intrinsic and manifest as a difficulty in cognitive processing that impacts the ability to acquire

academic skills (Grigorenko et al., 2020; Snowling, 1998). However, aside from phonemic awareness (Brady & Shankweiler, 1991; Bruck, 1992; Bus & Ijzendoorn, 1999; Ijzendoorn & Bus, 1994; Juel et al., 1986; Metsala et al., 1998), which is the ability to access and manipulate the small individual sounds (phonemes) in spoken language (Fletcher & Grigorenko, 2017), no additional cognitive processing deficits have been causally linked to the development of a learning disability in an academic domain (Fletcher, et al., 2004; Fletcher & Grigorenko, 2017; Vellutino et al., 2004). Often, commonly found deficits in phonemic awareness of individuals with learning disabilities are cited as a main argument in favour of a biological view of learning disabilities (e.g., Fiedorowicz et al., 2001). Yet, even though phonemic awareness contributes to a reading disability in some individuals (for review, see Melby-Lervag et al., 2012) a significant portion of variability in phonological processing is not accounted for by biological factors (Catts et al., 2017; O'Brien & Yeatman, 2020; Pennington et al., 2012), and phonemic awareness deficits are not always present in those with genetic risk factors (Blomert & Willems, 2010). Furthermore, phonemic awareness is also significantly impacted by the early language environment (e.g., Burgess et al., 2002) and by explicit instruction in the early school years (Elbro & Peterson, 2004; Torgeson et al., 2010). Two studies found that only about half of students with severe phonemic awareness deficits in kindergarten went on to have a reading disability in later grades (Catts et al., 2017; Pennington et al., 2012); on the other hand, only about 43-55 percent of individuals with a reading disability showed a phonemic awareness deficit, suggesting that use of phonemic awareness deficits to screen for reading disability could miss approximately half of all cases (Pennington et al., 2012). Thus, while there is considerable agreement that phonemic awareness contributes to the manifestation of a word-reading disability in many individuals with these impairments (Catts et al, 2017; Fletcher & Grigorenko, 2017;

Morris et al., 1998), it is not sufficient as a causal factor; rather, reading disabilities are determined by both heritable and environmental influences.

This is not to say that relationships between individual differences in cognitive processes and academic skills do not exist. There are robust correlations between many measures of cognitive processing and academic achievement (Swanson & Siegel, 2011). For example, working memory, attention, and phonological processing deficits are all correlated with mathematics learning disabilities (e.g., Fletcher & Grigorenko, 2017; Swanson & Sachse-Lee, 2012); these same processes are also correlated with reading disabilities (Swanson & Siegel, 2011). Students with learning disabilities in the area of written expression may show lower group mean performance on measures of executive processes such as organization and self-regulation (Beringer, 2004). Executive functioning abilities, such as inhibition, shifting, and updating, have also been shown to correlate with reading comprehension (Butterfuss & Kendeou, 2018). Research has also shown that working memory and processing speed deficits are more frequent among those with learning disabilities coupled with attention-deficit/hyperactivity disorder, which has been proposed as a contributing factor for high rates of comorbidity (McGrath et al., 2011; Miller et al., 2013; Willcutt et al., 2010). On the other hand, it may be that these are cognitive markers, rather than causal in the co-occurrence of these disorders (e.g., Plomin & Kovas, 2005). Future research will continue to explore the relationships between cognitive processes and learning disabilities; however, presently the evidence supporting a causational link is sparse. Furthermore, as will be summarized later in this paper, a student's cognitive processing abilities are of limited value to the assessment and intervention for individual students.

Environmental influences are another well-researched area, regarding the etiology of learning disabilities. When examining environmental contributions to the manifestation of

learning disabilities, it is helpful to first consider how children learn academic skills. Here, I focus on word reading as it is the most extensively researched academic skill. When mastering word reading, students' use of the written information in words progresses through a series of phases (Ehri, 1995; Ehri & McCormick, 1998). Children start with a cluster of foundational skills, learning letters (or graphemes) of the written alphabet and their most frequent corresponding sounds, blending those sounds together, and decoding novel words. With plenty of practice decoding words, the process of recognizing words and word parts becomes quicker, and eventually automatic (Ehri & McCormick, 1998). In learning to read words, some children move through these phases more rapidly, without extensive explicit and systematic instruction; many others (an estimated 40-65%), require more explicit and systematic teaching of these concepts along with ample time to practice applied skills with frequent feedback and cumulative review (e.g., Vaughn & Fletcher, 2021). The process of acquiring word reading skills does not occur naturally; that is, humans are not "hardwired" to learn to read, as we are for evolutionary skills like walking and talking (Miciak & Fletcher, 2020). Instead, pre-existing neural pathways that are key in oral language and visual processing are reorganized to form a new system for the purpose of developing word-reading skills (for review, see Vaughn & Fletcher, 2021). This process necessitates several years of practice and explicit, systematic, instruction in the knowledge and skills required. If the initial steps do not progress well, for example, the child has difficulty connecting individual phonemes with graphemes and sounding out the printed words (alphabetic principle; Liberman, 1996), the student will experience difficulty progressing to automatic, or accurate and quick, word reading (Vaughn & Fletcher, 2021). Thus, reading will continue to be effortful and non-fluent, impairing reading comprehension, and in turn, may decrease student motivation to read (Morgan et al., 2008). This may culminate in less

opportunity to practice and can perpetuate the challenges experienced (Lyon et al., 2001; Vaughn & Fletcher, 2021). Each of these environmental factors (i.e., lack of explicit, systematic, instruction and opportunity for supported practice) may contribute to the development of a learning disability over time. For a discussion of research on environmental contributors to early mathematics performance, see for example, Silver and Libertus (2022) and Hawes and Ansari (2020).

In summary, the manifestation of learning disabilities appears to be an outcome of biological or environmental components, and most likely an interaction of these multi-faceted factors (Catts et al., 2017). Importantly, practitioners (and researchers) may hold beliefs about the causal factors of learning disabilities that differ from the most current models, such as believing learning disabilities to be primarily biological/genetic and that this results in a specific deficit in a cognitive process that leads to the academic impairment. This orientation may lead a practitioner to embrace frameworks and diagnostic practices that may differ from those that support a more interactive causal view of learning disabilities. These differences in frameworks and diagnostic approaches, in turn, are the focus of the current study.

Arguments For and Against Diagnosing Learning Disabilities

Regardless of the ongoing research and debates in the field concerning etiology, there are several compelling reasons why diagnosis is important for students with suspected learning disabilities. First, and arguably most important, is access to services. Historically, many of the intensive interventions available to struggling students in Nova Scotia, for example, required a formal assessment and diagnosis of a learning disability (e.g., South Shore Regional Centre for Education [SSRCE] Severe Learning Disabilities Program, 2006; Annapolis Valley Regional Centre for Education [AVRCE], 2003). While changes in policy may no longer require students

to have a diagnosis to access interventions (Nova Scotia Department of Early Education and Child Development, 2019), it is difficult to determine whether the practice of excluding students from, or not prioritizing students for, intervention based on a lack of a diagnosis continues in some Regional Centres for Education provincially, especially given that this is a relatively new shift in policy. Similar informal practices were observed in Ontario, as documented in the Ontario Human Rights Commission's Right to Read Report (p. 299-301, 2022).

Secondly, the intensity and length of interventions increase as students get older, making interventions more costly and sometimes less effective if they are delayed (e.g., Torgesen, 2002). Thus, diagnosis is important because delays may impede access to timely interventions for those with learning disabilities, which is especially important given that the effectiveness of interventions appears to decrease the longer the student waits (see Shaywitz et al., 1999; Torgeson, 2004).

A third reason why learning disability diagnoses are critical is that financial supports available to children, youth and adults are often predicated on a diagnosis (Harrison & Holmes, 2012; OHRC, 2022; Waterfield & Whelan, 2017). For example, the 'Tuition Support Program' by the Nova Scotia Department of Education and Early Childhood Development, gives financial support for students to attend designated special education schools and a student requires a diagnosis before consideration (Nova Scotia Department of Early Education and Child Development, 2023). Furthermore, in some jurisdictions across Canada, school funding formulas may depend on the number of students identified with a disability (People for Education, 2016). Additionally, post-secondary benefits, such as the Canada Student Grant for Students with Permanent Disabilities, which currently offers students $2,800 per year, require a current diagnosis (Government of Canada, 2022). Once recognized as a post-secondary student with a

permanent disability, additional funding also becomes available for assistive technology (Government of Canada, 2022).

As with some public school programs, support centres at Canadian post-secondary institutions may only be accessible to those with formal diagnoses. These centres allow the student to access assistive services and individualized support, and help to set up accommodations (e.g., a quiet place to write exams, more time on exams, etc.). Accommodations may be a key part of success for students beyond high school (Harrison & Holmes, 2012). It has been found that in Canadian universities, students with learning disabilities receive approximately half of all academic accommodations that are provided (Harrison & Wolforth, 2007; Killean & Hubka, 1999), without which it has been suggested that many students with learning disabilities struggle to make it through their first semester (for discussion, see Stegemann, 2016).

Finally, receiving a diagnosis may help students and those around them to better understand their longstanding academic difficulties. One systematic review found that receiving a diagnosis led to increased positive self-perceptions for some students who believed that they were perceived by others as unintelligent or lazy prior to diagnosis (Gibby-Leversuch et al., 2021). In another study, Canadian adults whose learning disabilities went undiagnosed in grade school expressed that they would not have felt like “such a failure” or had low self-esteem growing up had they been identified earlier (Duquette & Fullarton, 2009).

It would be remiss not to mention that some have made arguments against diagnosing students with learning disabilities. One argument is that since the early presence of academic difficulties does not necessarily mean that a student has a learning disability, diagnosing early may over-identify students as having a learning disability. It is estimated that about 25-30% of

students in kindergarten and grade one are at risk for learning disabilities with impairment in word reading and may even qualify for a diagnosis (Mathes & Denton, 2002); however, research has shown that almost all beginning readers (approximately 95%) can learn to read well if they are taught through evidence-based methods and given the interventions they require when standard teaching procedures are not adequate (Moats, 2020). Thus, diagnosing students with learning disabilities too early, before mid to late first grade, in the absence of intensive interventions, may over-identify young students. A second argument has been that access to intensive interventions and special education should be available throughout elementary, junior high, and high schools in Canada without a formal diagnosis (for discussion, see OHRC); if this were the case, the argument could be made that a diagnosis is not critical for service access. As previously noted, a formal diagnosis may still be required to access some services in Nova Scotia and Canada more generally (OHRC, 2022; SSRCE, 2006), and is required to access resources beyond high school; certainly, until access to all interventions and accommodations are guaranteed, diagnoses are critical.

Finally, some argue against diagnosing learning disabilities given the apparent difficulties in the field to agree upon operational definitions, mostly because learning disability categories are socially constructed, as are mental health disorders more generally (Fletcher et al., 2005; Grigorenko et al., 2020; Hulme & Snowling, 2013; Stanovich, 1999). Learning disabilities can appear difficult to define, and thus, to fairly apply rigid categories of "learning disability" or "non-learning disability" is difficult. This is because, unlike many medical conditions, learning disabilities are not all-or-nothing categorical entities that one has or does not have (e.g., like measles; mumps, etc.). Rather, as is the case with other mental health disorders, the field may be represented as having disagreements in the cluster of symptoms required, the degree of

impairment required, and other related criteria upon which to base diagnostic decisions (Fletcher, 2012; Francis et al., 2005; Rodgers, 1983; Shaywitz et al., 1992; Silva et al., 1985). Diagnosis is complicated by the fact that learning impairments, the main presenting problem in students suspected of having a learning disability, exist on one end of a continuum (Fletcher et al., 2005). Academic achievement, like many other skills, is normally distributed; meaning that, skills in each academic domain like reading, writing, and math are naturally spread out in the population, with some students achieving at the high end of the distribution, and some at the low end (Fletcher et al., 2005). There is no clear point in the distribution, below which would indicate a disability. That is, individuals closest to the cut point will be very similar to one another, whether identified as having a learning disability or not. This can make it difficult to categorize individuals who experience academic difficulties in a meaningful and unbiased way.

Despite these difficulties, as discussed, diagnosis of learning disabilities continues to be needed for access to resources and to help students, families, and teachers, understand the learning challenges. The professionals holding the key to those resources are the psychologists who provide the assessments and make diagnoses. Most psychologists attempt to be objective when assessing learning disabilities, however, the roles they are in may include inherent pressures to become either a "gatekeeper" or an "advocate" (Williams et al., 2022). For psychologists working in schools, the pressure may be centred around gatekeeping finite resources, in which many other forces (e.g., supervisors, administration, and school boards) would exert influences (Williams et al., 2022). For those in private practice, there may be internal pressure (e.g., to act as an advocate for someone who may be viewed as being 'failed' by others, or feelings of pressure to give a diagnosis even when individuals do not necessarily meet criteria, due to high costs associated with private assessments; Williams et al., 2022; Wolforth,

2012). Both roles have the potential for biased outcomes, which underscores the need for objectivity during assessment for learning disabilities. Diagnostic frameworks may help increase objectivity, as they are designed to guide psychologists in their diagnostic decision-making.

In summary, a formal diagnosis of learning disability is often required for access to resources, such as timely interventions, financial support, access to community-based organizations, and post-secondary accommodations. While important concerns are raised regarding the sometimes-flawed conceptualizations of learning disabilities, it is clear that diagnosis continues to be used as a means to determine who should have access to certain resources. Unless this shifts, learning disability diagnosis will continue to be necessary and beneficial to those students who struggle academically. Moreover, receiving a formal diagnosis for learning difficulties may also help students, families, and educators to gain a deeper understanding of the difficulties the student is experiencing (Sako, 2016).

Diagnostic Frameworks and Methods Used in Canada

Diagnostic Frameworks

Diagnostic frameworks define disorders, or disabilities, and set out the procedures, rules, or criteria for diagnosis for practitioners in the field. The goal of a framework for diagnosing students with learning disabilities is to provide a comprehensive definition of learning disabilities and outline the criteria necessary to diagnose (Francis et al., 2005). Frameworks for the diagnosis of learning disabilities have been released by many different professional and government bodies. For one example, the American Psychological Association publishes the *Diagnostic Statistical Manual* (the DSM; e.g., APA, 2000; 2013; 2022) which includes frameworks for all childhood mental health disorders (see also the *International Classification of Diseases* 11th revision, 2019, for the system used throughout the United Kingdom). Frameworks like the DSM

are viewed as “living documents” which are regularly reviewed for alignment with current research evidence and are updated accordingly (Regier et al., 2009; Tannock, 2013). Provincial professional bodies (e.g., Ontario Psychological Association), and not-for-profit groups (e.g., the Learning Disability Association of Canada [LDAC]) have also released documents outlining diagnostic frameworks that have been influential in Canada.

There is no singular federal policy in Canada which governs how a psychologist should assess students for possible learning disabilities, in the school setting or beyond (D’Intino, 2017). Under the Constitution Act (1867), section 93, each provincial Ministry of Education is responsible for enacting its own regulations (D’Intino, 2017; Kozey & Siegel, 2008); thus, guidance for assessment can vary greatly from province to province (Kozey & Siegel, 2008). However, in 2002, the Learning Disabilities Association of Canada released what they entitled, the *Official Definition of Learning Disabilities*, which many provincial policies appear to have relied on for laying out a definition and guiding the diagnosis of learning disabilities (Agrawal et al., 2019; Klassen, 2002; Kozey & Siegel, 2008; Shroeder et al., 2020). Despite these guidelines created by this Canadian not-for-profit, the practices and criteria used do not appear consistent across psychologists in Canada (Kozey & Siegel, 2008), nor even within a given province, including Nova Scotia. Along with these policies by provincial or Canadian bodies, current and previous editions of the DSM framework (e.g., APA, 2000; 2013; 2022) have been influential on educational policy and practices in Canada (Kozey & Siegel, 2008; Shroeder et al., 2020). Both DSM and the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) diagnostic frameworks have had influence over Provincial Education Departments and district Boards of Education guidelines (e.g., Alberta Education, 2021; Manitoba Education and

Advanced Learning; 2015) and appear to be the two most influential frameworks in Canada (Kozey & Siegel, 2008; Shroeder et al., 2020).

The major complication in having two main diagnostic frameworks informing practices across the country lies in them containing different, sometimes conflicting criteria (Fiedorowicz et al., 2015), and in the extent to which each does or does not follow evidence-based practices. Prior to the release of the fifth edition of the Diagnostic Statistical Manual of Mental Health Disorders (DSM-5) in 2013 (5th ed.; DSM-5; APA, 2013), these frameworks co-existed relatively well. One main criterion of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (4th ed.; DSM-IV; APA, 1994) was a discrepancy between intelligence and academic achievement. That is, a measure of intellectual ability (often represented by an IQ score) was to be about two standard deviations above the score obtained on a measure of academic achievement (e.g., a reading or math test; 4th ed.; DSM-IV; APA, 1994). The DSM-IV also included the assessment of cognitive processes as a means to identify a processing cause for the observed academic difficulty (APA, 1994). The way in which these criteria were consistent with the LDAC *Official Definition of Learning Disabilities* (2002), lies in the requirement of a measure of intelligence and measures of cognitive processing, each with required levels of attainment, with the presupposition that these measures contribute to a better understanding of the student with learning difficulties. The 2013 revisions to the DSM were significant (Stegemann, 2016), and necessary to keep up with the growing body of research denouncing the key features of previous iterations (Tannock, 2013). These revisions included removing the discrepancy criterion, as well as removing the need for measures of intelligence and cognitive processes. Instead, academic difficulties and measures related to this criterion were brought to the forefront (Tannock, 2013).

The main criterion of IQ-achievement discrepancy in the previous version of the DSM reflected the commonly held viewpoint that students with learning disabilities were best characterized as "unexpected underachievers" who, for all intents and purposes were capable (as denoted by their average, or above average IQ score), but their achievement level was not commensurate with that capability (Lyon et al., 2001). The student with a learning disability was viewed as distinct from "expected underachievers" whose capabilities were seen as low, thus aligning with their poor academic achievement (Lyon et al., 2001). Based on the concept of "unexpected underachiever", the intelligence-achievement discrepancy method was the gold standard in operationalizing learning disability diagnosis for many years, despite considerable evidence of conceptual and psychometric flaws (Lyon et al., 2001; Siegel, 1989; Tannock, 2014). A discrepancy between ability (IQ) and academic achievement is the hallmark of this method, with an average or above-average IQ score representing "unexpectedness" (Lyon et al., 2001). In the 1990s, there was a surge in research contesting the use of discrepancy-based criteria in learning disability diagnostic assessment practices, demonstrating there was no meaningful difference between those who met discrepancy criteria and those who did not (Fletcher et al., 1994; Siegel, 1989, 1992; Stanovich & Siegel, 1994; Stuebing et al., 2002; Vellutino et al., 2000); students with significantly low academic skills have the same academic challenges and instructional needs, regardless of their intelligence test score (for review, see Vaughn & Fletcher, 2021)

When the DSM became aligned with the evidence and the requirement of both discrepancy and average intelligence was removed from its criteria list in 2013, it essentially established the LDAC and the DSM as competing diagnostic frameworks (APA, 2013; Schroeder, et al., 2020). The removal of this criterion from the DSM indicated a shift toward a

view of a more ‘needs-based’ approach, where the extent of the academic difficulty is seen as the core impairment, regardless of the potential causes of learning disabilities (Tannock, 2013). This is a fundamental inconsistency between the frameworks, where the LDAC has continued to endorse a primarily neurobiological and ‘intrinsic’ view of learning disabilities (LDAC, 2002; re-endorsed, 2015), and gives little credence to the environmental aspects which may contribute to the manifestation of a learning disability. The language used in the LDAC *Official Definition* (2002; re-endorsed in 2015) implies that the deficit is in a cognitive process and fails to acknowledge the possibility that a low score on a measure of cognitive processes could be a consequence of, or unrelated to, a learning disability (Kozey & Siegel, 2008). This is in stark contrast to the language used in the current iteration of the DSM (APA, 2022), which highlights one or more academic skills as the area of disability, not a cognitive process that theoretically underlies it.

The current definition and resulting implied criteria for the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) requires (1) at least average abilities essential for thinking or reasoning; (2) impairment in one or more cognitive processes related to perceiving, thinking, remembering or learning (e.g., language processing, phonological processing, visual-spatial processing, processing speed, memory and attention, executive functions); (3) impairment in an academic domain (e.g., reading, math, writing, or oral language); and (4) learning disabilities are not due primarily to global intellectual deficiency, sensory deficits, socio-economic factors, cultural or linguistic differences, lack of motivation, or ineffective teaching, although these may contribute to challenges experienced. The DSM-5-TR main criteria involve (1) impairment in an academic skill (math, reading, or writing) that is quantifiably below average; (2) impairment must occur during school years and be persistent (at

least 6 months); (3) interventions that target difficulties must have been provided, and not have resulted in remediation of academic difficulties; and (4) learning difficulties are not better accounted for by intellectual disabilities, uncorrected visual or auditory acuity, other mental or neurological disorders, psychosocial adversity, lack of proficiency in the language of academic instruction, or inadequate educational instruction (APA, 2022). Both frameworks incorporate inclusionary and exclusionary criteria, all of which must be met to make a diagnosis (Harrison & Holmes, 2012; Tannock, 2014; Williams et al., 2022). While exclusionary criteria largely align between the two frameworks, important differences in main criteria exist (Schroeder, et al., 2020).

Two primary diagnostic differences are immediately evident. The LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) requires a measure of intellectual functioning as well as measures of cognitive processes, whereas the DSM-5-TR does not require these. For both intellectual functioning and cognitive processes, the LDAC *Official Definition* does not specify how best to operationalize, in other words, put into practical use, the measurement tool itself (LDAC, 2002; 2015; Schroeder, et al., 2020). Thus, theoretically, different psychologists could interpret "at least average abilities" or "an impairment" in a variety of manners. Additionally, each framework takes a slightly different approach to operationalizing academic deficits. The LDAC *Official Definition* does not offer specific guidance as to what constitutes average, whereas the DSM-5-TR indicates a range: between 1-2.5 standard deviations below average, with 1.5 being highlighted as a better choice for greater diagnostic certainty (Schroeder, et al., 2020). The variability in practices related to ambiguity around operationalizing may be further exacerbated by the fact that psychologists may use a number of different methods to do so (Sadusky et al., 2021; Schroeder, et al., 2020).

Diagnostic Methods

Diagnostic methods are essentially action plans, typically measurement-based, which are used to determine whether an individual meets a given diagnostic criteria. That is, they inform how a psychologist goes about operationalizing a criterion laid out in policy, guidelines, or a diagnostic framework, for the purpose of evaluating whether a student meets a specific definition of a learning disability. Diagnostic methods can be used in conjunction with, or under the umbrella of, a diagnostic framework, in order to operationalize the given criteria (for an overview of the diagnostic frameworks and potential methods of operationalizing given criteria, see Appendix A).

The adoption of a particular diagnostic method may be impacted by the diagnostic framework adhered to, school district guidelines, as well as employer expectations. The views of learning disability that the psychologist holds have also been shown to affect the diagnostic methods employed (Cottrell & Barrett, 2017), where each diagnostic method has its own set of underlying assumptions. Furthermore, diagnostic methods may or may not be aligned with current evidence in the field. One such method, intelligence-achievement discrepancy, has previously been noted as not aligning with the evidence. While intelligence-achievement discrepancy is now commonly referred to as a 'method' in the literature, it was made popular with the DSM-IV (APA, 1994), along with other diagnostic frameworks (e.g., the LDAC *Official Definition.* 2002), which contained the criterion specifying that the student must have a significant discrepancy between an IQ score and achievement. Since then, the intelligence-achievement discrepancy method has continued to be used as a means to determine whether an individual is an "unexpected underachiever", as previously discussed (Sadusky et al., 2021).

Some psychologists may not have altered their practice to align with the current evidence, and these professionals may still employ an intelligence-achievement discrepancy method. In Canada, given that the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) currently requires a measure of intelligence and a measure of academic functioning, without clearly outlining how to operationalize described deficits, it is reasonable to assume that liberties could be taken while adhering to this framework. LDAC affiliates, Fiedorowicz and colleagues (2015), have recently denounced the use of the intelligence-achievement discrepancy method. However, the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015), which is the guiding source of diagnostic information, does not clarify that a discrepancy between IQ and achievement is not required. Furthermore, it does not prevent users of this framework from modifying traditional discrepancy methods (e.g., calculating a significant difference score between expected academic achievement and an IQ score) to the closely allied practice of using a specific cut-score in comparing an IQ score and academic functioning; a problematic concept discussed further in subsequent sections.

Another commonly employed method which is related to criteria addresses uneven performance on cognitive processing skills; that is, the presence of a cognitive processing deficit alongside cognitive processing strengths (for a meta-analysis of recent surveys, see Sadusky et al., 2021). This method, referred to as processing strengths and weaknesses, largely takes the form of measuring and comparing standardized scores across cognitive processes (Fletcher & Miciak, 2019). Shifts toward the use of processing strengths and weaknesses methods have been observed as a result of longstanding evidence against the use of the intelligence-achievement discrepancy method (Dombrowski et al., 2024).

Alongside measures of academic functioning, cognitive processing patterns are argued to illuminate a unique student learning profile (Sadusky et al., 2021). Proponents of this approach view the individual with a learning disability as having cognitive processing weaknesses which would provide an explanation for the observed, theoretically related, academic weaknesses (Flanagan et al., 2010; Flanagan & Alfonso, 2017). At the same time, it is argued that the individual has cognitive strengths which make the academic failure "unexpected"; it has sometimes been noted that a learning disability denotes a specific deficit within a "sea of strengths" (Shaywitz, 2003). Furthermore, this approach is thought to distinguish students with learning disabilities from students with low academic achievement and commensurately low cognitive processing scores (sometimes these are factor and subtest scores on an IQ test), or "expected underachievers" as is used for students with commensurate IQ scores (Fletcher & Miciak, 2019; also historically referred to as "slow learners").

There are many variations of processing strengths and weaknesses methods (e.g., concordance/discordance method, Hale & Fiorello, 2004; dual discrepancy/consistency criteria and cross battery assessment, Flanagan et al., 2013; discrepancy/consistency method, Naglieri & Das, 1997; the psychological processing analyzer, Dehn, 2022; etc.). While defining and differentiating these methods is beyond the scope of this paper, it should be noted that each method operationalizes cognitive strengths and weaknesses and unexpectedly low academic performance in a series of steps or mathematical calculations. These methods also vary in whether they focus on within-person (ipsative) comparisons and/or take into account normative performance (Stuebing et al., 2012). Research has shown that diagnostic agreement rates between different processing strengths and weaknesses methods are quite low (range of about 13-60% agreement rate; Miciak et al., 2014; Miciak et al., 2016), and the more complex the

method (e.g., looking at intraindividual patterns across multiple domains), the less reliable the method has been found to be (Fletcher & Miciak, 2019). Generally, as indicated in a recent systematic review of the literature on processing strengths and weaknesses, these methods identify learning disabilities at the same rate as chance regardless of the type of processing strengths and weaknesses approach used, the tests employed, or whether real or simulated data is used (Dombrowski et al., 2024).

Recall that one LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) criterion is that impairment in one or more cognitive processes related to perceiving, thinking, remembering or learning (e.g., language processing, phonological processing, visual-spatial processing, processing speed, memory and attention, executive functions). This is consistent with a processing strengths and weaknesses approach because these require a cognitive deficit to explain the observed academic deficit. Principally, processing strengths and weaknesses methods are predicated on the use of cognitive processing measures, and their approaches are both aligned with the view that the deficit is within the cognitive domain itself (Flanagan et al., 2010). Thus, it is reasonable to predict that psychologists who adhere to the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) criteria may use one of the identified processing strengths and weaknesses methods to operationalize impairments in cognitive and academic domains.

There are those who, in response to the lack of evidence supporting the use of intelligence and cognitive tests in diagnostic decision-making regarding learning disabilities, have shifted to a low-achievement method, of which the focus is on the measurement of academic difficulties (for review, see Fletcher et al., 2005). While evidence supports the use of this method (for discussion, see Tannock, 2013), the measurement of achievement has

difficulties of its own. As with any measurement-based method, low-achievement methods, especially when using measurements taken from only one test, are susceptible to measurement error. Studies have found that diagnostic decision-making using one test can lead to misidentification in up to 35% of cases (Francis et al., 2005; Shaywitz et al., 1992). In addition, low achievement methods may not take into account some environmental factors (e.g., whether the student has had sufficient opportunity to learn the skill) that may be contributing to impairment. However, it has been noted that low-achievement methods are intended to be used with due consideration given to exclusionary factors (Tannock, 2013). Low achievement methods align well with the current iteration of the DSM framework (DSM-5-TR; APA, 2022) because the only standardized measure that the DSM-5-TR requires presently, is of academic achievement. While there is mention in the DSM-5-TR of additional environmental factors which may contribute to the difficulties experienced, these are not necessarily a main focus, nor do they require formal measurement (Tannock, 2016)– a concept elaborated upon with the next method discussed. Moreover, environmental factors included in the DSM-5-TR such as inadequate classroom instruction are meant to be exclusionary, meaning that the observed difficulties are not better accounted for by lack of exposure to instruction, nor other concerns which may impact academic achievement such as visual and auditory acuity or an intellectual disability.

So far, the diagnostic methods discussed outline constructs to measure and how to interpret these related to given criteria. There is a different diagnostic method which stretches our current understanding of assessment as something an individual psychologist does over a session or two with an individual. Rather, an entire education system needs to be operating by providing systematic evidence-based supports at varying levels to all students (Berkeley et al.,

2020). This inclusive education delivery system is often called “response to intervention” (Fletcher & Miciak, 2019), and there are interpretations of how these should be designed; most commonly, through a multi-tiered system of supports (Berkeley et al., 2020). That said, the method of learning disability diagnosis within this system is also sometimes labelled as response to intervention (Sadusky et al., 2021). This response to intervention method of assessment places one emphasis on environmental factors associated with learning disabilities (Fletcher et al., 2005). Within this method, the academic impairment is ‘unexpected’ given a history of evidence-based instruction and interventions that are effective for most all students (Fletcher et al., 2004); these students are sometimes referred to as “non-responders” or “inadequate responders” (e.g., Miciak et al., 2014; Vaughn & Fuchs, 2003). Measurement of this instructional response, or of academic performance subsequent to receiving an evidence-based intervention, is used in psychologist’s assessments (Fuchs et al., 2003; Fletcher & Miciak, 2019). The notion of not adequately responding to intervention is most frequently defined by rules within the overall education delivery system - and these may differ in different educational settings. Measuring student’s responses to intervention may focus on student growth over time (Deno, 1986), or on postintervention achievement levels, or both (Fuchs et al., 2003). A psychologist may play an integral role in supporting aspects of these multi-tiered education systems (e.g., screening, progress monitoring, decision-making rules) and in collecting this information on the student’s instructional response to integrate with further assessment of academic achievement and to formulate and diagnose learning disabilities.

The larger education system operating using this model includes evidence-based classroom instruction for all students and evidence-based interventions for those who need it. It also includes academic screening and progress monitoring, often with curriculum-based

measures (Madaus & Shaw, 2006). At the tier 1 or classroom level, all students receive evidence-based instruction that should be sufficient to teach most children an academic skill (Fuchs & Fuchs, 2006). Tiers 2 and 3 are progressively more intensive evidence-based interventions for those who are not meeting academic benchmarks. In an approach to assessment focusing solely on a response to intervention method, a student who has not improved adequately following tier 2 or 3 intervention, often defined as not coming into the average range on measurements of the academic skill, would be diagnosed as having a learning disability (Fuchs & Fuchs, 2006). However, many proponents of the response to intervention method agree that, if a student does not respond adequately to evidence-based interventions, a further assessment with standardized measures of academic achievement can be useful for diagnosis (Willis & Dumont, 2006).

A response to intervention method may appear at first glance to assist in operationalizing one criterion from the DSM-5-TR framework. Within the DSM-5-TR, symptoms must persist "despite the provision of interventions that target those difficulties" (p.77). As Tannock (2016) explains, however, the working group responsible for deriving this framework did not include "evidence-based interventions" or a response to intervention method as necessary elements of this criterion. The inclusion of targeted intervention was intended to ensure the student being examined had been provided with some sort of extra help regarding the impaired academic skill, either at home or at school (Tannock, 2016). This "extra help" does not equate to evidence-based, intensive intervention, as would be required by a response to intervention method. However, ambiguity in the DSM-5-TR (APA, 2022) may leave room for operationalizing "despite the provision of interventions that target those difficulties" in different ways, and the DSM-5-TR certainly does not exclude such an approach.

Reliability and Validity of Diagnostic Methods

There is an abundance of evidence to suggest that intelligence-achievement discrepancy is not a valid diagnostic method. These findings can be summarized in three main points. First, students with relatively low IQ scores (non-discrepant) and students with higher IQ scores (discrepant) do not differ in a practical way on their cognitive correlates, behaviour, achievement, or instructional needs (for meta-analyses, see Stuebing et al., 2002; 2009). Second, IQ scores are not good predictors of who will respond to intervention (Stuebing et al., 2009). Third, studies that explore brain activation patterns of students with relatively higher and lower IQ scores find no meaningful differences (Simos et al., 2014; Tanaka et al., 2011). In terms of processing strengths and weaknesses methods, as previously mentioned, these methods have sparse data, at best, to support their validity (Beaujean et al., 2018; Benson et al., 2018; Dombrowski et al., 2024; Fletcher & Miciak, 2017; McGill & Busse, 2017). Multiple processing strengths and weaknesses methods have been examined to determine whether students differ in academic achievement based on whether they meet the criteria for the method, or they do not. Notably, researchers have found that whether students meet the criteria under a processing strengths and weaknesses method or not, they do not differ – especially with regard to who will respond to intervention (Miciak et al., 2014; Miciak et al., 2016). Some difficulties with aspects of these approaches will be elaborated upon in the discussion section. Empirical research has shown that response to intervention methods are valid diagnostic approaches when supported by an effective multi-tiered system of support education system (Fletcher & Miciak, 2019; although these are not a uniform approach and validity may differ amongst methods labelled as such). Meaningful subgroups of students have been identified, which supports intervention response as a valid classification attribute (for review, see Fletcher et al., 2019). Finally, low achievement

methods have been argued to reliably and validly identify students who differ from their typically achieving peers (e.g., Stanovich & Siegel, 1994).

All of the methods discussed rely on defining and using somewhat arbitrary cut points on academic achievement measures that indicate significant impairments in an academic skill, considered in a range indicative of a learning disability; this use of cut points brings into question the reliability of each given approach (Fletcher et al., 1994; Fletcher et al., 2005; Francis et al., 2005; Stuebing et al., 2002). Such psychometric and practical considerations of standardized test use and interpretation is discussed next.

Psychometric and Practical Considerations for Diagnosis

Cut Points and Difference Scores

Any psychometric approach to diagnosing learning disabilities will have limitations when using a specific cut point to determine whether an individual meets a given threshold (Francis et al., 2005). These difficulties are inherent to measures that are standardized and normed on a large sample to estimate the normal distribution of test scores in the general population (Graham & Neu, 2007). With standardized measures, a student's raw score on a test is compared to the performance of the normed sample, and the student's relative performance to others of similar age or grade is derived from the theoretical normed distribution; thus, we find that a student performed at the 10^{th} (19^{th}, 50^{th}, 75^{th}, etc.) percentile compared to same-age peers on this test. As previously discussed, academic achievement occurs on a continuous distribution, and there is no clear point which indicates the presence or absence of a learning disability. Furthermore, research and guidelines suggest different cut-points to indicate significant impairment in academic performance that should be considered for the criteria for a learning disability (Fletcher, 2012; Francis et al., 2005; Rodgers, 1983; Shaywitz et al., 1992; Silva et al., 1985).

The cut-points used to meet criteria for low academic performance (or for a strength or weakness in cognitive processing, or an "average" IQ score) are arbitrary and have associated measurement error.

Further difficulties exist in using various cut points in terms of meeting the criteria of average intelligence. Different systems point to different cut scores to denote the "average range". For example, requiring an IQ score of 85 (e.g., Reynolds Intellectual Assessment Scales, Reynolds & Kamphaus, 2003) or 90 (e.g., Weschler Intelligence Scale for Children – Fifth Edition, Integrated; Raiford 2018); any score below the cut-score is considered "below average" and does not meet this criterion of some frameworks for diagnosing learning disabilities (Seigel, 1988; Seigel & Hurford, 2019). Consider the following theoretical student profiles to illuminate some of the difficulties encountered with cut scores. Jane's results on an intelligence test was an IQ score of 83 and she had a composite score on word and nonword reading of 79. John's score on the intelligence test resulted in an IQ of 85 and his score on the word and nonword reading composite was also 79 (for a similar example, see Taylor et al., 2017). In the scenario where a district or practitioner defines average IQ as 85 (within one SD of the mean), John but not Jane would potentially be labelled as having a learning disability. This is problematic for several reasons. First, given measurement error, there can be little confidence that these two students actually differ on their IQ scores. An individual's true score on a given test can only, with reasonable confidence, be determined in terms of a range of scores (Francis et al., 2005). Second, there is only a low to moderate correlation in the student population between IQ and word reading achievement (Vellutino et al., 2000); with correlations in this range, there is no basis for making predictions for an individual student's reading "potential" based on their IQ scores (Vellutino et al., 2000). Finally, both Jane and John are impaired in word-level reading skills and

research shows that students with a range of IQ scores respond to intervention in word reading in a similar manner; that is, an IQ score does not determine who will benefit or not from intensive interventions (Morris et al., 2010). If another system or practitioner used a 90 cut-score as denoting average IQ, neither student would be eligible for a learning disability diagnosis or related services, even though research has shown that students with reading impairments share the same deficits in word reading and related skills such as phonological awareness and decoding, regardless of IQ score (Stanovich & Siegel, 2004), and again, respond to interventions the same (Morris et al., 2010; Stuebing et al., 2002). In a district that uses an IQ cut score of 80 as average, both students would qualify as having a learning disability, but John's older brother with an IQ score of 78 would not.

As can be seen, there are both psychometric reasons for the difficulties with cut-scores, and also reasons based on research findings of how using IQ score cut-scores does not equate to creating groups who differ in their learning difficulty or response to effective interventions. Some in the field suggested segregating groups based on an IQ score or intelligence-achievement discrepancy was akin to putting the horse before the cart (Stanovich, 1991). This seemed like a good idea until the data showed it only creates groups of students who differ on the IQ tests and the knowledge and skills most closely related to IQ, not on the learning difficulty, its causes, or the required interventions (Stanovich & Siegel, 2004).

To summarize, under these approaches, a struggling student with an IQ score that does not meet the "average" criterion, who has the same instructional needs as a struggling student with a slightly higher IQ score (Stuebing et al., 2009), could be denied access to a diagnosis, intervention, and other resources, based on the difference of a couple of points. This is particularly troubling when considering that all standardized measures are subject to

measurement error, with scores that naturally fluctuate. Therefore, an individual's true score on a given test can only, with reasonable confidence, be determined in terms of a range of scores (Francis et al., 2005).

In frameworks or models for diagnosing learning disabilities that have the criterion of a discrepancy between intelligence and achievement, the difficulty with arbitrarily setting what magnitude of discrepancy is required runs into all the same psychometric and validity concerns as using IQ cut points, along with some unique statistical errors in reasoning. The DSM-IV (APA, 1994) had the criteria that a score on a measure of aptitude (i.e., an IQ test) was to be at least 2 standard deviations (30 points on measures with a mean of 100 and SD of 1.5) above the standard score on the academic measure. Others report observing 1.5 or 1.0 standard deviations required to fulfill this discrepancy criterion (Schulte-Korne, 2014). For students with an achievement score of 79, the required IQ score would thus be 109 (2 SDs), 101 (1.5 SDs) or 94 (1 SD). Again, there is no evidence to show that the cause of the learning difficulty, nor the intervention, differs between groups based on relatively higher vs. lower IQ scores (e.g., Stanovich & Siegel, 2004; Morris et al., 2010; Stuebing et al., 2002). Most discrepancy methods assume a perfect correlation between academic skills and intelligence in the normal population and further ignore the statistical phenomenon of regression toward the mean (Fletcher et al., 2005). When an individual is measured twice, as they would have to be to obtain a difference score, one score will naturally regress toward 'average'(Fletcher et al., 2005; Francis et al., 2005). Due to this lack of validity and the flawed psychometrics involved in the practice, it is strongly recommended that difference scores be avoided when making diagnostic decisions (Farmer & Kim, 2020).

The Common Structure of Tests of Intelligence

Intelligence tests are typically composed of hierarchical constructs, including global intellectual functioning (sometimes referred to as psychometric *g*, or, often, IQ), which is broken down into index or composite scores that measure cognitive ability domains. For example, one frequently used intelligence test, the Weschler Intelligence Scale for Children (WISC; Weschler, 2014), includes five index scores which are reported to measure cognitive domains or abilities (i.e., verbal comprehension, visual-spatial, fluid reasoning, working memory, and processing speed). Index scores are further broken down into subtest scores, which aim to measure specific processing skills that feed into a cognitive domain (McGill & Dombrowski, 2019). Each of these three levels has different theoretical, psychometric, and practical implications.

Formal measurement of intelligence became common in the learning disability identification process in the 1970s (Rutter, 1978, Rutter & Yule 1975). The idea of an "unexpected underachiever" as a discrepancy between ability and achievement paved the way for tests of intelligence to become commonplace in assessment because the prevailing belief was that IQ scores were valid measures of intellectual potential (for discussion see Stanovich, 1999). This assumption has been scrutinized for many years, because tests of intelligence have not been shown to measure potential, rather, they reflect an estimate of current intellectual functioning (Lyon et al., 2001; Share et al., 1989; Sternberg & Grigorenko, 2002 Thorndike, 1963). It has also been argued that tests of intelligence contain measures more applicable to acquired than innate learning ability (Siegel, 1989; Siegel & Himel, 1998). For example, some measures included in intelligence tests are highly dependent on language ability, which is typically related to learning opportunities and may be a weak point for individuals with reading disabilities;

consequently, this can interfere with accurately estimating intellectual functioning (Siegel & Hurford, 2019).

Intelligence tests have also been shown to contain bias that calls into question whether they are ethical to use with vulnerable populations (for review, see OHRC, 2022). For example, tests of intelligence may not be valid measures for assessing the intellectual functioning of individuals with cultural and linguistic backgrounds that differ from the Westernized culture upon which these tests are based (Das et al., 2007; Geva & Wiener, 2015), or those whose formal instruction has been minimal or has included relatively little exposure to the types of tasks required of intelligence tests (for discussion, see Carr, 2023; Williams et al., 2022). In summary, intelligence tests do not measure the learning potential of individuals

Practical Implications of Using IQ Scores in Learning Disability Assessments

The practical implications of the use of tests of intelligence in assessing students for learning disabilities are a heavily researched topic. Whether incorporated as part of an intelligence-achievement discrepancy method or not, research does not support the use of an IQ score as a necessary component of a comprehensive assessment for learning disabilities. In addition to a lack of evidence supporting their practical utility in identifying learning disability (Fletcher et al., 2004; Lyon et al., 2001), there is a lack of evidence to support the use of intelligence tests in tailoring the intervention to individual students (Aaron, 1997; Fletcher & Miciak, 2019; Stanovich, 1999; Stuebing et al., 2009), or to suggest they are predictive of the potential success that a student might experience as a result of a given intervention (Fletcher et al., 2007; Stuebing et al., 2009; Vellutino et al., 2000). Because their value-added is minimal in comparison to the time of the psychologist, undue stress on the student, as well as the financial burden associated with these measures, it has been argued that tests of intelligence are

unnecessary for the diagnosis of learning disability (Fletcher & Miciak, 2019). Moreover, there is much evidence to suggest that relying on IQ scores can be harmful to students when used within an intelligence-achievement discrepancy method because a student often has to struggle for quite a while before the discrepancy is large enough for diagnosis (e.g., "the wait to fail method", see Lyon et al., 2001). Reliance on IQ scores independent from their use within an intelligence-achievement discrepancy method has also been shown to negatively impact vulnerable students, such as those from lower socio-economic, or racialized backgrounds (for discussion, see OHRC, 2022).

There may be times when a measure of IQ is warranted and useful to the diagnostic process (Grigorenko et al., 2019). If an intellectual disability is suspected, an IQ score may be a useful measure to obtain (Fletcher et al., 2004). However, it has also been argued that measures of adaptive functioning and behaviour are more cost-effective and potentially efficacious ways to rule out intellectual disability when suspected during the learning disability assessment process (Fletcher et al., 2004).

Measures of Cognitive Processing: Within and Separate from Tests of Intelligence

The assumption in the field of psychology that cognitive processing deficits underly a learning disability has led to a heavy focus on the measurement of cognitive processes when assessing for learning disabilities, as seen with processing strengths and weaknesses methods. Cognition is an overarching term that refers to the different states and processes involved in perception and judgement (Britannica, 2023). Essentially, cognition allows us to perceive, think, and interact efficiently with the external world. Cognitive processes feed into overall cognition, and they involve things like language processing, attention, problem-solving, executive functioning, organization, and different types of memory (e.g., visual-spatial short-term memory,

verbal short-term memory, etc.; LDAC, 2015). Many tests separate from intelligence tests are dedicated to measuring cognitive processes (e.g., the Comprehensive Test of Phonological Processing – 2nd edition [CTOPP-2], Wide Range Assessment of Memory and Learning – 2nd edition [WRAML-2]).

As well as separate tests of cognitive processes, there are more specific clusters of measures that share cognitive processing features within tests of intelligence. These measures, typically called indices or composite scores, have also been contested as contributing very little to the diagnostic process (Taylor et al., 2017; Watkins & Canivez, 2004), as well as having minimal implications for intervention (Fletcher & Miciak, 2017; Miciak et al., 2016; Siegel & Hurford, 2019). Typically, these measures are represented by clusters of scores from subtests purported to contribute to the measurement of a specific ability (e.g., visual-spatial processing, processing speed) (McGill & Dombrowski, 2019). Many proponents of processing strengths and weaknesses methods rely on these index measures to operationalize learning disability criteria (see Flanagan et al., 2010).

When tests of intelligence are created, test makers conduct various statistical procedures called factor analyses that analyze how subtests load onto indices, and indices onto psychometric g (IQ) creating a model of best fit (McGill et al., 2018). A body of independent research has been amassed which raises concerns about the models of fit of commonly used tests of intelligence (McGill et al., 2018). For example, Dombrowski et al. (2022), found that the Wechsler Intelligence Scale for Children – Fifth Edition (WISC-V), a test that claims to measure five separate cognitive domains (i.e., verbal comprehension, visual-spatial working memory, fluid reasoning, working memory, and processing speed), actually better fits a model of four distinct domains. This is problematic in terms of assessment because high-stakes diagnostic decisions

may be made based on these index scores that may not be statistically representative of the reported cognitive domains. Research shows that the more specific the measure within these models, the less valid their interpretation (Restori et al., 2009). Indeed, subtest scores themselves do not contribute any predictive value in regard to academic achievement that a global measure of intelligence does not already account for (Macmann & Barnett, 1997; McDermott et al., 1990), and the variance accounted for by index scores is significantly weaker than that accounted for by a global IQ score (Dombrowski et al., 2017; Kranzler et al., 2015). Despite the documented psychometric flaws in the interpretation of scores beyond full-scale IQ (Dombrowski et al., 2018), many developers or proponents of popular intelligence tests encourage it, especially in relation to analyzing a student's profile of cognitive processing strengths and weaknesses (Kaufman & Kaufman, 2004; Naglieri & Das, 1997; Restori et al., 2009; Woodcock et al., 2001).

Thus, in line with the recommendations of the test manuals, cognitive profile analysis is a commonly employed method of interpretation (McGill & Busse, 2017), which is cause for concern. This analytical approach involves making inferences about a student's ability based on the scatter of their plotted scores at the subtest or index level (McGill et al., 2018). It has been found that cognitive profile analysis, and related processing strengths and weaknesses methods, accurately identify individuals with a learning disability at the same rate as chance (for a systematic review, see Dombrowski et al., 2024; see also McGill, 2018). Not only this, but cognitive profile analysis has the potential to miss the most severely impacted children, who demonstrate a "flat" profile due to similar levels of impairment across all areas; a profile common to those with severe reading disabilities (Fletcher et al., 2005). This approach also has the potential to lead users to interpret full-scale IQ scores as invalid based on significant scatter

across indices (Sattler, 2008), a practice denounced by researchers examining valid psychometric practices (Farmer and Floyd 2018; Flanagan & Alfonso, 2017; McGill 2016; McGill & Busse, 2017; Schneider & Roman 2018).

Regardless of how cognitive process scores are interpreted, the measures themselves have little evidence to support their use in terms of cost-effectiveness and value-added to diagnostic outcomes and intervention planning (Siegel & Hurford, 2019). Extensive testing of cognitive processes is expensive and timely (Burns et al., 2016; Kearns & Fuchs, 2013; McGill et al., 2018), and the value added for both diagnostic and intervention purposes is minimal or invalid (Burns et al., 2016; McGill & Busse, 2017; Miciak et al., 2016; Reschly, et al., 1999; Siegel & Hurford, 2019; Stuebing et al., 2015). Treatment outcomes are not shown to be better when interventions are informed by one's cognitive processing profile (Cronbach & Snow, 1977; Fletcher & Miciak, 2019; Miciak et al., 2016), rendering these measures low- or no-value within the evidence-based assessment of learning disabilities. At worst, such analyses may lead to focusing on cognitive processing rather than academic skills, or to misleading interpretations of the causes of one's learning difficulties.

Measures of Academic Skill

As with all standardized measures, the same psychometric cautions regarding arbitrary cut points apply to measures of academic achievement (Stuebing et al., 2002). Standardized tests of academic skills have been demonstrated to be useful in terms of identifying students with academic impairments (Fletcher & Miciak, 2019). In tandem with a review of a student's past school performance, academic measures allow for corroboration of academic problems (Gross et al., 2019), and they are often the first domain-specific evaluation, formally comparing the student's achievement in a cluster of academic skills or knowledge to their same-age peers

(Fletcher & Miciak, 2019). These assessments of academic weaknesses as well as strengths, while not necessarily detailed, are helpful in determining what areas the student needs an intervention (e.g., word reading, math facts, math problem solving, etc.) and are thus more useful than an analysis of cognitive processing strengths and weaknesses (see Burns et al., 2016; Fletcher et al., 2005; Fletcher & Miciak, 2019; Maki et al., 2017). Inconsistent with cognitive processing measures, more detailed inventories of academic skills may be useful in pinpointing more precise areas of challenge, and these may complement a psychoeducational assessment. On tests designed to thoroughly examine a domain, taking a careful look at the errors made and the skills required have been suggested to help individualize interventions (Siegel & Hurford, 2019). Standardized academic measures, in one form or another, are required within any diagnostic framework or method discussed and are a critical component of any comprehensive assessment for learning disabilities.

Assessment Practices Supported by Evidence

There has been a growing consensus in the research literature on several aspects of evidence-based, and as discussed, non-evidence-based, practices when assessing students for potential learning disabilities. Most notably, evidence currently best supports a hybrid model which amalgamates low-achievement and response to intervention methods, to factor in academic achievement as well as prior instruction and intervention support (Fletcher & Miciak, 2019).

Psychoeducational assessments, and their inseparable link to standardized measures, are fundamental components in the diagnostic process of learning disability (Gross et al., 2019; Watkins et al., 2001). Thus, it is extremely important for psychologists to practice in a manner that is supported by current research. In regard to standardized measures, all of which have been

described as having some level of measurement error contributing to issues with reliability, Fletcher and Miciak (2019) outline a few ways in which psychologists can ensure their practices align with the evidence on test interpretation. First, they caution that no decision should be made based on results from a single measure (e.g., making diagnostic decisions based on results from one academic measure at one point in time) or satisfaction of a single criterion. Second, they recommend that psychologists not adhere to strict cut-points whenever possible, instead using confidence intervals to increase the probability that the true score is within that range. Third, Fletcher and Miciak (2019) suggest that clinical judgment should be used when making decisions based on test scores. They point out that it may be better to misidentify someone who it later becomes clear does not need services, as opposed to not identifying someone who does. Thus, the professional may use a lens which errs on the side of caution that enables services, rather than allow a strict cut point on a measure to dictate intervention placement. While this thinking could be necessary for access to interventions, it may also lead to overdiagnosis as shown in some studies (e.g., Canivez, 2013).

Concerning the domains being measured, research has been clear that an assessment for learning disabilities does not necessitate the measurement of intelligence (Fletcher et al., 2004), or cognitive processes (Miciak & Fletcher, 2020). Frameworks such as the LDAC *Official Definition* of Learning Disabilities (2002; re-endorsed in 2015) and methods such as intelligence-achievement discrepancy and processing strengths and weaknesses that require these measurements are not aligned with evidence-based practices (e.g., Beaujean, 2018; McGill, 2016; Fletcher & Miciak, 2019; Williams & Miciak, 2018). Rather, evidence-based assessment practices include a comprehensive assessment of academic strengths and weaknesses (Burns et al., 2016; Maki et al., 2017), which aligns well with the DSM-5-TR framework's main criterion

(APA, 2022). While not required by the DSM-5-TR, response to intervention methods are also useful and valid approaches to the identification of learning disabilities (Fletcher & Miciak, 2019), which could be used to fulfill the criterion. However, as previously noted, using this method of assessment requires an education system which is fully aligned with evidence-based models of instruction, intervention, screening, and progress monitoring (i.e., a multi-tiered system of support), which could pose difficulties for psychologists attempting to use this method. When a response to intervention method is used, to increase diagnostic reliability, the use of ranges for 'adequate response' is most aligned with the evidence, rather than strict cut points (Fletcher & Miciak, 2019).

In summary, evidence-based assessment for students suspected of having a learning disability must involve a comprehensive evaluation of academic strengths and weaknesses, academic history, and the potential contribution of known confounding variables that might preclude a diagnosis (e.g., visual and auditory deficits, intellectual disability; Dombrowski & Gischlar, 2014; Grigorenko et al., 2019). Furthermore, evidence-based assessment does not include a measure of intelligence or an assessment of cognitive strengths and weaknesses (e.g., Dombrowski et al., 2024; Fletcher et al., 2020). These evidence-based assessment practices are better aligned with the DSM-5-TR than the LDAC framework.

Extending beyond assessment purposes, the evidence supports that psychologists ideally work within an education system which operates an effective multi-tiered system of supports, or minimally that they implement a universal screener in early grades along with early intervention, as a school-wide approach to prevent at-risk students from developing a disability (OHRC, 2022). As a result, it is proposed that fewer students would experience academic difficulties and ultimately be referred for assessment. If working within such a system which supports the use of

a response to intervention method, those who receive evidence-based intervention and are determined to have not adequately responded may be referred for further assessment (a hybrid between response to intervention and low achievement methods has been proposed, e.g., Fletcher & Miciak, 2019); these students would not only meet but would have surpassed the level of support required by the DSM-5-TR criterion of a previous intervention being implemented. Though research has been clear about which practices are evidence-based, and which are not (e.g., Dombrowski et al., 2024; Fletcher & Miciak, 2019), recent survey data, primarily emanating from the United States, has shown that approaches to learning disability assessment continue to be varied, with a majority of psychologists retaining non-evidence-based practices in their assessment of learning disabilities (Benson et al., 2020; Machek & Nelson, 2010; Sadusky et al., 2021).

The Research to Practice Gap

The most controversial aspect of assessment for learning disabilities in the field corresponds to the most prominent difference between the two diagnostic frameworks used in Canada (e.g., DSM-5-TR [APA, 2022], LDAC *Official Definition,* 2002; re-endorsed in 2015): the role of intelligence and cognitive processing tests. The following paragraphs detail the research on how psychologists interpret standardized tests, how they use diagnostic methods, and which frameworks they may be adhering to.

Survey results examining psychologists' use of standardized tests in the United States reveal that test scores, including those derived from intelligence tests (Gross et al., 2019), remain the most highly valued element of assessment data when identifying learning disabilities (Maki & Adams, 2020). Professional perception of IQ demonstrates an unwavering commitment to this construct which the field of learning disabilities has retained, despite significant evidence against

its utility in assessment (Fletcher & Miciak, 2019; Stuebing et al., 2009). For example, nearly two-thirds of one study's sample of psychologists believed that an IQ score was useful in understanding a student's instructional needs (Machek & Nelson, 2010). While many psychologists do interpret the most valid measure from these tests, a full-scale IQ score (Machek & Nelson, 2010), a majority of psychologists sampled in two separate studies report interpreting index measures (Kranzler et al., 2020; Machek & Nelson, 2010) and in one study even subtest measures (Kranzler et al., 2020) in their learning disability assessment practices. This is not entirely surprising given the continued focus on these measures in graduate training programs (Farmer et al, 2021; Lockwood et al., 2022).

Diagnostic methods employed by psychologists in their assessment of learning disabilities also continue to be diverse, often lacking alignment with evidence-based practice (Benson et al., 2020; Sadusky et al., 2021). Given findings concerning the continued interpretation of index- and subtest-level scores, it is unsurprising that surveys have also found processing strengths and weaknesses methods to be one of, if not the most, commonly employed (Benson et al., 2020; Maki & Adams, 2019). Alarmingly, results have illuminated the continued use of intelligence-achievement discrepancy methods, with multiple recent studies finding approximately one-third of respondents indicated currently employing these methods (Benson et al., 2020; Maki & Adams, 2019). Other surveys have concluded that it is the vast majority of psychologists who continue to utilize intelligence-achievement discrepancy methods (Cottrell & Barrett, 2016; Lockwood et al, 2022). A recent international meta-analysis of eleven survey-based studies confirmed the incongruence in diagnostic methods being used, with a focus on data collected after the publication of the DSM-5 (Sadusky et al., 2021). Although studies report varying rates, intelligence-achievement discrepancy methods continue to be used frequently, and

both response to intervention and processing strengths and weaknesses methods have grown immensely in popularity. Sadusky and colleagues (2021) noted the various methods utilized in operationalizing learning disability criteria were connected to the contrasting diagnostic frameworks to which psychologists adhere. While intelligence-achievement discrepancy methods and processing strengths and weaknesses continue to be used, recent research does suggest that response to intervention methods are highly favoured and reported to be used by psychologists (Benson et al., 2020; Maki & Adams, 2019).

Although Canadian psychologists' diagnostic practices are not well documented in comparison to the United States, it is reasonable to suggest that they also vary based on the diagnostic framework adhered to. With the LDAC and the DSM containing not only contrasting criteria but various manners of operationalizing these within each framework, it stands to reason that diagnostic decisions may be vastly different between professionals.

In the absence of clear, unambiguous guidelines, psychologists are left to interpret the best methods to operationalize criteria associated with a given framework (Cavendish, 2013; Sadusky et al., 2021). Considering that diagnostic rates are dependent on diagnostic frameworks (Schroeder et al., 2020), methods (Maki et al., 2015), procedures (Miciak et al., 2018), and clinical judgement (Schroeder et al., 2017; Wilcox & Schroeder, 2015), it is reasonable to surmise that a fair proportion of Canadian psychologists may be practicing in ways that do not align with the delineated evidence. In the Canadian context, the danger of this incongruence was illustrated by Schroeder and colleagues (2020), who applied the differing criteria from LDAC and DSM-5 to a large set of assessment data to explore whether the same individuals would be identified as having a math learning disability. Furthermore, they applied a number of different possible operationalizations of the criteria, due to ambiguity (e.g., defining 'below average' as a

standard deviation of 1 below average, and then 1.5 below average), and considered different possible applications of measures of cognitive functioning (e.g., IQ), citing the text beyond the diagnostic criteria within the DSM as containing further guidance about the use of intelligence testing, particularly for ruling out intellectual disability (see Schroeder et al., 2020, p. 177). As such, each case was analyzed for both academic and cognitive deficits, which goes beyond the requirements of the DSM-5. They found that, although the use of the criteria across the two frameworks produced similar numbers of positive identification of learning disabilities, the individuals who were identified were markedly distinct. Regardless of the manner in which either framework was operationalized, agreement rates did not exceed 22% of cases analyzed; in fact, even when DSM-5 criteria included a cut point of 1.5 standard deviations below the mean and above on a measure of intelligence, agreement rates with any variation of LDAC operationalization were quite low (e.g., 2%, 8%, and 9%). In practical terms, these results can be taken to mean that the best-case scenario of agreement between LDAC and DSM-5, when operationalized with the inclusion of a measure of intelligence, would mean that 78% of students identified with one approach would not retain their diagnosis using the other. In the worst case, these results show that certain combinations and instantiations of criteria between the frameworks result in approximately 98% of students who were identified with one approach not being identified by the other. While this is the first study of its kind, and the analysis was specific to math-related learning disabilities, the results clearly highlight the striking practical implications of applying differing criteria to identify students suspected to have a learning disability, especially when measures of intelligence are included in the assessment process.

The Role of Employment Setting and Policies, Years of Experience, and Etiological Beliefs

Psychologists' employment settings, policies, experience, and beliefs, can contribute to assessment decision-making. Psychologists who diagnose learning disabilities commonly work in either private or public school settings, which may influence their approach to assessment. Psychologists in private practice less frequently select measures based on availability, as those in school settings do, and they more frequently select standardized measures based on test attributes such as validity and reliability (Al Dahhan et al., 2021). This suggests that psychologists in private practice have more flexibility to practice according to their preferences. Training also plays a role in test selection, as psychologists will most often stick with tests they were trained to use (Al Dahhan et al., 2021; Lockwood et al., 2022). In the United States, state regulations have been found to have a moderate (Benson et al., 2020; Kranzler et al., 2020) to large (Benson et al., 2020) effect on diagnostic methods employed, which means that diagnostic decision-making may differ depending on location. Psychologists' age and years of experience have also been found to be highly correlated with choice of method (e.g., response to intervention, processing strengths and weaknesses). It is reasonable to assume that Canadian psychologists may also be impacted by these factors, such as workplace policies and years of experience.

It has been argued that many of the inconsistencies related to assessment practices are a result of professionals' misunderstandings about the characteristics of learning disabilities (Miciak & Fletcher, 2020). For example, the weight that a psychologist assigns to each etiological category (i.e., biological or environmental) can greatly influence their approach to diagnostic practices. Cottrell and Barrett (2017) found significant correlations between professionals' beliefs surrounding the etiology of learning disabilities and their chosen methods of assessment. Proponents of a more strict, biologically based perspective are more likely to

focus their efforts on exploring cognitive processes, whereas professionals who are also open to environmental influences are more likely to focus on exploring the impaired academic skills (Cottrell & Barrett, 2017) and what has been done to remediate these. For psychologists working in schools, one study suggests that assessment practices may be even more highly impacted by their etiological views than other factors like school guidelines (Cottrell & Barrett, 2017).

Efforts to Close the Research-to-Practice Gap in Canada

As is well documented, practice often requires quite some time to catch up to what is supported through research as evidence-based (Restori et al., 2009; Stanovich, 2005). This seems especially true in the field of learning disabilities, where calls for change have been echoing for many years (Farmer et al., 2021; Harrison & Holmes, 2012; Lyon et al., 2001; Siegel, 1989; Stanovich, 1999; Stanovich, 2005). One suggested way to affect change is through a process of 'unifying' diagnostic practices, ensuring that all psychologists in a given location are practicing consistently (Schroeder et al., 2020). However, practices need to be unified around an evidence-based approach.

Recently, movement has been made toward a unified framework for the diagnosis of learning disability within Canada. In 2018, the Ontario Psychological Association (OPA) released their *Guidelines for Diagnosis and Assessment of Learning Disabilities* which were developed by a group of working psychologists who achieved their own consensus on criteria to include for learning disability diagnosis and what the assessment process should entail. Of note, the working group was described as having "considerable debate" in the area of cognitive testing (Williams et al, 2022). However, they did ultimately include criteria related to deficits in cognitive processes that are "logically" related to academic difficulties, and the requirement for at least average abilities necessary for reasoning and thinking (OPA, 2018). The OPA's inclusion

of intelligence measures and cognitive processes, including the endorsement of cognitive profile analysis when an IQ score is 'invalid', has been challenged for its lack of alignment with the evidence (OHRC, 2022). In their Right to Read Report (2022), the OHRC thoroughly delineated the potential harm of including these criteria and outlined a manner in which to bring current practices in line with research. The OHRC has called upon the OPA and the Ontario Ministry of Education to adjust their criteria list to reflect those contained within the DSM-5. It is clear that a consensus approach toward unifying diagnostic practices that align with the evidence is not imminent in Canada. In the absence of unification efforts that align with evidence, it could be argued that inconsistency in diagnostic decision-making is actually more beneficial, given that a portion of professionals can be reasonably assumed to be practicing in evidence-based ways.

While no official consensus approach exists on a provincial level, Nova Scotia appears to have largely operated under the diagnostic guidance of the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015), with Centres for Education websites containing explicit reference to the framework (e.g., CBVRCE, n.d.; Halifax Regional Centre for Education [HRCE], 2023; SSRCE, 2023). In addition, the Student Services Division in the Department of Education and Early Childhood Development, which is the governing body responsible for most matters related to education in Nova Scotia, provides guidelines for psychologists working within schools (Department of Education, 2009). While this is a document which broadly addresses the role of the school psychologist, it does include guidance which could be viewed as not aligning with the evidence. For example, the latest rendition of these guidelines stipulates that school psychologists should "contribute to the development of individual learner profiles of strengths and challenges through the measurement of cognitive abilities…" (Department of Education, 2009, p. 6).

Nova Scotia assessment practices have been characterized by some as aligning with response to intervention methods, however, those points are predicated on a review of documents that do not necessarily pertain to assessment and diagnosis (e.g., individual program planning guidelines; D'Intino, 2017). The Department of Early Education and Child Development has adopted a tiered system for inclusive education (DEECD, 2019). However, these movements are at the system level and do not make clear the role of diagnosis in the process, nor are they specific to individuals struggling with learning difficulties (DEECD, 2019). Furthermore, the system framework has not consistently included evidence-based classroom instruction, interventions, screening, or progress monitoring.

Given that a number of Centres for Education are seemingly influenced by the LDAC (2022) *Official Definition*, and provincial documents contain reference to the regular use of measures of cognitive ability, individual psychologists that work within the system are likely influenced to some degree by this framework. Considering that the role of Canadian psychologists working within schools is often considered to be that of a "tester" who spends the majority of their time engaging in assessment-related practices (King et al., 2016; Saklofske et al., 2007), it is important to explore the level to which these practices align with the evidence.

The Present Study

Psychologists are professionals who make many judgements in the way they approach assessments for students with suspected learning disabilities. These approaches have the potential to diverge at multiple points including diagnostic framework, diagnostic methods, and test interpretation practices. Furthermore, their practices may be influenced by many factors including their own educational history, practice setting, years of experience, and views on the etiology of learning disabilities. With such variability, a lack of information regarding the

practices of psychologists responsible for diagnosing learning disabilities is cause for concern, given the potential for considerably low agreement rates when differing diagnostic practices are used (Schroeder et al., 2020), and the potential for negative life outcomes for individuals with a learning disability, especially those who do not receive adequate intervention and other supports (for review see OHRC, 2022; Livingston et al., 2018). Students with learning disabilities are a vulnerable population in terms of academic attainment, social and emotional well-being, and life outcomes. For Nova Scotia's school-aged children and youth to be optimally supported, it will be important that diagnostic practices and the resulting treatment opportunities are in line with current evidence-based practices.

Much of the data pertaining to diagnostic practices emanates from the United States. It is valuable to have more representative and localized samples from which to draw conclusions, especially given the presence of differing frameworks between Canada and the United States (Schroeder et al., 2020). The present study was completed with the primary goal of addressing a lack of knowledge in the area of learning disability diagnosis in Nova Scotia. A secondary goal was to examine the congruence of reported practices for diagnosis with evidence-based practices, as a potential tool for practitioners and decision-makers. Revision of policies guiding practice may be called for to deliver equitable approaches to learning disabilities diagnoses (Benson et al., 2020). The guidelines for school-based psychology practice are currently listed as "under review" on the Nova Scotia Department of Education and Early Childhood Development's Student Services website (Province of Nova Scotia, n.d.). Information such as that provided by this research could inform the revision of those related guidelines.

To address the aforementioned goals, the current study surveyed psychologists in Nova Scotia, with a focus on their diagnostic practices pertaining to assessment for learning

disabilities. We prioritized the exploration of participants' use of measures of IQ and cognitive processes, as these themes are prominent in the literature concerning the gaps between evidence-based and field practices. Therefore, the overall purpose was to better understand how and when psychologists use the information they gather during the assessment process to judge whether it is appropriate to make a learning disability diagnosis. The specific research questions and study methodology follow.

Research Questions

(1) How are psychologists in Nova Scotia diagnosing learning disabilities?

   i. What diagnostic criteria do psychologists endorse to define who does and does not have a learning disability?

   ii. What methods do psychologists report using when assessing for learning disabilities and what reasons do they endorse for using these?

   iii. Which diagnostic frameworks do psychologists report using when assessing for learning disabilities?

   iv. Given psychologists' reported criteria and methods, what proportion of psychologists align with the DSM-5-TR vs. the LDAC frameworks in their diagnosis of learning disabilities?

   v. What diagnostic terminology are psychologists using when diagnosing learning disabilities and do they consider commonly used diagnostic terms as representing the same populations?

(2) Are participants reported diagnostic methods (e.g., intelligence-achievement discrepancy, processing strengths and weaknesses, response to intervention), reported diagnostic

frameworks (e.g., DSM, LDAC), and diagnostic framework alignment categories (e.g., Full DSM, Partial DSM, Full LDAC, Partial LDAC) consistent across questions in the survey?

(3) What are psychologists' beliefs about learning disabilities?

    i. What etiological perspectives (e.g., environmental causes and/or biological causes) do psychologists have about learning disabilities?

    ii. What are psychologists' beliefs about the usefulness of intelligence tests in the assessment of a suspected learning disability?

    iii. How do psychologists' etiological perspectives and beliefs about intelligence test usefulness relate?

(4) How do psychologists' beliefs (i.e., IQ usefulness perspectives and etiological perspectives), years of experience, and employment settings (e.g., public vs. private practice) predict their alignment with what I have reviewed in the field to be evidence-based practices?

Methodology

Survey Instrumentation and Measures

The survey was divided into six sections to explore information central to the research questions and to adequately describe the sample: demographics and background information; beliefs about the etiology of learning disabilities (e.g., environmental and/or biological causes for manifestation); diagnostic criteria used and their means of operationalizing a given criterion through use of either cut scores, difference scores, or type of intervention; beliefs about intelligence and IQ testing; use of diagnostic methods and diagnostic frameworks; and lastly, diagnostic framework use and terminology used to denote learning disabilities. The entire survey is presented in Appendix B. There were 48 core questions and an additional 7 sub-questions. An adaptive questioning approach was taken to shorten the survey completion time, in which

participants were not asked to answer questions that were only relevant to items they did not endorse.

Survey validity was ensured in two ways. First, as reported in this section, each domain of the survey was based on previous questionnaires with related research or was built with information from the diagnostic frameworks most frequently used in Canada (Kozey & Siegel, 2008; Shroeder et al., 2020). Second, the survey underwent several rounds of revision based on input from two expert practitioners in the field. Two registered psychologists were consulted, each of whom had knowledge of the research in this area and decades of experience in assessing and diagnosing learning disabilities in school and private practice settings. A small number of individual items were revised or removed, taking their feedback into account.

Demographic Information

Demographic questions used in this survey were modelled after those used in similar research studies (e.g., Al Dahhan et al., 2021; Benson et al., 2020; King et al., 2022). Participants responded to items concerning their gender, registration status, years of experience, education qualifications, employment setting, and time spent conducting learning disability assessments with various student populations. Given the small size of the province, and thus of the target population, demographic questions were minimized and carefully selected to prioritize the protection of participant anonymity, while also gathering enough information to describe the sample adequately.

Beliefs about the Etiology of Learning Disabilities

To assess participants' beliefs about factors that influence the manifestation of learning disabilities (i.e., etiology or causes of learning disabilities), questions were adapted from Cottrell and Barrett (2017). Their survey had 11 questions about psychologist's etiological beliefs, rated

on a four-point Likert scale (1=strongly disagree to 4=strongly agree). Five of their questions asked about participants' views on factors that exist in the environment which may contribute to the manifestation of learning disabilities (e.g., "Learning disabilities are significantly impacted by environmental deprivations"), and six asked about biological factors (e.g., "A student is born with a learning disability, and they will always have a learning disability, even if they are provided with the highest quality instruction.")

The current survey included four items from their environmental scale and three from their biological scale to reduce survey completion time[1]. Two scale variables were calculated for use in this study from the mean of each scale's items. The reliabilities for the Environmental and Biological scales were $\alpha = .64$ and .62, respectively. These coefficients are lower than those reported by Cottrell and Barrett (2017; $\alpha = .73$ and .71, respectively). These estimates may be an underestimate of reliability due to the small number of items per scale (Eisinga et al., 2013; Taber, 2018; Tavakol & Dennick, 2011). We judged these reliabilities as meeting a minimally acceptable level for the purposes of this study. As will be presented in the results section, support for the reliability of these scales comes from the observation of predicted patterns of relationships as expected in further analyses. Additionally, Cottrell and Barrett (2017), found similar relationships between etiological scales in their study.

Diagnostic Criteria: Endorsement and Operationalization

To explore which criteria psychologists are using to determine whether a diagnosis should be made, participants rated their level of agreement with a series of four criteria (see

[1] There were four items that participants responded to on the Biological Perspectives scale. One item was removed as it significantly depressed scale reliability ($\alpha = .47$). The item removed was number 8, "Greater emphasis should be placed on evaluating the child's psychological functioning/processing than their environment when evaluating the student for a learning disability."

Appendix B). Two items were primarily associated with the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015), and two items were associated with both the LDAC and the DSM frameworks. Each criterion was answered on a four-point Likert scale (from 1 = strongly disagree to 4 = strongly agree).

Additionally, to better understand how psychologists operationalize these four criteria, they were asked to specify which cut scores they considered to represent the average range, what difference scores they used when applicable, as well as the nature of the intervention required to make a diagnosis. As such, the follow-up question for measurement-based criteria included four options such as "a standard score of 85 (or 1 SD below the mean) and below" to select from when answering, for example, how they operationalize "impairment" in a cognitive process. For criteria related to the measurement of IQ and cognitive processes, participants were also asked to report whether they compare scores from these tests to scores from academic achievement tests. Responses to these and closely related questions were used to create two further variables; framework alignment and evidence alignment. Each variable is explained next.

Framework Alignment Category. Participants' responses to these criteria and two related items about assessment methods from later in the questionnaire[2], were coded to categorize participants in terms of their framework alignment. The categories were, Full DSM, Partial DSM, Full LDAC, and Partial LDAC. The process used for coding is delineated in Appendix C. Briefly, participants were coded as Full LDAC if they endorsed testing of IQ and cognitive processes, and Partial LDAC if they endorsed only one of these two criteria. Both DSM categorizations were contingent on participants not endorsing the use of either IQ or

[2] These items were "Do you currently use an IQ-discrepancy method when assessing for learning disabilities?" and "Do you currently use a processing strengths and weaknesses method when assessing for learning disabilities?"

cognitive processing scores in the learning disability assessment process and were differentiated based on whether they require an evidence-based intervention had been completed prior to diagnosis (i.e., Partial DSM), or simply require that extra help had been given to the student (i.e., Full DSM). An example of integrating the methods questions with the criteria follows: to determine whether an individual was in agreement with average IQ being necessary for learning disability diagnosis, the individual could endorse **either** the criteria "a student must have at least average intelligence" or "do you currently use an IQ-discrepancy method when assessing for learning disabilities?" These two items were considered to meet this criterion. Coding was completed independently by myself and my supervisor with 100% categorization agreement. This was not surprising given that the steps were concrete rather than involving subjective judgments.

Evidence-Aligned Diagnostic Practices. The framework alignment categories captured which frameworks the psychologists were endorsing but did not fully capture the extent to which evidence-based practices were being followed. Thus, an Evidence-Aligned Diagnostic Practices scale, from 1-4, was created to capture increasing alignment with evidence-based practices. An interval scale was used as it best captured the underlying concept of evidence-based practice, with movement away from intelligence testing being the primary focus. Participants were coded as 1 on this scale if they endorsed the measurement and use of IQ and the measurement and use of cognitive processing tests while assessing for suspected learning disabilities (determined in the same way as for the LDAC framework; see Appendix C). Participants were coded as a 2 on the scale if they endorsed only one of these two criteria. As participants approached more evidence-aligned diagnostic practices, they no longer endorsed the measurement and use of IQ or cognitive processes scores in the assessment for learning disabilities; however, participants who

did endorse that, "IQ tests should routinely be used within the learning disability diagnostic process" were coded as a 3 on the scale. Finally, participants were coded at a 4 on the Evidence-Aligned Practice scale when they did not endorse any of the survey items pertaining to IQ testing and score use (unless it was in relation to a suspected intellectual disability), or any items involving testing and use of cognitive process scores.

Beliefs about Intelligence Tests and IQ Scores

To assess how respondents perceive intelligence and the usefulness of IQ tests, participants rated a series of ten position statements on a four-point Likert scale (from 1 = strongly disagree to 4 = strongly agree). These questions were adapted from Machek and Nelson (2010), with some reworking of questions and slight alterations to language as they were primarily looking at perceptions of intelligence testing in relation to reading disabilities rather than to learning disabilities more generally. In addition, references to DSM disorders were updated to be consistent with current labels. Two questions were included here for further exploration which were not included in the resulting scale. One question derived from research on teachers' beliefs (e.g., Metsala & Harkins, 2020), addressed the degree to which participants view intelligence as a fixed trait. A second question was from a separate scale in Machek and Nelson's (2010) study which concerned the view that declining use of tests of intelligence would be related to school psychologists' job security.

The IQ Usefulness Scale was therefore comprised of eight items. Item nine on the survey needed to be reversed coded and then the mean ratings across the eight items made up participants scores. There was a high level of internal consistency for this IQ Usefulness Scale, as determined by a Cronbach's alpha of 0.88.

Two items in the full IQ Usefulness Scale were used in calculating the Evidence-Aligned Diagnostic Practices Scale. Thus, to include the IQ Usefulness Scale in the prediction of this scale, a condensed version was created removing those two items. The condensed IQ Usefulness Scale had six items and maintained a high level of internal consistency with a Cronbach's alpha of 0.84.

Diagnostic Method Use

To assess psychologists' use of diagnostic methods in assessing for learning disabilities (intelligence-achievement discrepancy; processing strengths and weaknesses; response to intervention; low achievement), participants were asked to indicate either yes or no regarding their current use of each. Follow-up questions probed participants' reasoning for using or not using the method, to which they could endorse an unlimited number of options (e.g., work policy, work obligation, accessibility, training, evidence, ease, time constraints). These follow-up questions were adapted from Al Dahhan et al. (2021), who asked respondents to elaborate on why they endorsed the use of certain standardized tests. Item wording was changed for our purpose of assessing method use rather than test use, and a few reasoning items were added to address additional external factors which may contribute to selected use (e.g., provincial or school board policies). Additionally, this survey captured why they may choose not to use each given method. Therefore, all questions were reworded to provide participants with parallel options when they did not endorse method use. For example, the option "evidence supports the use of this method" became "evidence does not support the use of this method" for those who responded they did not use that method.

Diagnostic Framework and Terminology Use

The survey concluded with four questions directly asking participants about their use of diagnostic terminology and frameworks. The first two questions explicitly asked whether participants use the terms learning disability, learning disorder, and dyslexia when they diagnose; participants could endorse multiple responses. A third question asked participants whether they view learning disability and specific learning disorder as "representing the same disability/disorder (i.e., the same group of people)?" A follow-up, open-ended question was included for those who responded no, asking them to elaborate on what they viewed as the differences between the two. Finally, participants were asked to indicate their primary learning disability diagnostic framework from the following options: the LDAC, the DSM, or other (please specify).

Procedure

One primary recruitment method was email contact with appropriate registrants listed on the NSBEP directory of psychologists. At the time of recruitment, there were 162 psychologists listed as primarily practicing in "school psychology." Twelve psychologists listed did not have publicly available email addresses, and a further 24 were not contacted as they only had general administrative email addresses for the private practice where they are employed. Therefore, 126 psychologists were emailed as they listed their primary area of practice in "school psychology" and had publicly available, private email addresses. Four emails were declared "undeliverable" by the messaging service, making the final number of psychologists who were directly emailed 122.

The invitation to participate included a brief summary of the purpose of the anonymous survey, intended audience/inclusionary criteria, and the opportunity to be entered into a draw for

one of three $75 gift cards, along with a direct link to the consent and survey. Two reminders were sent, each about a month apart, indicating that participants were still being sought.

A second primary method of recruitment was supported by the public education union division for psychologists (Psychologists in Schools Association). Their leadership supported this research by distributing the invitation to participate in this study to their members on multiple dates.

In accordance with ethical standards, the study was conducted on the SimpleSurvey platform which stores data in Canada. Access to SimpleSurvey is available on any smart device (e.g., cellphone, tablet, computer). Questions were presented the same way for each participant, and participants had the option to save their responses and return to the website later to continue.

Recruitment and Participants

This research targeted psychologists currently practicing in Nova Scotia who identify themselves as school psychologists and who are actively involved in conducting psychoeducational assessments for suspected learning disabilities (e.g., must have completed one or more assessments for suspected learning disability in the past two years; for a similar approach see Benson et al, 2020). Participants must also have completed these assessments with students 5-21 years of age. Of the 122 psychologists contacted, 81 participants responded to the online survey. Nineteen participants discontinued the survey before completion, and one participant was excluded due to an indication that they no longer practiced in the province. Therefore, the final sample size was 61 practicing psychologists, a response rate of 50% of those contacted and representing 37.7% of those listed as primarily practicing in “school psychology” in the NSBEP directory.

Thus, 61 (57 females and four males) participants were included in the analyses (for a detailed demographic response breakdown, please see Table 1). All respondents were either fully registered as psychologists (73.8%, n = 45), or on the candidate register[3] (26.2%, n = 16). Most participants had a terminal master's degree in school psychology (n = 57), two received master's level training in related areas (e.g., counselling psychology, developmental psychology), and two were trained at the doctoral level.

A wide range of years of experience was reported, with the most frequent being in the five to nine years (21.3%) and over 15 years (44.3%; see Table 1 for full breakdown) categories. Predominantly, respondents work in Regional Centres for Education (n = 46) as their primary setting, with 25% (n = 15) indicating that they primarily work in private practice. Respondents were also given the option to detail any secondary employment settings. Slightly less than 10% (n = 6) indicated that they work secondarily at Regional Centres for Education, and 34.4% (n = 21) of participants indicated that they work secondarily in private practice. Participants were spread fairly evenly in terms of reported employment locations with 34.4% (n = 21) respondents reporting they primarily work in urban locations, 36.1% (n = 22) in rural locations, and 29.5% (n = 18) in both rural and urban settings.

Participants responded to a question about the percentage of time they spend conducting assessments for suspected learning disabilities. The majority of respondents indicated that they spend between 21-40% (n = 18), 41-60% (n = 18), or 61-80% (n = 11) of their working hours assessing students for suspected learning disability. A further five participants responded that they spend between 81-100%, and nine participants indicated that this takes up less than 20% of

[3] These are individuals with terminal master's degrees, who are required to complete four years of supervised practice prior to becoming registered.

their working hours. Most participants reported conducting assessments with elementary, junior high/middle school, and high school students, while 39% (n = 24) reported also working with post-secondary students. When asked to estimate the proportion of time they spend assessing each population, participants reported spending the most time with elementary students (*M* = 54.7%, *SD* = 19.8), followed by junior high/middle school students (*M* = 23.0%, *SD* = 15.2), high school students (*M* = 19.2%, *SD* = 18.6) and finally post-secondary students (*M* = 8.6%, *SD* = 18.5).

Results

Analysis Overview

All analyses were conducted using IBM SPSS Statistics Version 29. The main study variables included a mix of nominal, ordinal, and interval. Research questions were answered using descriptive statistics, chi-square tests of independence, bivariate correlations, and hierarchical multiple regression. The results of analyses are presented to answer each research question in turn.

Psychologists' Diagnostic Practices

The first research question addressed multiple components of how psychologists are diagnosing learning disabilities in Nova Scotia. Descriptive statistics and mean response rates for variables examined for this first research question are presented in Tables 2 through 7.

To examine what diagnostic criteria participants endorse for the diagnosis of a learning disability, the means, SDs, and proportion of participants agreeing were first examined for each of the four criteria (see Table 2). All participants agreed or strongly agreed that a student must have an impairment in an academic skill to be diagnosed with a learning disability (*M* = 3.61, *SD* = .49). Similarly, a high proportion of overall agreement (i.e., either selected agree or strongly agree) was found for the criterion "difficulties must persist despite targeted

intervention/programming" (*M* = 3.44, *SD* = .67); only four participants indicated that they disagreed or strongly disagreed with this item.

There appeared to be less agreement with the criterion that "A student must have at least average intelligence" (*M* = 2.08, *SD* = .81); with 16 participants endorsing one of the "agreement" responses. The mean rating was similar concerning the criterion that "A student must have impairment in one or more cognitive processes" (*M* = 2.08, *SD* = .74), with 15 participants endorsing one of the "agreement" responses. Table 3 reports participant responses to follow-up questions about the operationalization of these criteria. Note that all participants answered these questions, not just those who endorsed the related criterion. Cut scores defining the average range for measurement-based criteria seemed to vary depending on the test. For example, 62.1% (n = 36) of the participants endorsed either 85 and above or 90 and above as the cut-off for an average IQ score, while that proportion was 29.1% (n = 16) for cognitive processes and 44.2% (n = 27) for academic tests.

The second component of research question one addressed which methods psychologists use for diagnosis and why (see Table 4 for descriptive statistics). The majority of respondents endorsed that they use a response to intervention method (n = 38, 63.3%) and a low achievement method (n = 49, 80.3%) when assessing for learning disabilities. Thirteen (21.7%) respondents indicated that they currently use processing strengths and weaknesses methods and eight (13.1%) endorsed that they use an intelligence-achievement discrepancy method.

The most commonly reported reason for either using or not using a given method was beliefs about the method's evidence base (see Table 5 for comprehensive results on participants' reasons for method use). For example, 89.5% of those who endorsed using a response to intervention method and 81.6% of those who reported using a low achievement method endorsed

that they do so because evidence supports the use of these methods. Conversely, 94.3% of those who selected "no" to using intelligence-achievement discrepancy, and 91.5% of those who selected "no" to using processing strengths and weaknesses, endorsed that they do not use these methods due to a lack of supporting evidence. Training was another commonly reported influence on decision-making. Of the smaller numbers of psychologists who reported using an intelligence-achievement discrepancy or processing strengths and weaknesses method, most endorsed that they do so because of training (87.5% and 77%, respectively). District and provincial policies, obligations to supervisors, and time constraints, each played a relatively small role in decision-making (e.g., less than 15% cited each of these reasons).

The first research question also addressed what framework participants reported using for assessing learning disabilities. Participants largely reported using the DSM (n = 52, 85.2%). The use of LDAC's framework was reported by only five respondents (8.2%) and only four selected "other". Each participant who selected "other" further elaborated that they use both the DSM and the LDAC frameworks (see Table 7).

As outlined in the methods section, participants were assigned to a framework-alignment category, based on their responses to the four criteria and closely aligned questions (for the coding scheme, see Appendix C). Eighteen percent of participants (n = 11) were categorized as Full DSM; 42.6% (n = 26) as Partial DSM; 18% (n = 11) as Full LDAC; and 21.3% (n = 13) as Partial LDAC. To further validate the coding system, Kruskal-Wallis H tests were run to determine if there were differences in median criteria scores between the four assigned framework categories. Distributions of criterion scores were similar for all groups, as assessed by visual inspection of a bar graph. Median IQ Criterion scores ($\chi^2(3) = 27.04$, $p = <.001$; n = 59) and Cognitive Criterion scores ($\chi^2(3) = 30.57$, $p = <.001$; n = 59) were statistically different

between groups. Academic Criterion scores ($\chi^2(3) = 3.93$, $p = .270$; n = 59) and Intervention Criterion scores $\chi^2(3) = 1.14$, $p = .77$) were not significantly different between groups. These findings support the notion that what differentiates the groups are the IQ and cognitive processing test use which is associated with LDAC alignment but that the groups do not differ on the academic-related criteria. It should be noted that the Intervention Criterion scores were only used in assigning participants to either Partial or Full DSM categories.

The final component of research question one explored the terminology that psychologists use and whether they view the different diagnostic labels as representing the same or different disorders (see Table 7). Most participants reported using the DSM terminology of specific learning disorder (n = 56, 91.8%), while less than half reported using the term "learning disability" (n = 21, 34.4%). A high proportion of respondents (n = 49; 80.3%) indicated that they believe specific learning disorders and learning disabilities to be the same conceptual diagnosis, regardless of terminology; however, 19.7% (n = 12) of participants indicated that they view these terms as representing different disorders and different groups of people. Further qualitative comments from these participants are briefly addressed in the discussion section.

Internal Consistency of Diagnostic Framework and Method Use

The second research question addressed whether participants reported use of three of four diagnostic methods (i.e., intelligence-achievement discrepancy, processing strengths and weaknesses, response to intervention) and their reported use of the diagnostic frameworks (e.g., DSM, LDAC) are consistent with their responses to related questions. First, a series of chi-square tests of independence was performed to evaluate the relationship between intelligence-achievement discrepancy, processing strengths and weaknesses, and response to intervention methods and questions related to operationalizing these methods. Chi-square tests involving

intelligence-achievement discrepancy and processing strengths and weaknesses had a higher-than-recommended number of cells with an expected cell value of less than five. Therefore, the Likelihood Ratio and Fischer's Exact Test values are reported for a more conservative statistic.

The relationship between participants' reported intelligence-achievement discrepancy use and whether they endorsed an item asking if they compare results of IQ tests and academic achievement tests was significant, χ^2 (1, n = 60) = 34.23, p = <.001; Phi = .828, p < .001. Those who selected that they compare scores on these tests were significantly more likely to also state that they use intelligence-achievement discrepancy methods than those that do not compare test scores between IQ and academics. Similarly, those who selected that they compare scores on tests of cognitive processes and academic skill were significantly more likely to report using processing strengths and weaknesses than those who did not, χ^2 (1, n = 59) = 17.49, p = <.001; Phi = .544, p <.001. No significant relationship was found between reported response to intervention use and participants' endorsement of an item asking whether they require evidence-based interventions to have occurred before making a learning disability diagnosis, or if they require the student to be provided with extra help or programming (p = .254).

Further chi-square tests were used to examine both framework alignment categories and self-reported framework use and their relationships to two items from the IQ usefulness section of the survey (see Table 8). These items assessed the endorsement of routine use of intelligence tests in assessment for learning disabilities and restricted use of IQ only for differential diagnosis when an intellectual disability is suspected. Again, all tests had more cells than recommended with an expected cell value of less than five, so a Likelihood Ratio value is reported for a more conservative statistic. Results showed that endorsing the routine use of tests of intelligence in the learning disability assessment process was more likely for those who reported using the LDAC

framework than those who reported using the DSM, χ^2 (2, N = 61) = 11.14, p = .004; Cramer's V = .359, p = .020. Participants assigned framework alignment category was also significantly related to their routine use of IQ tests χ^2 (3, N = 61) = 20.86, p < .001; Cramer's V = .523, p < .001. Overall, participants assigned to partial and full DSM categories were less likely to endorse using tests of intelligence routinely in the assessment of learning disability than those in partial and full LDAC categories. No significant differences were found for the assigned framework category, or participants' self-reported framework use, and their endorsement that intelligence tests should only be used if an intellectual disability is suspected (p = .093 and p = .100, respectively). This is surprising, as this practice aligns with the DSM framework.

Psychologists' Beliefs About Learning Disabilities

The third research question concerned the nature of psychologists' beliefs about the etiology of learning disabilities and the usefulness of intelligence tests. To examine participants' etiological perspectives, ratings and proportion of agreement or disagreement were examined for each item (for a similar approach to examining these questions, see Cottrell & Barrett, 2017).

Overall, respondents endorsed the relationship between learning disabilities and environmental factors at high rates (see Table 9). Over 85% of respondents either agreed or strongly agreed that environmental deprivations (n = 53) and ineffective instructional opportunities (n = 52) significantly impact whether a learning disability will manifest. Eighty-five percent (n = 51) of respondents either agreed or strongly agreed that improvements in general educational instruction would decrease the prevalence of learning disabilities and about 71% (n = 44) of respondents viewed learning disabilities as something that can often be prevented through effective instructional opportunities.

Participants also frequently endorsed items related to a biological etiology. For items targeting the role of heritability in the development of learning disabilities, 60.6% (n = 37) agreed or strongly agreed. Participants responded similarly for the items addressing the neurobiological foundations of learning disabilities (68.8%, n = 42) and the permanence of learning disabilities, (70.5%, n = 43). On the other hand, respondents did not highly endorse the statement that measurement of IQ or cognitive processes is more important than environmental factors when assessing for learning disabilities, with 72.2% (n = 44) either disagreeing or strongly disagreeing.

The same approach was taken to examine participants' views on the usefulness of IQ tests (this follows the approach of Machek & Nelson, 2010). Overall, a substantial proportion of respondents indicated that they perceive IQ tests to be useful in the learning disability assessment process (see Table 9). About 42% (n = 26) of respondents agreed or strongly agreed that full-scale IQ scores are useful to help understand the nature of a learning disability. The proportions of those agreeing that factor scores or subtest scores derived from tests of intelligence are useful to help understand the nature of a learning disability were 52.2% (n = 32) and 36.6% (n = 22), respectively.

Routine use of tests of intelligence in the learning disability assessment process was either agreed or strongly agreed with by 57.4% of respondents (n = 35), while only using IQ tests when needed to differentiate between learning disability and intellectual disability was endorsed by 36% (n = 22). A high proportion of respondents either agreed or strongly agreed that "an IQ test provides qualitative information about how a student learns" (73.8%, n = 45), and over half agreed that tests of intelligence are useful for treatment planning and generation of instructional strategies (59%, n = 36). Of the entire set of questions, Item 10, which assessed respondents'

views of the usefulness of tests of intelligence in providing qualitative information about how a student learns, appeared the most favoured with 85.2% (n = 52) either agreeing or strongly agreeing (M = 3.02, SD = .62). While the majority of participants (62.3%, n = 38) did disagree that a substantial decrease in the use of tests of intelligence is a threat to their job security, the remaining 38% agreed that this would be the case.

Bivariate correlations were examined to determine the relationship between an individual's views on the etiology of learning disabilities and the favorability of the usefulness of IQ tests (see Table 10). Scatter plots were examined for each scale to ensure linearity assumptions were met. All variables were normally distributed with skewness and kurtosis values between -1 and 1, and correlations are presented with all data points in the equation.

An increase in the degree of agreement on the environmental scale was moderately and negatively correlated with the Biological Perspectives scale (r = -.380, p = <.01). This indicates that participants who had stronger agreement with a biological perspective of learning disabilities had lower agreement concerning environmental causes. There was a weak negative correlation between the Environmental Perspectives scale and the IQ Usefulness scale (r = -.257, p < .05), indicating that the stronger a participant agreed with environmental etiological perspectives, the less they agreed with the usefulness of tests of intelligence. There was no significant relationship between the IQ Usefulness scale and the Biological Perspectives scale.

Contributors to Psychologists' Use of Evidence-Based Practices

The fourth research question asked about how psychologists' beliefs, years of experience, and employment setting, predict their alignment with what has been reviewed in this study as evidence-based practice. A four-step hierarchical multiple regression analysis was conducted to

examine the contribution of each of these variables on a participant's level of evidence-aligned diagnostic practices.[4]

All assumptions were met for this analysis. The distributions of all variables were normally distributed (Tabachnick & Fidell, 2007), yielding normally distributed residuals for the regression analysis. The assumption of linearity was met as assessed by a plot of studentized residuals against the predicted values. Independence of residuals was shown as assessed by a Durbin-Watson statistic, which was equal to 2.2. The assumption of homoscedasticity was met as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. Furthermore, there was no evidence of multicollinearity, as all tolerance values exceeded .71. There were no leverage values greater than 0.2, and the highest value for Cook's distance was .24.

Employment setting was entered as the first step, to control for practice setting. The remaining 3 variables were entered from least to most strongly correlated with the dependent variable to determine the unique contribution in each model (see Table 10 for correlations and Table 11 for the results of the regression).

In the first step (or model), employment setting did not predict significant variance in the extent of evidence-aligned practice. Entered as the second step, the Environmental Perspectives scale predicted 11.5% of the variance in the extent of evidence-aligned practices. In the third step, the Biological Perspectives scale accounted for an additional 8.5% of the variance. In the final step, the IQ Usefulness scale accounted for an additional 27.9% of the variance in the Evidence-Aligned Diagnostic Practices scale. In the final model, accounting for a total of 48% of

[4] Years of experience was initially included as a control in the first step. It did not significantly predict the dependent variable or change any significant outcomes. This variable is not reported in the final equation for parsimony and given the relatively small size of the sample.

the variance in evidence-aligned diagnostic practices, etiological beliefs about biology and perspectives on the usefulness of tests of intelligence were significant predictors.

Employment Setting and Diagnostic Practices

Although not a central research question, the relationship between employment setting and diagnostic practices and beliefs warrants further exploration. Given the small number of participants who primarily worked in private practice, results should be interpreted with caution. First, a series of descriptive statistics were run separately for psychologists primarily practicing in Regional Centres for Education (n = 46) and those primarily practicing in private settings (n = 15) (see Table 12). Regarding diagnostic criteria, it appeared a similar proportion of psychologists working privately endorsed the criterion, "A student must have at least average intelligence" (26.6%, n = 4) and the criterion, "A student must have impairment in one or more cognitive processes" (26.7%, n = 4) as psychologists working primarily in schools (26.6%, n = 12; and 23.9%, n = 11, respectively). Psychologists did appear to differ somewhat between employment settings on their endorsement of the "evidence that difficulties persist despite targeted intervention" criterion, with 86.6% of those primarily practicing privately endorsing this criterion, and 95.6% of those primarily practicing in schools endorsing this criterion.

It appeared that similar proportions of psychologists between employment settings reported using response to intervention methods for diagnosing learning disabilities. Sixty-three percent (n = 29) of psychologists working primarily in Regional Centres for Education and 60% (n = 9) of psychologists working primarily privately, reported using this method. For low-achievement methods, 84.8% (n = 39) of psychologists working in schools report its use. Psychologists practicing privately also reported using this method, but for what appeared to be a smaller proportion (66.7%; n = 10). On the other hand, it appeared that a higher proportion of

psychologists practicing privately reported using intelligence-achievement discrepancy (26.7%, n = 4) and processing strengths and weaknesses (40%, n = 6), than those working in schools (8.7%, n = 4; 15.6%, n = 7, respectively).

Comparisons between framework assignment frequencies revealed what appeared to be differences between employment settings. Over half (53.4%, n = 8) of the participants working privately were categorized as either partially or fully aligned with LDAC, whereas 34.8% (n = 16) of those working in schools were categorized as such. The breakdown of self-reported framework use revealed that psychologists working in schools and private practice predominantly endorsed that they use the DSM framework (91.3%, n = 42 and 66.7%, n = 10, respectively); however, 33.3 % (n = 5) in private practice reported using LDAC or both frameworks while that number for the regional centres was 8.7% (n = 4).

An independent-samples t-test was run to determine if there were differences in perspectives on etiology and the usefulness of tests of intelligence between psychologists who primarily work in schools and those who primarily work in private practice. The mean score on the environmental etiological perspective was higher, or more agreed with, for those who primarily work in schools (M = 3.26, SD = .43) than those who work in private practice (M = 2.88, SD = .57); M_D = .379, 95% CI [.098, .659], $t(59) = 2.707$, p = .004, d = .805. No significant group differences were found for perspectives on biological etiology (p = .419) or usefulness of IQ tests (p = .158).

Discussion

The overarching goal of this study was to explore the assessment practices of psychologists diagnosing learning disabilities in Nova Scotia and to compare the results with research on evidence-based practices. Study results showed that, in some respects, it appears as

though psychologists in Nova Scotia are moving away from non-evidence-based practices (e.g., intelligence-achievement discrepancy and processing strengths and weaknesses methods) and toward evidence-based practices (e.g., low achievement and response-to-intervention methods); in general, this represents a shift away from methods consistent with the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) framework and more consistent with the DSM-5-TR (APA, 2022). On the other hand, respondents frequently endorsed the use of intelligence tests and measures of cognitive processing, in ways not found to align with evidence. Thus, it appears that psychologists in Nova Scotia may be in a relative state of flux, moving away from some practices and toward those which are better supported by evidence. At the same time, there appear to be steps to be taken to commit to the necessary changes to fully align practices in the diagnosis of learning disabilities with the current evidence. Findings from this study regarding diagnostic test use, methods, and frameworks are each discussed in turn, in relation to the existing literature.

Standardized Test Use and Defining Average Performance

Many psychologists surveyed in this study endorsed the use of standardized tests, particularly tests of intelligence, in ways that do not align with the evidence. When assessing students for potential learning disabilities, just over half of the responding psychologists (n = 32, 53%) endorsed the use of factor scores, and a significant number endorsed the use of an overall IQ score (n = 26, 42%) and subtest scores (n = 22, 37%). These results are similar to those reported in other studies, though, psychologists in Nova Scotia may be somewhat less frequent in their endorsement. For example, Machek & Nelson (2010) found that 62% of psychologists endorsed the use of factor scores, and Kranzler et al. (2020), found a 64% endorsement rate. In line with Machek & Nelson (2010), albeit 14 years later, our results indicated that factor scores

appear the most favoured among the potential intelligence test scores that could be used. However, some studies report the full-scale IQ score interpretation as the most favoured (e.g., Kranzler et al., 2020, reported an 80% endorsement rate). Of the potential scores from intelligence tests, full-scale IQ scores are the most valid in terms of psychometric interpretation (Dombrowski et al., 2017; Restori et al., 2009), yet these appear to be judged as less useful than factor scores, with psychologists in this study endorsing the use of full-scale IQ scores at a rate of 48%, consistent with Machek & Nelson (2010).

A diagnostic practices survey among Nova Scotia psychologists 15 years ago (N = 47), found that about half of participants endorsed the item that, 'Full-scale IQ score or GAI is necessary for learning disability diagnosis' (Blotnicky, 2010). Thus, it appears that fifteen years later it is still approximately half of the sample who believe that full-scale IQ scores are useful in diagnosing learning disabilities. This is one finding that tempers the notion that psychologists have moved more fully toward evidence-based practices in the province. While the survey conducted in Nova Scotia fifteen years ago did not look at factor scores as they pertain to tests of intelligence, it did question participant use of specific cognitive measures (Blotnicky, 2010), which may be thought of as standalone versions of what a factor score intends to measure on an intelligence test. Many participants in that study either reported occasionally or always using specific tests of phonological processing (85%), memory or attention (85%), and processing speed (96%). However, it is unclear how the scores from these tests were being used by respondents (e.g., to assess for cognitive impairments, for use in diagnosis, to inform interventions). While this could indicate there has been a shift away from the use of factor scores, it could also be that psychologists continue to use these specific cognitive measures but do not derive them from a test of intelligence.

Interpretation of scores derived from intelligence tests beyond that of a full-scale measure of IQ (i.e., factor and subtest scores), have widely been condemned in terms of psychometric properties (for review, see McGill et al., 2018). The use of these scores and interpreting the cognitive profile (e.g., scatter) are central to older conceptualizations and more recent reconceptualizations of the processing strengths and weaknesses method (see also the section below on Diagnostic Methods). These approaches are invalid and unreliable in identifying learning disabilities for a number of reasons. At a test level, exploratory factor-analysis studies have found subtests and factor scores on popular tests of intelligence to inadequately load on the identified related factor (Canivez et al., 2017; Dombrowski et al., 2017). This means that it is questionable whether psychologists are obtaining accurate indicators of the cognitive abilities that the test purports to measure. Research has also shown that both subtest and factor scores are unstable over time, making diagnostic conclusions derived from these scores at a specific point in time unreliable (Watkins & Canivez, 2004). Examining intra-individual patterns or scatter and the myriad of associated practices, often called cognitive profile analysis, have consistently been shown to be psychometrically invalid (Benson et al., 2018; Canivez, 2013; McGill et al., 2018), unreliable for diagnosis (Taylor et al., 2017), and non-informative for treatment purposes (Fletcher & Miciak, 2017; Miciak et al., 2016; Morris et al., 2012; Steubing et al., 2015).

Children experiencing academic difficulties have been found to have similar cognitive processing patterns as those who are achieving as expected for their age (D'Angiulli & Siegel, 2003), making the use of cognitive process or subtest scores an ineffective way to differentiate students with versus without learning disabilities. Although scatter between factor-level processing scores are still widely used in processing strengths and weaknesses methods, even early proponents of subtest-level cognitive profile analysis caution against its use (e.g., Kaufman

et al., 2015; Schnieder & Kaufman, 2017). Therefore, that just over a third of respondents in this study endorsing subtest scores as useful in understanding the nature of a learning disability is cause for concern. Although this rate is favourable to similar studies in the United States which found closer to 60-70% endorsement (Kranzler et al., 2020; Machek & Nelson, 2010), considering that these methods are as accurate in identifying students with learning disabilities as chance (for review, see McGill et al., 2018; Watkins, 2005), I would argue that one-third of psychologists endorsing subtest score use is too high.

Canadian researchers (e.g., Siegel, 1988; 1989; Stanovich & Siegel, 1994) were among the first to point out that measures of IQ are irrelevant to the diagnosis of learning disabilities (OHRC, 2022); yet, decades later, these practices are still endorsed by popular groups in Canada. In regard to learning disabilities, the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) states that "These disorders affect learning in individuals who otherwise demonstrate at least average abilities essential for thinking and/or reasoning", which is typically estimated by a measure of intelligence (i.e., an IQ score). While the DSM-5-TR does mention average intelligence in their discussion on diagnostic features of learning disabilities, it generally defines this range broadly, as 70, plus or minus five points to account for standard error (APA, 2022). Further, the DSM-5-TR does not require a measure of intelligence to make a diagnosis, rather, it highlights the range below which an intellectual developmental disorder would be a more appropriate diagnosis to explore. The LDAC framework, on the other hand, does require a measure of average intellectual ability to make a diagnosis. However, the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) does not specify what constitutes an "average or above average" IQ score. Other Canadian guidelines, such as those developed by the Ontario Psychological Association in 2018 also include average IQ as a criterion for

diagnosis and offer ranges between 85-115 to represent average functioning. Similarly, most diagnostic frameworks or guidelines require that academic achievement on a standardized measure is below average (e.g., DSM-5-TR, ICD-10, LDAC, OPA). However, the LDAC framework does not offer guidance on what cut scores to use to define these ranges, and DSM-5-TR (APA, 2022) offers a wide range of degrees of severity of academic functioning which may be associated with a learning disorder from which to choose.

Given these differences in the amount of guidance provided between frameworks, it is reasonable that psychologists would vary in their interpretations of cut scores used to represent average, or below average. A large proportion (38%, n = 23) of surveyed psychologists endorsed the same cut score across all tests (i.e., academic, cognitive processes, intelligence). The remaining respondents endorsed different scores for defining the average and below-average ranges on these different types of tests. This variability in cut scores between tests might be a component of sound practice if psychologists are using them intentionally and conscientiously. For example, if a psychologist uses both tests of intelligence and tests of academic achievement in their learning disability assessments, the cut score representing below-average achievement should be much higher than for average IQ. It would not be best practice to have a student be struggling to such an extent that they had to obtain a standard score of 70 or lower to meet the academic criterion of below average, especially given the fact that cut scores defining average are largely arbitrary. Similarly, it is not an evidence-based practice to require a student to have a full-scale IQ of 80, 85, or 90 and above to meet the average IQ criterion, as is required by the LDAC framework. The practices in both of these examples would prevent many students struggling with academics from being diagnosed with a learning disability. Further, as a cut score defining the average range for full-scale IQ increases (e.g., 85, 90), fewer students inevitably

meet this criterion. While researchers aligned with the LDAC framework have argued that the removal of the need for intelligence testing from the DSM-5-TR criteria could increase the risk of false positives and over-diagnosis (Fiedorowicz et al., 2015), the practice of disqualifying students based on an IQ cut score has been shown to be an invalid means to differentiate students who do and do not have a learning disability, nor do IQ scores indicate who will respond to intervention (e.g., Francis et al., 2005; Steubing et al., 2009). Unfortunately, our results indicate that respondents tend to conceptualize cut scores this way, with more psychologists being strict on what constitutes average IQ (21% agreed to 90 and above) than below-average academics (only 2% agreed to 90 and above). Furthermore, another 39% (n = 24) and 21% (n = 13) endorsed FSIQ cut scores of 85 and 80 respectively, as defining the average range.

Unexpected underachievement, that is poor academic achievement which is unexpected due to an average or above average level of intellectual functioning, has been a problematic concept in the learning disability field for many years (for discussion, see Siegel, 1988, Siegel & Stanovich, 1994, and Stanovich, 1999). Both the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) and the DSM-5-TR (APA, 2022) make reference to unexpected underachievement; however, the DSM refers to "unexpected" as lower academic achievement than would be expected for the age of the student. Unexpectedness as it relates to tests of intelligence is often determined either through the use of a cut score; or, more traditionally, difference scores which are a core component of intelligence achievement discrepancy methods.

To determine whether the concept of unexpected underachievement and its related approaches are currently practiced in Nova Scotia, participants were asked whether they compare IQ scores or cognitive processing scores to academic achievement scores. There were 11

participants (18%) who endorsed comparing a measure of IQ and academic achievement. Further optional questions, which applied only to these participants, revealed some common themes. First, three psychologists reported using specific magnitudes, or number of points that define a difference, for defining the degree of discrepancy required (e.g., 10-14 and 15-19 points); one participant described the magnitude as being defined by their chosen test battery (i.e., Woodcock-Johnson IV Tests of Cognitive Abilities; Schrank & Wendling, 2018). Second, several participants indicated that the magnitude of required discrepancy depends on the unique student profile. Finally, a couple of participants responded that a specific magnitude is not required, but that an IQ score is an important piece of information in the overall assessment. What might be deduced from those of the 11 participants who chose to elaborate, is that when psychologists do compare performance on intelligence tests to performance on academic achievement tests, they are typically doing one of three things: using standard difference scores for all cases; using flexible scores along with clinical judgement on a case-by-case basis; or generally comparing IQ to academic achievement as part of a large picture of student functioning (which may involve the use of specific cut scores from which to draw conclusions). It is important to note that the use of clinical judgment when making diagnostic decisions has long been argued as problematic (e.g., Dombrowski et al., 2022; Macmann & Barnett, 1997) and has been shown to be outperformed by more rigid diagnostic guidelines in making accurate classifications (Canivez, 2013).

Relatively higher numbers of psychologists reported comparing scores on measures of cognitive processes to academic achievement scores (n = 22; 37%; 9 psychologists endorsed both FSIQ and cognitive processing comparisons with academic achievement). A follow-up question further probed whether the participant uses the presence of cognitive strengths to determine unexpected underachievement. Seventeen respondents endorsed this manner of

comparison. Although the unexpected underachievement question was intended for those who had endorsed comparing cognitive processing weaknesses to find a causal connection with academic underachievement, two participants endorsed the unexpected underachievement question without first endorsing the parent question. Therefore, 15 of the 22 participants, or 25% of the sample, who endorsed causally linking cognitive deficits with academic achievement scores also endorsed using cognitive strengths to establish unexpected underachievement. This practice of comparing both cognitive strengths and cognitive weaknesses to academic achievement is the crux of processing strengths and weaknesses methods (for review, see McGill & Busse, 2017). The two participants who only endorsed the requirement of cognitive strengths to establish unexpected underachievement should not be disregarded; these individuals could be seen as endorsing a more traditional discrepancy method in their operationalization of measures of cognitive processes and their conceptualization of unexpected underachievement. It appears, based on these results, that the concept of unexpected underachievement remains salient for a significant portion of psychologists practicing in Nova Scotia. This is despite a plethora of evidence that defining underachievement on the basis of intelligence and cognitive tests is not valid (i.e., does not provide meaningfully different groups of students; Miciak et al., 2014; Miciak et al., 2016; Miciak et al., 2018; Stuebing et al., 2015) and is potentially discriminatory for those most marginalized in our communities (McDowell et al., 2007; Schatschneider & Hart, 2024, preprint; for review, see Ortiz, 2022).

Perspectives on the Utility of Tests of Intelligence

As discussed, this survey also targeted participants' perspectives on the utility of intelligence tests and how they may view the scores derived from these tests as useful for the purpose of diagnosis. Questioning also extended beyond this; to ask about how useful

intelligence tests are for informing recommendations concerning instruction and interventions or to rule out a potential intellectual disability. The majority of psychologists sampled believed that "A student's IQ score has implications for how a student can learn and be taught." (n = 45, 74%). Similarly, just over half of the participants endorsed that "IQ tests are useful in the treatment planning and generation of instructional strategies for students with learning disabilities." (n = 36, 59%). These statements are not consistent with research, which shows that IQ scores do not represent learning potential (e.g., Francis et al., 2005; Steubing et al., 2009). As previously discussed, IQ scores are not a good indicator of which students will, or will not, respond to intervention. For example, Vellutino, Scanlon, and Lyon (2000) conducted an intervention study in which 76 children who were shown through both teacher report and standardized testing to be poor readers, were randomly assigned to an intensive intervention. Their findings suggested that a student's IQ score was not an accurate means to differentiate responders from non-responders, which also indicates that using an IQ score as a proxy for potential is a faulty concept. Similar intervention studies have since been conducted and lend further support to these findings (for a meta-analytic review, see Steubing et al., 2009), as well as demonstrating a lack of evidence for the use of cognitive processing measures to inform intervention (for a meta-analytic review, see Burns et al., 2016). In addition to IQ scores, other factors such as racial background and socio-economic status have been studied and found not to differentiate responders to evidence-based intervention from non-responders (Morris et al., 2012). This further supports the notion that the use of an average intelligence criterion to define learning disabilities is harmful and discriminatory to vulnerable populations within our communities, in that, racialized students have been shown to be overrepresented as 'below average' on these tests since the 1970s (e.g., Jensen, 1976; Loehlin, Lindzey, & Spuhler, 1975; for more recent studies see Aston et al., 2021),

and many would not meet diagnostic requirements under this method. To summarize, a measure of general intelligence does not determine or limit how well students with learning disabilities can learn with appropriately targeted and intensive instruction, nor do other factors such as race or socio-economic background.

About a third of participants indicated the use of an intelligence test is only appropriate when there is a question of a possible intellectual disability, and a differential diagnosis is required. This group of participants are endorsing this exclusionary practice which is aligned with DSM-5-TR (APA, 2022) and with some current research in the field (Cornoldi et al., 2014; Lee & Cheon, 2024). However, some researchers suggest that using tests of intelligence as a primary method of differentiation between learning disabilities and intellectual disabilities is not efficient (e.g., Fletcher & Miciak, 2024). These researchers suggest that assessment of adaptive functioning is less time-consuming and potentially less harmful than testing to obtain an IQ score (Fletcher et al., 2004). For example, if IQ is assessed to be relatively low (e.g., 70-80 or below) and the student does not meet the critical criterion of impaired adaptive functioning necessary for a diagnosis of intellectual disability, a self-fulling prophecy may be set in motion. These students are sometimes referred to as “slow learners” or having “borderline intellectually functioning”; the expectations for students who score in this gray area will likely be lowered, and academic interventions may not be forthcoming because these students' IQ scores may be seen as representative of an upper limit on a student's ability to learn. Certainly, adaptations and other supports may not be put in place by withholding the learning disability label.

As has been discussed, there is a lack of evidence to suggest that tests of intelligence do meaningfully contribute to intervention. Therefore, using tests of intelligence for the purpose of ruling out intellectual disability for each student who has a suspected learning disability, a far

more prevalent diagnosis than intellectual disability, is argued to be a waste of time and resources (for discussion, see Fletcher et al., 2004). The results from this differential item contrast with the item asking whether routine use of IQ tests is appropriate for learning disability assessments. Over half of the respondents endorsed this item (n = 35, 57%). Routine use of intelligence tests is not aligned with evidence-based practice. As previously discussed, this is because scores derived from these tests are not valid or reliable components of learning disability diagnosis, nor are they useful in informing intervention. Despite this, in their position paper on the most recent LDAC framework update, Fiedorowicz and colleagues., 2015, highlighted their disagreement with measures of intelligence being used solely when intellectual disability is suspected; rather, they argue that it is an important part of all learning disability assessments and can inform intervention. They further stated support of routine use in that "the distinction between learning disabilities and an intellectual impairment has been considered a key issue as it can provide insights about potential for learning and types of interventions appropriate for each group" (Fiedorowicz et al., 2015, p. 7). However, in the absence of reason to suspect an intellectual disability, this is an overuse of tests not informative to diagnosis or treatment.

In the study with psychologists in Nova Scotia conducted almost 15 years ago, 95% of respondents endorsed from a moderate to a significant extent that 'IQ tests are crucial for learning disability diagnosis', yet only about half indicated that the IQ score was a necessary component of learning disability diagnosis (Blotnicky, 2010). Although the findings from the current study may show a movement toward evidence-based practice, still, over half of the participants endorsed the routine use of IQ tests, and as previously stated, 74% endorsed that a student's IQ determines their learning potential. This can be taken to mean that psychologists continue to use and judge tests of intelligence to be useful beyond the contribution of a score

used for diagnostic purposes. Overall, the seemingly unwavering commitment to tests of intelligence has been echoed in this study, as in numerous others (e.g., Benson et al., 2020; Kranzler et al., 2020; Machek & Nelson, 2010, Sotelo-Dynega & Dixon, 2014).

Diagnostic Method Use

Psychologists surveyed for this study reported using a variety of diagnostic methods when assessing for learning disabilities. Thirteen percent of psychologists reported that they continue to use an intelligence-achievement discrepancy method despite a plethora of research showing this is not a valid approach to diagnosing learning disabilities; that is, it does not create meaningfully different groups of students (Fletcher & Miciak, 2019). It may actually be harmful due to a large portion of students with learning difficulties being excluded from diagnosis based on a below-average IQ score, or the difference between an IQ score and academic achievement not being large enough (Fletcher et al., 1994; Stanovich & Siegel, 1994; Stuebing et al., 2002; Vaughn & Fuchs, 2006; Algozzine et al., 1982). For many years, this method of learning disability identification has excluded students from receiving supports which are contingent on diagnosis. Instead, students with too small of a difference between their IQ scores and academic achievement scores are seen as performing at their expected level and are often not seen as worthy of intervention. Dr. Tim Odegard, who now conducts research in the area of learning disabilities and holds a number of related and distinguished positions, was one such student (Carr, 2023). As Dr. Odegard puts it, he was seen as “too stupid to be diagnosed with dyslexia” (Carr, 2023, para. 5), and he has shared his frustration that this harmful practice continues four decades later.

Thirteen percent of psychologists who reported using intelligence-achievement-discrepancy methods is a lower proportion than similar recent American studies, for which approximately

one-third of respondents indicated using an intelligence-achievement discrepancy method (Benson et al., 2020; Maki & Adams, 2019), and from additional studies concluding that the vast majority of psychologists continue to use intelligence-achievement discrepancy methods in their practice (Cottrell & Barrett, 2016; Lockwood et al, 2022). Our results indicate that psychologists in Nova Scotia have generally moved away from this method when compared to results obtained in a similar provincial survey. Fifteen years ago, Blotnicky (2010), found that 23% of 47 respondents reported occasional use of intelligence-achievement discrepancy, and 49% said they always or almost always use this method. It is important to keep in mind that while only 13% endorsed using this method, 18% reported comparing an IQ score with a measure of academic achievement.

Processing strengths and weaknesses approaches also have an accumulating body of evidence to suggest that their use is neither reliable nor valid in identifying students with learning disabilities (e.g., Miciak et al., 2014; Miciak et al., 2015; Miciak et al., 2016; Steubing et al., 2012; Taylor et al., 2017). This is largely due to their foundation being the interpretation of cognitive profile scatter, or patterns, which once was mostly at the subtest level and is now largely through the use of factor scores on tests of intelligence or tests of specific cognitive processes (Watkins & Canivez, 2022). As discussed, there are many psychometric and practical issues with the interpretation of these scores for this purpose. It appears that psychologists practicing in Nova Scotia use processing strengths and weaknesses methods (22%, n = 13) more than they use intelligence-achievement discrepancy methods (13%, n = 8) when diagnosing learning disabilities. This is consistent with the general favourability toward using factor scores in learning disability assessments, which is one common way to measure cognitive strengths and impairments. Proponents of a processing strengths and weaknesses method may have been

underestimated in this study because 37% reported comparing cognitive deficits to measures of below average academic achievement. This is done to demonstrate a theoretically linked and often intuitive connection between an observed cognitive deficit, in order to explain the observed academic difficulty; this, along with the presence of an at least average measure of cognitive processing to show that the student is "capable" of achieving at a higher level, are core components of processing strengths and weaknesses methods (Beaujean et al., 2018). Similar surveys in the United States have tended to report higher rates of processing strengths and weaknesses endorsement with about a third to a half of respondents reporting its use (Benson et al., 2020; Maki & Adams, 2019). Results from the earlier Nova Scotia study showed that 17% of participants reported that they occasionally use processing strengths and weaknesses methods, and 38% reported that they always use processing strengths and weaknesses methods when assessing for potential learning disabilities (Blotnicky, 2010). Again, findings from the current study suggest a movement away from these methods based on the seemingly lesser rates of endorsement in the current study.

One method that evidence supports for the purpose of learning disability identification is response to intervention. The use of a response to intervention method for diagnosing learning disabilities was endorsed by 63% of respondents in this survey; a higher proportion than most comparable results which tend to top out at approximately half of respondents reporting use (for a meta-analytic review, see Sadusky et al., 2021). Compared to Nova Scotian psychologists surveyed 15 years ago, many more appeared to report the use of a response to intervention method in the current study. Blotnicky (2010) found that 17% of the 46 psychologists who responded to the item endorsed that they frequently use a response to intervention approach and 32% endorsed that they do so occasionally. The high proportion of endorsement from psychologists surveyed in the current

study may seem paradoxical for a couple of reasons. First, diagnosing in this manner requires an education system that uses evidence-based methods of classroom instruction, and evidence-based tiered interventions, along with effective screening and progress monitoring. Many of these elements have not been present in the Nova Scotia education system, which has largely relied on interventions such as Reading Recovery (Clay, 1993) and the Leveled Literacy Intervention (Fountas & Pinnell, 2009) in the area of reading, and no consistent, evidence-based approaches for writing or mathematics. Furthermore, screening and progress monitoring have largely been with levelled reading inventories, which have shown to be unreliable (Parker et al., 2015). Therefore, it is difficult to conceive of how this method could be implemented for assessment when the required system does not support it. Second, there was a high endorsement rate of the usefulness of tests of intelligence; many participants did report the use of a response to intervention method alongside other methods which require measures of intelligence or cognitive processing.

In fact, over sixty percent of respondents (n = 39, 64%) reported using multiple methods in their diagnostic practices. These findings concur with those from Benson et al. (2020), who found large overlaps between reported use of intelligence-achievement discrepancy and processing strengths and weaknesses, processing strengths and weaknesses and response to intervention, and response to intervention and intelligence-achievement discrepancy. As also noted by those authors, the results from the current study do not capture whether participants are using multiple methods at different times for assessments with different students, or if they are using them concurrently to assess the same student. Overlapping methods from our study included six respondents who reported using both intelligence-achievement discrepancy and processing strengths and weaknesses methods, six who reported using both intelligence-achievement discrepancy and response to intervention, and five who reported using both processing strengths and weaknesses

and response to intervention. Thus, a portion of participants who endorsed using response to intervention in their diagnostic practices are also using non-evidence-based methods like intelligence-achievement discrepancy and processing strengths and weaknesses. Low achievement methods which were reported by the vast majority of respondents (80%, n = 49) were also commonly reported to be used in conjunction with other diagnostic methods like processing strengths and weaknesses (n = 9), and response to intervention (n = 29). Therefore, on the surface, participants who report the use of low achievement or response to intervention may look as though they are following current recommendations for best practices. However, a portion of these psychologists also continue to report using intelligence-achievement discrepancy or processing strengths and weaknesses, and many also endorsed the use of IQ and cognitive measures, even when they did not report using related diagnostic methods (e.g., intelligence-achievement discrepancy or processing strengths and weaknesses), or diagnostic frameworks which require them (e.g., LDAC).

There appeared to be overall consistency between participants' responses to method selection and related questions concerning the comparison of measures of intelligence or cognitive processes with academic achievement (shown with the chi-square results for intelligence-achievement discrepancy and processing strengths and weaknesses). This means that participants who selected "yes" to comparing IQ scores or cognitive processing scores to academic achievement scores were significantly more likely to report using intelligence-achievement discrepancy or processing strengths and weaknesses, respectively. However, in comparing participants' endorsement of response to intervention with a related question which asked participants whether they require either evidence-based intervention or extra help to diagnose a learning disability, respondents were not consistent. Expected results would have been those who

endorsed the response to intervention method more highly endorsing evidence-based interventions rather than extra help. The parent question that precipitated the question asking participants whether they endorse either evidence-based intervention or extra help asked, “How do you determine whether a “targeted intervention” has been implemented?”. This wording was taken directly from the DSM-5-TR (APA, 2022), which does not require an evidence-based intervention for the purpose of diagnosis (for discussion, see Tannock, 2014). Participants' endorsement of either extra-help or evidence-based intervention may be more reflective of their understanding, or misunderstanding, of the diagnostic criteria contained within the DSM, rather than their use of a response to intervention method. Furthermore, as discussed, the education system has largely not supported this approach.

Diagnostic Frameworks: Reported Use and Alignment

When asked which diagnostic framework “do you typically use when assessing learning difficulties?”, many respondents endorsed that they use the DSM-5-TR (n = 52, 85%). The DSM was revised in 2013 to align with recent research on learning disabilities and their diagnosis and was updated again in 2022 without major changes to diagnostic criteria (APA 2013; 2022). That 85% of the psychologists reported following this framework, however, does not align with responses to other questions in the survey. For example, six participants who reported that they use the DSM also reported that they use processing strengths and weaknesses, one reported that they use intelligence-achievement discrepancy, and two reported that they use both processing strengths and weaknesses and intelligence-achievement discrepancy. In addition, all four of the participants who reported using both the LDAC and the DSM frameworks also reported using either processing strengths and weaknesses or intelligence-achievement discrepancy methods. Fourteen participants who reported using the DSM as their primary diagnostic framework also

endorsed criteria specific to the LDAC framework (e.g., the student must have an average IQ or average cognitive processing scores), which is fundamentally incongruent with the DSM-5-TR. Moreover, the previously discussed high levels of endorsement of the use of intelligence test scores in diagnosing learning disabilities, informing interventions, or gaining qualitative information, is also incongruent with the majority reporting following the DSM framework.

In this study, I used the diagnostic criteria participants endorsed as well as their answers to closely related questions (see Appendix C), to assign participants to the framework their responses best fell within. The proportion fully aligning with the criteria contained in the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) was 18% (n = 11), while 21% (n = 13) were found to be partially aligned. Eighteen percent (n = 11) of participants were fully aligned with the DSM-5-TR criteria, and 43% (n = 26) were found to be partially aligned. In total, 57% (n = 35) of participants reported categories did not align with our own categorization. This is not to suggest that psychologists are misreporting their diagnostic framework use, but it is likely that many psychologists who may be partially aligned with either framework or are in the process of moving toward the use of DSM or are using it for some things and not others. For some psychologists following the current criteria in the DSM, routine intelligence testing remains a highly endorsed component of learning disability assessment, a practice better aligned, and significantly more likely to be endorsed, by those aligned with the LDAC framework. Further, we found no significant group differences between diagnostic frameworks and only using intelligence testing when an intellectual disability is suspected. We would have expected to see an increased rate of endorsement from those aligned with DSM on this item, as it is a practice supported by this framework. It is possible that these findings further support the notion that some psychologists are using IQ tests for purposes other than diagnosis or

exclusion of other related diagnoses (e.g., to inform intervention and instruction, for qualitative information).

Psychologists were also asked about the diagnostic label(s) they use when diagnosing students with learning difficulties. There were 92% of participants who endorsed using the label from the DSM-5-TR, that is, "specific learning disorder" (92%, n = 56). Thirty-four percent of psychologists endorsed that they use the label "learning disability". Whereas some participants may use these terms interchangeably, there were twelve participants (20%) who indicated that they do not "conceptualize a learning disability and specific learning disorder as representing the same disability/disorder (i.e., the same group of people)". These psychologists were asked to elaborate on their thoughts about the differences between a student with a specific learning disorder and a student with a learning disability; two main themes emerged. The first was the view that students with learning disabilities have higher reasoning skills than students with specific learning disorders. Second, the diagnostic labels were viewed as tied to their framework definitions, with stricter criteria for the diagnosis of a learning disability, and the category of a specific learning disorder being a broader definition. A number of participants stated that they believe those who qualify as having a learning disability would automatically qualify as having a specific learning disorder, but the opposite would not be true. This would in fact be the case if following the different criteria in the two frameworks; it is less clear if the psychologists were also relaying their beliefs about observable and concrete differences they think are important between students they label with a learning disability or with a specific learning disorder.

Evidence-Aligned Diagnostic Practices

One of the main goals of this study was to examine diagnostic practices in use in Nova Scotia through the lens of the research, or evidence-based practices. The categories of diagnostic

framework alignment were limited in this respect, as some participants categorized as endorsing the DSM-5-TR criteria also endorsed the routine use of IQ tests or other such practices less aligned with the evidence in assessments for learning disabilities. Going beyond the frameworks used, I developed a scale to strictly follow a number of evidence-based practices encoded in the criteria and aligned questions. The Evidence-Aligned Diagnostic Practices scale allowed for a more comprehensive, nuanced examination, and aligned conceptually with more of an interval scale for use in a hierarchical multiple regression analysis. Part of the goal of this scale was to examine how participants' beliefs about the origin, or etiology, of learning disabilities may impact the alignment of their diagnostic practices with the research. There are two primary perspectives about how learning disabilities manifest, one is more of a neurobiological perspective (i.e., a student is born with a learning disability and efforts to resolve related symptoms will not be effective) and the other is an environmental perspective (i.e., a student's home and educational environment is the main predictor that a learning disability will manifest). Research supports an interactive etiological view with both biological and environmental contributions to the manifestation of learning disabilities, in which biological etiological factors are seen more as predispositions and risk factors (Lyon et al., 2001; Catts & Petscher, 2022; Vellutino et al., 2004). Environmental factors, like poor quality instruction, and lack of familial resources to obtain support can be risk factors, however, their opposites can also make a student more resilient against the manifestation of a learning disability (for discussion, see Catts & Petscher, 2022). For example, research shows that if at-risk students receive early intervention, their outcomes can be improved (Lovett et al., 2017). In predicting alignment with evidence on the Evidence-Aligned Diagnostic Practices scale, participants who more highly endorsed environmental contributors to learning disabilities were associated with reliable increases in

evidence-based practices. This predictor was no longer significant when participants' beliefs about biological contributions to learning disabilities were taken into account. The stronger the participants' beliefs about the neurobiological origins of learning disabilities, the less likely their diagnostic practices aligned with the evidence. Similarly, the higher the participants' overall rating of the usefulness of tests of intelligence, the lower their score on the Evidence-Aligned Diagnostic Practices scale. Both psychologists' beliefs about the biological causes of learning disabilities and their endorsement of the usefulness of intelligence tests contributed unique variance to their alignment with evidence-based practices in diagnosing learning disabilities. I next examine some associations with ongoing practices that are not aligned with current evidence.

Why Some Psychologists May Continue to Use Non-Evidence-Based Practices

There are a number of reasons why a psychologist may practice in ways that do not align with the majority of current research and evidence. As previously mentioned, etiological beliefs about learning disabilities contribute to such practices. In the current study, many psychologists endorsed both biological and environmental causes of learning disabilities; therefore, they might be generally thought of as supporting an interactive view of the etiology of learning disabilities which is aligned with evidence (Catts & Petscher, 2022; Vellutino et al., 2004). However, consistent with Cottrell & Barrett's (2017), findings, our results indicate that as psychologists agree more with biological causes for learning disabilities, they agree less with environmental causes for learning disabilities.

In one study, increasing biological etiological beliefs were negatively correlated with a preference for using a response to intervention method, and were positively correlated with a preference for the use of intelligence-achievement discrepancy and processing strengths and

weaknesses methods. On the other hand, increasing environmental etiological beliefs were negatively correlated with a preference for the use of intelligence-achievement discrepancy and processing strengths and weaknesses, and significantly positively correlated with a preference for the use of response to intervention method (Cottrell & Barrett, 2017). While the current study did not examine the statistical relationship between etiological beliefs and diagnostic methods used, mean scores on etiological items did appear to vary when compared with of the endorsement of specific diagnostic methods. Participants in this study who endorsed using both processing strengths and weaknesses and intelligence-achievement discrepancy methods appeared to have more positive beliefs about biological versus environmental causes of learning disabilities. Strong biological beliefs are generally associated with processing strengths and weaknesses and intelligence-achievement discrepancy methods because these methods are founded on the premise that a student's pattern of cognitive functioning, perhaps viewed as inherent, is the cause of their disability. Further, the biological perspective of learning disability etiology is also highly endorsed by the LDAC (Fiedorowicz et al., 2015). Indeed, stronger biological etiological beliefs were shown in the final regression model to be significantly predictive of non-evidence-based practices, which include tests of intelligence and measures of cognitive processing.

Reported use of response to intervention methods did not show the same pattern of apparent differences between mean scores based on etiological beliefs; in fact, mean ratings appeared very similar for those who reported the use of this method, and those who did not (i.e., all seemed to rate the environmental etiology scale higher). This is not surprising given that many respondents from the current study, as well as in the existing literature (for a meta-analytic review, see Sadusky et al., 2021), report using response to intervention methods which are founded on the idea that environmental factors, primarily poor instruction, are what lead to

learning disabilities in the vast majority of students. The lack of observed apparent differences between means could be taken as further support for the idea that psychologists, regardless of their use of IQ or cognitive tests, largely seem to be supportive of the idea that environmental factors like instruction, extra help at home or school, and opportunities for intervention are important to the learning disability assessment process. Our finding of a significant negative correlation between environmental etiological perspectives and participants perspectives on the usefulness of intelligence tests indicates that those who believe more strongly in environmental causes of learning disabilities are less likely to see IQ as being useful; that said, with both environmental etiological perspectives and IQ usefulness scales being highly endorsed by participants, there is a portion who agree with environmental causes of learning disabilities and still see intelligence tests being useful. This could, perhaps, be another indication of the state of flux that psychologists might find themselves in; or, it may be reflective of some psychologist's support of measures of intelligence and cognitive processing combined with observing a students response to intervention (for discussion, see Willis & Dumont, 2006).

It is during professional training (i.e., graduate programs), when emerging psychologists adopt many of their beliefs about learning disabilities and are exposed to the diagnostic tools, methods, and frameworks they will eventually take into practice (Cook et al., 2009; Sotelo-Dynega & Dixon, 2014). Research has shown that training informs many facets of practice including test selection (Al Dahhan et al., 2021; Lockwood et al., 2022) and diagnostic methods used (Maki & Adams, 2018). The impact of training can be positive or negative, considering that those who are trained in non-evidence-based practices will more than likely adhere to them (for discussion, see VanDerHeyden, 2018). This allegiance to trained practices may be due to holding beliefs that support them, being comfortable with them, or that opportunities to expand practices

may not be readily accessible (VanDerHeyden, 2018). While it was 15 years ago, psychologists in Nova Scotia who reported they would have liked to shift practices after graduation, also answered that a lack of ongoing professional development was a major barrier to doing so (Blotnicky, 2010). Results found in this study echo this sentiment, in that training was one of the most commonly selected reasons for either using or not using, a given method. For example, 88% (n = 7) of those who report the use of intelligence-achievement discrepancy, and 77% (n = 10) of those who report the use of processing strengths and weaknesses do so because that is how they were trained. That said, many psychologists selected training at a lesser rate (34%, n = 13) to explain their endorsement of response to intervention use, and selected "evidence best supports the use of this method" at a high rate (90%, n = 34). This difference appears to indicate a desire to follow the evidence, to some extent, in spite of training, which was also shown in Blotnicky, (2010). However, it does not necessarily mean that psychologists are de-implementing previous practices, rather, they may be attempting to adopt new evidence-based practices and integrate them.

Psychologists are exposed to research literature during their training, which may be influenced by the views of program faculty (Shaw, 2021). Further, recent research has shown that outdated and non-evidence based instructional materials continue to be used by school psychology faculty to teach assessment-based courses (Lockwood & Farmer, 2019). Tests that psychologists are trained on impact them beyond the scope of their program (for discussion, see Farmer et al., 2021). Many psychologists may have a reduced ability to stay on top of current research, due to barriers to journal article access upon graduation and time constraints. This is problematic, given that effective psychological practice is contingent on up-to-date research knowledge (National Association of School Psychologists, 2010), and it increases the likelihood

that psychologists will either stick with the methods that they know or look to non-evidence-based resources for professional development (e.g., workshops, webinars, digital media; for discussion, see Dombroski et al., 2022). This may also result in psychologists adopting or continuing practices that are promoted by test makers and other parties who have a vested interest in psychologists practicing a certain way (for discussion on financial conflicts of interest, see Beaujean et al., 2024).

Another reason why psychologists may continue to practice in ways not aligned with the evidence could be workplace or policy-related barriers or pressures. For example, during their inquiry, the OHRC spoke with a school board which was attempting to change the current system structure to a more evidence-based tiered system but was facing significant challenges as a result of the referral waitlist. This board further recognized that this waitlist contains students who may not have needed an assessment had they received evidence-based instruction and intervention (OHRC, 2019). While the DSM-5-TR framework (i.e., aligned with a low achievement method) does not necessitate prior evidence-based intervention, a response to intervention method does. It seems, then, psychologists in Nova Scotia will not be able to take instructional response into account until the education system reforms. Indeed, results from the current study showed that 50% of participants who did not endorse using an response to intervention method in diagnosing learning disabilities selected "tiered instruction is often not evidence-based to support working within this method" for reasoning as to why they do not use this method. Thus, some psychologists may not incorporate response to intervention because students have not had access to evidence-based instruction and interventions in order to be reliably identified based on their prior educational experiences. This notion is supported by Blotnicky's (2010) survey of Nova Scotian psychologists who generally responded with skepticism when asked if a response to

intervention model could be practically implemented in school systems, with 11% selecting "not at all", 36% selecting to a slight extent, and 33% selecting "to a moderate extent" (Blotnicky, 2010). Although the current study was conducted 14 years later, it would be reasonable that psychologists are reluctant to make diagnostic decisions using this method when tier-one classroom instruction and early interventions are largely not evidence-aligned. A brief review of the early-grade literacy curriculum in Nova Scotia reveals that non-evidence-based instruction methods (e.g., levelled reading, cueing systems) continue to be required at a classroom level (DEECD, 2019b; 2019c)[5]. Without evidence-based instructional, screening, and progress monitoring across all tiers, the current validity of this information for informing assessment practices is limited. Thus, while a movement toward incorporating response to intervention-based information in assessments is aligned with evidence (Fletcher & Miciak, 2019), the structures are not in place to support this. Nonetheless, evidence-based methods which are not reliant on an effective response to intervention system of inclusive education were also eschewed by many psychologists, as found in this study.

Some studies based in the United States have found that state regulations have a moderate (Benson et al., 2020; Kranzler et al., 2020) to large (Benson et al., 2020) effect on diagnostic methods employed. Nova Scotia was one of the first provinces to mention using response to intervention as a framework for inclusive education in provincial legislation and, perhaps, as information to be taken into account in assessing for learning disabilities (Kozey & Siegel, 2008). However, language included in this legislation also referred to unexpected underachievement, very much in line with discrepancy methods. The Nova Scotia Department of

[5] A new English Language Arts curriculum for grades primary through two was released in June 2024 which varies from that referenced here. The 2019 curriculum has been the foundation of educational practices up until now.

Early Education and Childhood Development has stated in recent policies that they have a tiered system of instruction and interventions (DEECD, 2019). However, these policies are at the provincial system level and appear to inform an overarching delivery system for inclusive education, rather than providing guidance around incorporating evidence-based tiered approaches to interventions into the assessment practices of psychologists (DEECD, 2019). The provincial "School Psychology Guidelines" document, which provides information more directly applicable to assessment, has not been updated since 2009 and has been under revision for at least two years (Department of Education, 2009). However, policies alone may not impact the diagnostic decision-making of psychologists to a high degree when compared with other factors like beliefs about learning disabilities (Cottrell & Barrett, 2017). Our results suggest that psychologists practicing in Nova Scotia seldomly endorsed looking to school boards or provincial policies to inform their diagnostic method use, which is inconsistent with some findings emanating from the United States (e.g., Benson et al., 2020; Kranzler et al., 2020). There are a few reasons which may have contributed to this discrepancy. First, our sample included psychologists who practice privately and do not adhere to provincial educational policies. Second, it may be due to the continued requirement for a learning disability diagnosis to access school-based services in the United States; although this was the case in Nova Scotia for a number of years (e.g., South Shore Regional Centre for Education, Severe Learning Disabilities Program, 2006), under the new provincial Inclusive Education Policy, is no longer permitted (Department of Early Education and Childhood Development, 2019). Finally, as mentioned, the policies directly pertaining to school psychologists are not readily available, nor do they contain current information, so they may not be seen as useful to psychologists in the province. If provincial policies were updated to incorporate current research evidence, were directly

applicable to assessment and diagnostic practices, and were made available for psychologists, it may be that they would have more of an impact on diagnostic decision-making; even if that impact was not as powerful as some other factors, like etiological beliefs or training. While school board policies may play a role in decision-making, psychologists are professionals, regulated by professional bodies. Therefore, the response to practice based on evidence would appear ultimately to remain with the individual psychologist.

Finally, a reconceptualization of the role of psychologists who conduct assessments for learning disabilities, which has historically been uniquely tied to intelligence testing, may be a threatening notion for some (Klassen, 2002). Similar to Machek & Nelson (2010), we found that about a third of respondents view substantial decreases in IQ testing as threatening to their job security. This was true for those primarily working in schools and those working privately. Some psychologists may believe their role within the schools is unique given their use of intelligence tests and for private practitioners, billable hours might decrease with the reduction of intelligence and similar cognitive processing tests. In some ways, however, a reconceptualization of the current role may differentially affect psychologists working primarily in private practices versus those working primarily in schools. Our results suggested higher rates of LDAC alignment (53%, n = 8), intelligence-achievement discrepancy (27%, n = 4) and processing strengths and weaknesses (40%, n = 6) use among psychologists primarily working privately; albeit, we had a very small sample. Future research might investigate if psychologists working privately would find it more difficult to reconceptualize assessment practices to align better with evidence.

Some psychologists may not feel prepared to shift away from their current assessment practices and align them with evidence or to take on other roles in schools or private practice settings. Aligning fully with the DSM-5-TR criteria which were updated based on research,

would require skill development (Reschly & Ysseldyke, 2002) and an expanded and more in-depth understanding of current research on students' learning in different domains and on learning disabilities, all of which should inform assessment (Dombrowski et al., 2022). This would likely require psychologists to spend less time using tests they are familiar with (e.g., measures of IQ and cognitive processing). It should also be noted that psychologists are serving many more students and schools than is optimal (CPA, 2014) and are pulled in many different directions based on the needs of the school communities; this leaves less time for professional learning or for focusing on one area of professional learning. Given the large percentage of time participants reported spending on assessment, however, this is an area that could be prioritized.

There may also be an element of comfort and routine in using these tests, and this may prevent psychologists from fully letting them go. As has been discussed, endorsement of the use of intelligence tests extends beyond for the purpose of diagnosis. Only 27% (n = 16) of respondents in our study endorsed that students must have an average IQ for a learning disability diagnosis but 57% (n = 35) endorsed routine IQ test use and 85% (n = 52) of respondents agreed that IQ tests provide qualitative information about student's learning. Thus, it seems that some psychologists may not be using an IQ score for diagnostic purposes but are routinely using intelligence tests because of the qualitative information which they find they glean from them. These are factors which keep the use of intelligence tests as a routine part of assessments for learning disabilities.

Implications

The results discussed could have some implications and be useful in thinking through policies for psychologists, psychology training programs, and governing bodies. The findings from

this study could be considered within the overarching goal to increase the alignment of current and evidence-based practices to better support students with suspected learning disabilities.

Psychologists and educational systems must consider the ramifications of selected frameworks, methods, and test use on the students they serve, as well as the alignment of such practices with research in the field. A significant proportion of psychologists in this study were found to endorse and to report using a number of assessment approaches and practices that are not supported in the research. For example, the use of cut scores for intelligence and cognitive processing tests, and sometimes relatively high scores at that, will exclude a proportion of students in the population from diagnosis. Further, as was pointed out by respondents in open-ended questions, in order to receive a "learning disability" diagnosis under the LDAC Official Definition of Learning Disabilities (2002; re-indorsed in 2015), students are required to meet a number of criteria that are not required under the DSM-5-TR (APA, 2022). In fact, as shown by Schroeder and colleagues (2020), agreement rates, in terms of who gets diagnosed, between these two frameworks are generally very low; those who are diagnosed with LDAC may also be at risk of not being identified by DSM, and vice versa. When a cognitive or intelligence test is used as criteria in diagnosing, the chances of that student being diagnosed decreases, even if they are exhibiting substantial academic difficulties and would benefit from the available interventions and additional supports to the same extent as their peers who meet the criterion of having an average IQ (for a meta-analytic review, see Steubing et al., 2009). Of course, the students who will be overlooked as having a diagnosis are more often those from traditionally marginalized segments of the population, whose home environment may not prepare them or be as consistent with these standardized tests (e.g., Morris et al., 2012).

Psychologists in this study demonstrated ongoing support for the use of tests of intelligence even when not using them within a related framework or method. It is important to reflect on this practice and ask why this occurs. What qualitative information do psychologists feel they are obtaining from these tests? Is it ethical or responsible to give a test when it is not required? How does having a "low" IQ score impact a child's self-concept and how they are treated by others? It is foundational to the evidence-based practice movement that any given practice receive careful scrutiny; weighing risk against potential positive outcomes (Lilienfeld et al., 2019). As has been discussed, for practices like cognitive profile analysis or the use of IQ cut scores and difference scores, the risk is quite high (for discussion, see Farmer et al., 2021); the use of intelligence tests for qualitative purposes, too, could be viewed as having potential for harm which outweighs its positive contribution.

One major benefit of decreasing cognitive and intelligence testing is the time that psychologists would gain. Psychologists in Nova Scotia have continually voiced a desire to diversify their roles (Corkum et al., 2007; King et al., 2022). Reduction of intelligence and cognitive testing could potentially give psychologists more time to expand their roles and practice in ways that are not only preferred but are better aligned with CPA competencies. Additionally, for the often over-burdened school psychologist, spending less time conducting unnecessarily lengthy assessments would have the added benefit of moving through the waitlist at a faster rate to support students as quickly as possible. Further, this gained time could be spent supporting teachers and administration in their tier-one efforts, such as universal screening and data interpretation, which, if done effectively, have been shown to reduce referrals for assessments (VanDerHeyden, 2006). Logically, a decrease in testing results in a decrease in billable hours for psychologists practicing privately. However, we argue that this can be framed

as a positive change. Removing billable hours makes comprehensive psychoeducational assessments more affordable. Furthermore, reducing test purchasing which often costs privately practicing psychologists a significant amount of money (Burns et al., 2016; Kearns & Fuchs, 2013; McGill et al., 2018), and likely reduces the amount of budget available for other practices that psychologists in schools might engage in.

The results of this and related research may also have implications for programs that train school and clinical psychologists. Such programs have been shown to have a critical role to play in shifting the field toward evidence-based practices (Lockwood & Farmer, 2020). First, within these programs, an interactive or risk-resilience model of learning disabilities (Catts & Petscher, 2022; Vaughn et al., 2024) could be emphasized, mediating the link between more exclusive views of biological causes and the association with over-testing. Second, teaching focused on bottom-up approaches to understanding the continued use of non-evidence-based practices (Shaw, 2021) could be helpful in this domain. That is, psychologists in training would come to understand the origins of non-evidence-based approaches to assessment and how these work, and ultimately how to avoid the implementation of such (Schlesinger & Grob, 2017). Providing the skills necessary to critically evaluate diagnostic practices, by focusing on updated research in the field, could help psychologists further recognize the importance of staying abreast of research and evidence-supported practices. Moreover, training programs could help students develop what Lilienfeld and colleagues (2018), describe as “healthy self-doubt” which involves an active understanding of the fallacy of some of our own beliefs along with the ability to review evidence for and against those beliefs to arrive at a position on the subject (Farmer et al., 2022). As Dombrowski and colleagues (2022) highlight, developing critical-thinking skills and an ability to engage in scientific decision-making prior to engaging in implementation may be a crucial

foundation for evidence-based assessment practices. Where instructional materials (e.g., technical manuals, assessment-based textbooks) are highly impactful on the future practice of emerging school psychologists, it has been recommended that faculty who teach in this area be intentional about the content they select and the manner in which it is presented (see Farmer et al., 2021). It would seem critical that training programs create a foundation for assessment courses based on current research evidence, for emerging psychologists as it has been found to be more difficult to change practices once they have become habitual (Prasad & Ioannidis, 2014). As a soon-to-be graduate of the Masters of Arts in School Psychology program at Mount Saint Vincent University, I can attest that our primary assessment courses and corresponding practicum were largely aligned with the evidence-based practices gleaned throughout my research for this thesis.

In addition to the need for updated training and professional development for psychologists, broader school personnel may require support in understanding why a shift away from the status quo is necessary. Psychologists, particularly when working in schools, may worry about facing barriers to practice change. As VanDerHeyden (2018), indicates, some staff in schools may not as readily accept change, particularly from a new psychologist, because “this is the way we have always done it”; considering that it was the field of psychology which set the precedent of learning disability assessment necessitating measures of intelligence and cognitive processing, this is a fair point. VanDerHeyden (2018) indicates that adaptive leadership is required to overcome this challenge. Leadership from typical administrators (i.e., principals) can sometimes be harmful to the cause because their role is usually to keep the systems in line, not to support the instability as change necessitates (VanDerHeyden, 2018). Therefore, with the proper training, psychologists could be in a position to help provide information to school staff about

the research informing the shift toward evidence-based practices. They are also in a position to support structural changes that may need to happen to create this shift, such as facilitating supports, screening, and progress monitoring, for teachers implementing evidence-based tier-one instruction. In regard to reducing cognitive and IQ testing, it will be important to emphasize to administrators that psychologists are held to a separate code of ethical standards which supersedes other school-related procedures. Psychologists are ethically obliged to follow evidence-based practice and to avoid non-essential testing, particularly that which may harm students by reducing the likelihood of diagnosis when difficulties are apparent. The field would seem to be beyond the point where it can be argued that it is ethical to use practices which have been denounced by research and it is commonly agreed upon that these approaches reliant on measurement of intelligence and cognitive processing are not (e.g., Fletcher & Miciak, 2019; McGill et al., 2018; Stuebing et al., 2009).

While training programs can teach more about the de-implementation of non-evidence-based practices, other agencies and governing bodies can support these efforts from the top down through professional guidelines and policy perspectives (Shaw, 2021). This can either take the shape of a mandated practice change (i.e., a schoolboard policy which delineates which diagnostic practices are no longer considered valid means of diagnosis), or information disseminated from a professional association about evidence-based practice (Shaw, 2021). It should be noted that a mandated change could impact psychologists for better or worse, depending on the alignment of the mandate with evidence. Additionally, it has been suggested that professional organizations and governing bodies have a critical role to play in assessing continuing education opportunities for the quality of their content based on its alignment with the

evidence (Dombrowski et al., 2022), as continuing education is a requirement for licensure as a psychologist (Nova Scotia Board of Examiners in Psychology, 2017).

At a national level, changes might support the field toward adopting more evidence-aligned practices. The Learning Disabilities Association of Canada (LDAC) is a non-profit organization, primarily operated by leaders who are not psychologists, which offers a set of diagnostic guidelines that continue to be used widely across the country (Schroeder et al., 2020). Their process of creating these guidelines did bring together a group of psychologists to initially create the guidelines in 2002. After the DSM-5 was released in 2013, the LDAC re-endorsed the same guidelines in 2015 (Fiedorowicz et al., 2015), seemingly dismissing that same body of research which informed the DSM-5 revisions. These guidelines were also largely accepted by the Ontario Psychology Association (2018; updated in 2020). To align these guidelines with the evidence, these associations could consider deferring to professional and research bodies who integrate current research in guiding practices (e.g., DSM-5-TR; see also, the Right to Read Report chapter on professional assessment, OHRC, 2022).

Some in Canada have argued for a national consensus definition of learning disabilities to alleviate concerns about varied criteria and methods of operationalization and to facilitate better communication between professionals (D'Intino, 2017; Williams et al., 2022). While it is problematic that there is potential for different rates of diagnosis between provinces and practitioners, it is also important to consider that similar to a mandated change by a school board, a national definition could affect psychologists for better or for worse. Of note, the LDAC *Official Definition of Learning Disabilities* (2002; re-endorsed in 2015) is technically a national definition. For example, if the definition was not made with consideration to the evidence, and instead necessitated measures of IQ or cognitive processes to make a diagnosis similar to the

LDAC, this may lead psychologists away from evidence-based assessment practices. The federal government provides financial support for students with learning disabilities as they enter post-secondary school. If the support was contingent on a diagnosis that included those measures, as it often has been, this is problematic. It may be preferable to allow professional judgement and help psychologists and professional bodies individually shift to evidence-based practice rather than to offer a national definition.

Limitations and Future Directions

The current study's results should be interpreted while considering its limitations. One limitation was that the sample was somewhat small and the study design necessitated self-selection; the included participants made the conscious decision to complete the survey while others decided not to. The proportion of psychologists who responded from the contact list of invitees was about 50%; this proportion is slightly higher than some other studies in the United States (e.g., Lockwood et al., 2022; Machek & Nelson, 2010). However, this selection could have implications for the generalizability of the findings to the population of practicing psychologists in Nova Scotia. The survey may have been more likely to be discontinued by those most favourable to intelligence and cognitive processing test use as well as the LDAC framework. That is, the focus of the questions on this area may have felt uncomfortable, as psychologists may generally be familiar with current arguments amongst practicing psychologists in the field. Therefore, it is possible that this study underestimates the number of psychologists currently aligned with the LDAC framework and related methods in Nova Scotia. Furthermore, there could have been a social desirability bias even among those psychologists who completed the survey. The anonymous nature of the survey and the variance in practices reported may mean that social desirability did not distort responding to a significant degree. In

any case, a non-random sample requires caution when interpreting results; and further research with psychologists across Nova Scotia will help determine the generalizability of the findings in the current study.

A second limitation is that the sample contained many more psychologists who work primarily in school settings, as opposed to private practice settings. It was largely beyond the scope of this study to make inferences about the differences in diagnostic practices between these two groups. In the current study, employment setting was more used as a control in the analyses and the few comparisons made should be treated as preliminary suggestions about possible differences between the groups to potentially inform future research.

This study focused on a quantitative approach to describing psychologists' diagnostic practices for learning disabilities – yielding a picture of frequent and varied approaches in the province. A third limitation, however, toward fully understanding current approaches in Nova Scotia, was the absence of contextual information about when and how psychologists make the diagnostic decisions that they do. For example, it would be helpful to have more information about how the many psychologists who reported using multiple diagnostic methods use them (e.g., for different students, at the same time for the same assessment). While the results from the current study delineate practices broadly, they do not capture some of the nuanced information about individual approaches to assessment and diagnosis. Future research could expand upon these results by conducting interviews to obtain more specific information.

A final limitation of this study may be that the invitation was directed to psychologists who identified primarily as "school psychologists" in the professional directory. There will be many more psychologists who identify primarily as clinical psychologists and who are conducting assessments for suspected learning disabilities in Nova Scotia. While on the one

hand, the current study does not represent this broader sample, the goal of this study was to focus on school psychologists. Future research, primarily looking at private practice or public health-based samples, will be better placed to capture a picture of the practices in these settings.

Conclusions

Overall, this research delineates the diagnostic practices, criteria, and frameworks that school psychologists in Nova Scotia follow in the process of assessment for suspected learning disabilities. This research also provides insight into how psychologists' etiological beliefs and views on the usefulness of intelligence tests contribute to the alignment of their practices with what has been outlined as evidence-based in this document. The current findings could be useful to psychologists, school boards, governing bodies, and policymakers to support a movement to embrace evidence-based practices and guidelines, as this shift may very well be overdue. School psychologists have a very important role to play in supporting the well-being of school-aged children and youth; support which is best given through practices that are aligned with evidence. Psychologists have seemingly shown some progress in this direction, and with appropriate support from the provincial government, school boards, professional agencies, and training programs, progress can continue and will, in turn, largely benefit children and families.

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Table 1

Background and demographic characteristics of the sample (N=61)

Characteristic	N	Percentage	Mean (SD)
Registration Status			
Registered Psychologist	45	73.8	
Candidate Register	16	26.2	
Years of Experience			
Less than 1	1	1.6	
1-4	12	19.7	
5-9	13	21.3	
10-14	8	13.1	
15 or more	27	44.3	
Educational Background			
Master's Degree	57	93.4	
Doctoral Degree	2	3.3	
Other	2	3.3	
Primary Employment Setting			
Regional Centre for Education	46	75.4	
Private Practice	15	24.6	
Secondary Employment Setting			
Regional Centre for Education	6	9.8	
Private Practice	21	34.4	
None	34	55.7	
Practice Location			
Primarily Urban	21	34.4	
Primarily Rural	22	36.1	
Both	18	29.5	
Percentage of Time Assessing for learning disability			
1-20%	9	14.8	
21-40%	18	29.5	
41-60%	18	29.5	
61-80%	11	18.0	
81-100%	5	8.2	
Populations Serviced			
Elementary	61	100	
Middle School/Jr. High	57	93.4	
High School	54	88.5	
Post-secondary	24	39.3	
Percentage of Time Spent Servicing Population			
Elementary			54.7(19.8)
Middle School/Jr. High			23.0 (15.2)
High School			19.2 (18.6)
Post-secondary			8.6 (18.5)

Note. learning disability = learning disabilities.

Table 2

Descriptive statistics and mean response rates for diagnostic criteria Likert scale data

Diagnostic Criteria	n	Percentage	Mean (SD)
Average Intelligence (n = 60)			2.08 (.81)
Strongly Disagree	14	23.3	
Disagree	30	50.0	
Agree	13	21.7	
Strongly Agree	3	5.0	
Impairment in Cognitive Process			2.08 (.74)
Strongly Disagree	12	19.7	
Disagree	34	55.7	
Agree	13	21.3	
Strongly Agree	2	3.3	
Impairment in Academic Skill			3.61 (.49)
Agree	24	39.3	
Strongly Agree	37	60.7	
Targeted Intervention Required			3.44 (.67)
Strongly Disagree	1	1.6	
Disagree	3	4.9	
Agree	25	41.0	
Strongly Agree	32	52.5	

Note. Unless otherwise indicated, N=61; Valid percentages are reported to account for missing variables.

Table 3

Descriptive statistics for criteria operationalization questions

Operationalization Variable	n	Percentage
Average Intelligence Test Cut Score (n = 58)		
70 and above	9	15.5
80 and above	13	22.4
85 and above	24	41.4
90 and above	12	20.7
Below Average Cognitive Test Cut Score (n = 54)		
70 and below	14	25.9
80 and below	24	44.4
85 and below	15	27.8
90 and below	1	1.9
Below Average Academic Achievement Cut Score		
70 and below	8	13.1
80 and below	26	42.6
85 and below	26	42.6
90 and below	1	1.6
Type of Targeted Intervention (n = 59)		
Evidence-based	40	67.8
Extra help	19	32.2
Comparison Between IQ and Achievement Scores (n = 60)		
Yes	11	18.3
No	49	81.7
Comparison Between Cognitive and Achievement (n = 60)		
Yes	22	36.7
No	38	63.3
Cognitive Strengths as Unexpected Underachievement (n=34)		
Yes	17	50.0
No	17	50.0

Note. Unless otherwise indicated, N=61; Valid percentages are reported to account for missing variables.

Table 4

Descriptive statistics for diagnostic method use data

Diagnostic Methods	n	Percentage
Intelligence Achievement Discrepancy		
Yes	8	13.1
No	53	86.9
Processing Strengths and Weaknesses (n = 60)		
Yes	13	21.7
No	47	78.3
Response to Intervention (n = 60)		
Yes	38	63.3
No	22	36.7
Low Achievement		
Yes	49	80.3
No	12	19.7

Note. Unless otherwise indicated, N=61; Valid percentages are reported to account for missing variables.

Table 5

Descriptive statistics for participants' reasons for using or not using each method

		IAD	PSW	RTI	LA
Method Used	**Reason Given**	n(%)	n(%)	n(%)	n(%)
Yes	District/schoolboard policy	-	-	4(10.5)	2(4.1)
	Provincial policy	-	-	1(2.6)	-
	Obligation	-	-	2(5.3)	3(6.1)
	Training	7(87.5)	10(77.0)	13(34.2)	19(38.8)
	Accessibility	2(25.0)	2(15.4)	1(2.6)	8(16.3)
	Evidence	4(50.0)	6(46.2)	34(89.5)	40(81.6)
	Ease	-	2(15.4)	2(5.3)	9(18.4)
	Time constraints	-	-	-	4(8.2)
No	District/schoolboard policy	1(1.9)	1(2.1)	1(4.5)	-
	Provincial policy	-	-	1(4.5)	-
	Obligation	1(1.9)	1(2.1)	-	-
	Training	10(18.9)	10(21.3)	3(13.6)	3(25.0)
	Accessibility	1(1.9)	1(2.1)	2(9.1)	-
	Evidence	50(94.3)	43(91.5)	6(27.3)	7(58.3)
	Ease	2(3.8)	1(2.1)	5(22.7)	2(16.7)
	Time constraints	-	1(2.1)	3(13.6)	-
	Non-EB Instruction			11(50.0)	

Note. Percentages represent the proportion of those who selected the given response of yes or no; If none of the participants who selected yes or no chose a given reason, a dash was placed in that cell. IAD = intelligence-achievement discrepancy; PSW = processing strengths and weaknesses; RTI = response to intervention; LA = low achievement; blank = not an applicable reason for that method.

Table 6

Descriptive statistics for diagnostic framework use and categorization data

Diagnostic Framework	n	Percentage
Assigned Framework Category		
Full DSM	11	18.0
Partial DSM	26	42.6
Full LDAC	11	18.0
Partial LDAC	13	21.3
Reported Framework Used		
DSM	52	85.2
LDAC	5	8.2
Other[a]	4	6.6

Note. DSM = Diagnostic and Statistical Manual of Mental Health Disorders; LDAC = Learning Disabilities Association of Canada.

[a]All participants who selected other followed up by stating that they use both LDAC and DSM frameworks.

Table 7

Descriptive statistics for diagnostic terminology data

Diagnostic Terminology	N	Percentage
Specific Learning Disorder Used		
Yes	56	91.8
No	5	8.2
Learning Disability Used		
Yes	21	34.4
No	40	65.6
Dyslexia Used (n = 60)		
Yes	41	68.3
No	19	31.7
learning disability/SLD Same Conceptually		
Yes	49	80.3
No	12	19.7

Note. Unless otherwise indicated, N=61; Valid percentages are reported to account for missing variables; learning disability = learning disability; SLD = specific learning disorder.

Table 8

Percentages for all intelligence and IQ test usefulness perspectives Likert scale items

Item	Strongly Disagree	Disagree	Agree	Strongly Agree	Mean (SD)
1. Full-Scale IQ scores are useful in understanding the nature of a learning disability.	9.8	47.5	39.3	3.3	2.36(.71)
2. Factor index scores on an IQ test are useful in understanding the nature of a learning disability	9.8	37.7	49.2	3.3	2.46(.72)
3. Individual subtest scores on an IQ test are useful for understanding the nature of a learning disability	21.7	41.7	33.3	3.3	2.18(.81)
4. Intelligence is a fixed trait (e.g., an individual has a certain intellectual capacity which cannot be significantly altered)	8.3	56.7	35.0	-	2.27(.61)
5. Intelligence tests should routinely be used within the learning disability diagnostic process.	4.9	37.7	49.2	8.2	2.61(.71)
6. A student's IQ score has implications for how a student can learn and be taught.	1.6	24.6	67.2	6.6	2.79(.58)
7. IQ tests are useful in the treatment planning and generation of instructional strategies for students with learning disabilities.	9.8	31.1	54.1	4.9	2.54(.74)
8. Substantial decreases in the use of intelligence tests would have a negative impact on the school psychologist's job security.	11.5	50.8	26.2	11.5	2.38(.84)
9. Intelligence tests should only be used within the learning disability diagnostic process if an intellectual disability is suspected.	9.8	54.1	31.1	4.9	2.31(.72)
10. A student's performance on an IQ test provides qualitative information about how a student learns.	1.6	13.1	67.2	18.0	3.02(.62)

Note. Valid percentages are reported to account for missing variables; rating options not selected by any participant are left blank; Likert items scored from 1=strongly disagree to 4=strongly agree.

Table 9

Percentages for all environmental and biological etiological perspectives Likert scale items

Item	Strongly Disagree	Disagree	Agree	Strongly Agree	Mean (SD)
Environmental Etiological Items					
1. Learning disabilities are significantly impacted by environmental deprivations.	1.6	11.5	65.6	21.3	3.07(.63)
2. If the quality of general education instruction improved, the prevalence of learning disabilities would decrease.	-	15.0	41.7	43.3	3.28(.72)
3. Many children classified with learning disabilities have lacked effective instructional opportunities.	1.7	11.7	35.0	51.7	3.37(.76)
4. For most children, high-quality instruction early in a student's life can prevent the development of learning disabilities.	-	27.9	49.2	23.0	2.95(.72)
Biological Etiological Items					
5. A student is born with a learning disability and they will always have a learning disability, even if they are provided with the highest quality instruction.	4.9	24.6	65.6	4.9	2.70(.64)
6. Compared to environmental factors, heredity plays a more significant role in the development of a learning disability.	1.6	37.7	55.7	4.9	2.64(.61)
7. Learning disabilities are primarily related to deficits or abnormalities in the structure of the brain.	-	31.1	59.0	9.8	2.79(.61)
8. Greater emphasis should be placed on evaluating the child's psychological functioning/processing than their environment when evaluating the student for a learning disability.	6.6	65.6	21.3	6.6	2.28(.67)

Note. Valid percentages are reported to account for missing variables; rating options not selected by any participant are left blank; Likert items scored from 1=strongly disagree to 4=strongly agree.

Table 10

Bivariate correlations between variables used in regression analysis

	1.	2.	3.	4.	5.	6.	7.
1. Years of Experience							
2. Primary Practice Setting	.343**						
3. Environmental Perspectives Scale[a]	-.075	-.332**					
4. Biological Perspectives Scale[b]	-.117	-.027	-.380**				
5. IQ Usefulness Scale[c]	.027	.131	-.257*	.148			
6. IQ Usefulness Scale Condensed[d]	-.027	.068	-.231	.144	.972**		
7. Evidence-Aligned Practices	-.100	-.170	.334**	-.382**	-.630**	-.607**	

Note. * p < .05 level; ** p < .01 level

[a] Represents the 4-item environmental scale comprised of mean Likert scores on items 1, 2, 3, and 4 listed in Table 8

[b] Represents a 3-item scale comprised of mean Likert scores on items 5, 6, and 7 listed in Table 8

[c] The full IQ Usefulness scale was not used in the regression analysis but is included in this table as part of the exploration of the relationship between each of the three belief scales

[d] Represents the Condensed IQ Usefulness Scale with variables used to create the Evidence-Aligned Diagnostic Practices scale removed (i.e., see Table 9, items 5 and 9).

Table 11

Hierarchical regressions predicting evidence-based practice, controlling for employment setting and environmental etiological perspectives.

		Model 1		Model 2		Model 3		Model 4	
Step	Predictors	B	β [95% CI]	B	β [95% CI]	B	β [95% CI]	B	β [95% CI]
1	Employment Setting	-.446	-.170 [-.427, .086]	-.175	-.067 [-.329, .195]	-.320	-.122 [-.377, .133]	-.317	-.121 [-.329, .087]
2	Environment Scale[a]			.715	.311* [.049, .573]	.393	.171 [-.105, .447]	.137	.060 [-.169, .288]
3	Biological Scale[b]					-.783	-.320* [-.581, -.060]	-.695	-.284** [-.497, -.072]
4	IQ Usefulness Scale Con[c]							-1.18	-.544*** [-.743, -.346]
R^2			.029		.115		.200		.480
ΔR			.029		.086*		.085*		.279**

Note. * p < .05 level; ** p < .01 level; *** = p < .001 level.

[a] Represents the 4-item environmental scale comprised of mean Likert scores on items 1, 2, 3, 4 listed in Table 8

[b] Represents a 3-item scale comprised of mean Likert scores on items 5, 6, 7 listed in Table 8

[c] Represents the Condensed IQ Usefulness Scale with variables used to create Evidence-Aligned Diagnostic Practices scale removed (i.e., see Table 9, items 5 and 9)

Table 12

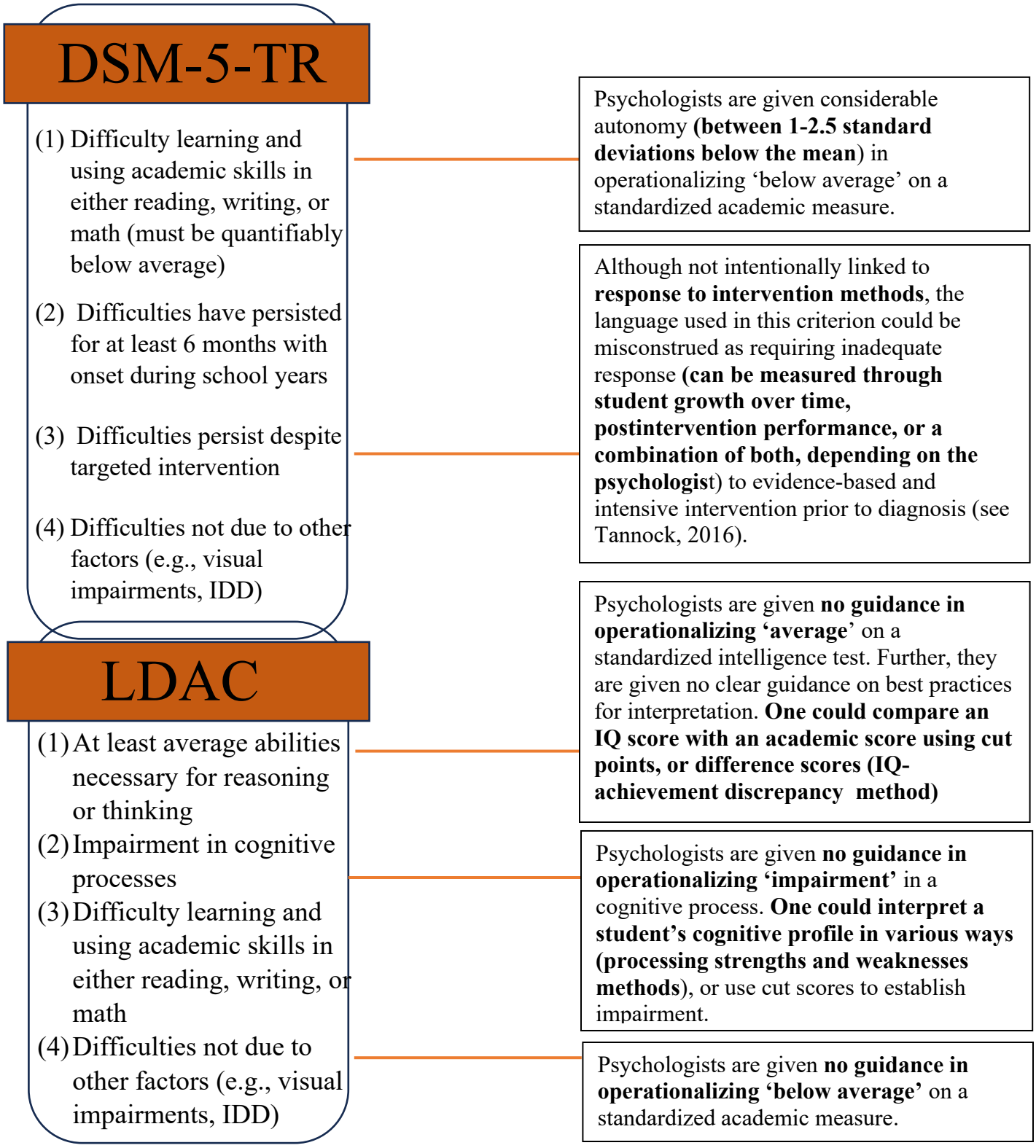
Descriptive statistics and mean response rates for criteria, method, and framework alignment data split by primary employment setting

Diagnostic Criteria	**Primarily RCE (N = 46) M(SD)**	**Primarily Private (N = 15) M(SD)**
Average Intelligence	2.09(.73)	2.07 (1.0)
Impairment in Cognitive Process	2.11(.67)	2.00 (.93)
Impairment in Academic Skill	3.63(.49)	3.53 (.52)
Targeted Intervention Required	3.59(.65)	3.00(.54)
Diagnostic Methods	**Primarily RCE n(%)**	**Primarily Private n(%)**
IAD		
Yes	4(8.7)	4(26.7)
No	42(91.3)	11(73.3)
PSW		
Yes	7(15.2)	6(40.0)
No	38(82.6)	9(60.0)
RTI		
Yes	29(63.0)	6(40.0)
No	16(34.8)	9(60.0)
LA		
Yes	39(84.8)	10(66.7)
No	7(15.2)	5(33.3)
Diagnostic Framework	**Primarily RCE n(%)**	**Primarily Private n(%)**
Assigned Framework Category		
Full DSM	8(17.4)	3(20.0)
Partial DSM	22(47.8)	4(26.7)
Full LDAC	7(15.2)	4(26.7)
Partial LDAC	9(19.6)	4(26.7)
Declared Framework Usage		
DSM	42(91.3)	10(66.7)
LDAC	3(6.5)	2(13.3)
Other[a]	1(2.2)	3(20.0)

Note. DSM = Diagnostic and Statistical Manual of Mental Health Disorders; LDAC = Learning Disabilities Association of Canada; learning disability = learning disability; SLD = specific learning disorder; RCE = Regional Centre for Education; Private = private practice; RTI = response to intervention; PSW = processing strengths and weaknesses; IAD = intelligence-achievement discrepancy, LA = low achievement.

[a]All participants who selected other followed up by stating that they use both LDAC and DSM frameworks

APPENDIX A



*Theoretically, a psychologist that agrees with either LDAC or DSM-5-TR criteria could be using response to intervention to determine who requires a comprehensive assessment (comprised of whichever measures they subscribe to). There is also nothing that precludes DSM-5-TR proponents from taking additional measures of IQ or cognitive processes, especially given that this used to be a requirement of the framework.

APPENDIX B

Survey Questions
Total: 48 core questions, 7 sub-questions

Demographic and Background Information

(1) Do you currently practice psychology in Nova Scotia, Canada?
____ Yes
____ No

(2) What is your registration status with the Nova Scotia Board of Examiners in Psychology?
____ Registered psychologist
____ Candidate register
____ Other (please specify): _____

(3) Have you provided direct services in relation to assessment of students with a suspected learning disability within the past two years?
____ Yes
____ No

(4) What is your self-identified gender?
____ Female
____ Male
____ Not listed
____ Prefer not to say

(5) Years of experience as a psychologist:
____ Less than 1
____ 1-4
____ 5-9
____ 10-14
____ 15 years or more

(6) What is your highest level of degree completed:
____ Master's degree in school psychology
____ Master's degree in clinical psychology
____ Doctoral degree
____ Other (please specify): _____

(7) What is your primary employment setting? Select all that apply.
____ Regional Centre for Education
____ Private practice

(8) Please select any secondary settings in which you are employed.
____ Regional Centre for Education
____ Private practice

APPENDIX B

(9) Are you primarily working in an urban or rural setting?
____ Urban setting
____ Rural setting
____ Both urban and rural settings

(10) Approximately what percentage of your working time is spent conducting assessments for suspected learning disabilities?
____ 1-20%
____ 21-40%
____ 41-60%
____ 61-80%
____ 81-100%

(11) Which student populations do you currently service? Select all that apply.

____ Elementary
____ Junior high/middle school
____ High school
____ Post-secondary

(12) Approximately what percentage of your time spent conducting assessments for suspected learning disabilities is with the following student populations (total should equal 100%):
Elementary: _____
Junior high/middle school: _____
High school: _____
Post-secondary: _____

APPENDIX B

Etiological Beliefs

Please read the following statements and indicate how strongly you agree or disagree with each one.
(1= strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree).

	Strongly Disagree			**Strongly Agree**
(1) Learning disabilities are significantly impacted by environmental deprivations.	**1**	**2**	**3**	**4**
(2) A student is born with a learning disability and they will always have a learning disability, even if they are provided with the highest quality instruction.	**1**	**2**	**3**	**4**
(3) If the quality of general education instruction improved the prevalence of learning disabilities would decrease.	**1**	**2**	**3**	**4**
(4) Compared to environmental factors, heredity plays a more significant role in the development of a learning disability.	**1**	**2**	**3**	**4**
(5) Many children classified with learning disabilities have lacked effective instructional opportunities.	**1**	**2**	**3**	**4**
(6) Learning disabilities are primarily related to deficits or abnormalities in the structure of the brain.	**1**	**2**	**3**	**4**
(7) For most children, high-quality instruction early in a student's life can prevent the development of learning disabilities.	**1**	**2**	**3**	**4**
(8) Greater emphasis should be placed on evaluating the child's psychological functioning/processing than their environment when evaluating the student for a learning disability.	**1**	**2**	**3**	**4**

APPENDIX B

Diagnostic Criteria

Please read the following diagnostic criteria and indicate how strongly you agree or disagree with each one **when assessing a student for a potential learning disability**. After rating the criteria, please complete the follow-up questions pertaining to each.

How strongly do you agree or disagree with the following diagnostic criterion when assessing a student for a potential learning disability:

	Strongly Disagree			Strongly Agree
(1) A student must have at least average intelligence	**1**	**2**	**3**	**4**

On a standardized intelligence test, how would you operationalize "at least average"?
____ A standard score of 70 (or 2.0 SDs below the mean) and above
____ A standard score of 80 (approximating1.5 SDs below the mean) and above
____ A standard score of 85 (or 1 SD below the mean) and above
____ A standard score of 90 (or .66 SDs below the mean) and above

When you use a standardized test to measure intelligence, do you compare the difference between the score obtained from this test (e.g., IQ) with a score obtained from a standardized measure of academic achievement?
____ Yes
____ No

If Yes: *How many points of difference between IQ and academic achievement do you require to make a diagnosis?*
____ 5-9
____ 10-14
____ 15-19
____ 20-24
____ 25+
____ Other (please specify): _____

How strongly do you agree or disagree with the following diagnostic criterion when assessing a student for a potential learning disability:

	Strongly Disagree			Strongly Agree
(2) A student must have impairment in one or more cognitive processes	**1**	**2**	**3**	**4**

When you use a standardized test to measure cognitive processes, how do you operationalize "impairment"?
____ A standard score of 70 (or 2.0 SDs below the mean) and below
____ A standard score of 80 (approximating1.5 SDs below the mean) and below
____ A standard score of 85 (or 1 SD below the mean) and below
____ A standard score of 90 (or .66 SDs below the mean) and below

APPENDIX B

When you use a standardized test to measure "impairment in one or more cognitive processes" , do you causally link the student's cognitive impairments with a related academic deficit?
____ Yes
____ No

If Yes: *Do you also look for the presence of strengths in one or more cognitive processes to establish unexpected underachievement?*
____ Yes
____ No

How strongly do you agree or disagree with the following diagnostic criterion when assessing a student for a potential learning disability:

	Strongly Disagree			Strongly Agree
(3) A student must have difficulty/impairment in learning or using an academic skill	**1**	**2**	**3**	**4**

When you use a standardized test to measure academic achievement, how do you operationalize "below average"?
____ A standard score of 70 (or 2.0 SDs below the mean) and below
____ A standard score of 80 (approximating1.5 SDs below the mean) and below
____ A standard score of 85 (or 1 SD below the mean) and below
____ A standard score of 90 (or .66 SDs below the mean) and below

How strongly do you agree or disagree with the following diagnostic criterion when assessing a student for a potential learning disability:

	Strongly Disagree			Strongly Agree
(4) Difficulties must persist despite targeted intervention/programming	**1**	**2**	**3**	**4**

How do you determine whether a "targeted intervention" has been implemented?

____ The student has been given extra help or programming in the area of academic difficulty at home or at school
____ The student has been given an evidence-based intervention targeting the area of academic difficulty

APPENDIX B

IQ Test Beliefs

Please read the following statements and indicate how strongly you agree or disagree with each one. (1= strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree).

	Strongly Disagree			Strongly Agree
(1) Full-Scale IQ scores are useful in understanding the nature of a learning disability.	**1**	**2**	**3**	**4**
(2) Factor index scores on an IQ test are useful in understanding the nature of a learning disability	**1**	**2**	**3**	**4**
(3) Individual subtest scores on an IQ test are useful for understanding the nature of a learning disability.	**1**	**2**	**3**	**4**
(4) Intelligence is a fixed trait (e.g., an individual has a certain intellectual capacity which cannot be significantly altered)	**1**	**2**	**3**	**4**
(5) Intelligence tests should routinely be used within the learning disability diagnostic process.	**1**	**2**	**3**	**4**
(6) A student's IQ score has implications for how a student can learn and be taught.	**1**	**2**	**3**	**4**
(7) IQ tests are useful in the treatment planning and generation of instructional strategies for students with learning disabilities.	**1**	**2**	**3**	**4**
(8) Substantial decreases in the use of intelligence tests would have a negative impact on the school psychologist's job security.	**1**	**2**	**3**	**4**
(9) Intelligence tests should only be used within the learning disability diagnostic process if an intellectual disability is suspected.	**1**	**2**	**3**	**4**
(10) A student's performance on an IQ test provides qualitative information about how a student learns.	**1**	**2**	**3**	**4**

APPENDIX B

Diagnostic Methods

(1) Do you currently use an IQ-discrepancy method when assessing for learning disabilities?

____ Yes

- ***If Yes:*** *What are your reasons for using this method for diagnosing learning disabilities? Select all that apply.*
  ____ District/schoolboard policy
  ____ Provincial policy
  ____ Obligation (e.g., supervisor)
  ____ Training (e.g., it was a method covered during graduate training)
  ____ Accessibility (e.g., the standardized tests I use facilitate this method)
  ____ Evidence (e.g., evidence supports the use of this method)
  ____ Ease (e.g., this method is easy to employ)
  ____ Time constraints (e.g., this method is quick and efficient)

____ No

- ***If No:*** *What are your reasons for not using this method for diagnosing learning disabilities? Select all that apply.*
  ____ District/schoolboard policy
  ____ Provincial policy
  ____ Obligation (e.g., supervisor)
  ____ Training (e.g., it was not a method covered during graduate training)
  ____ Accessibility (e.g., the standardized tests I use do not facilitate this method)
  ____ Evidence (e.g., evidence does not support the use of this method)
  ____ Ease (e.g., this method is not easy to employ)
  ____ Time constraints (e.g., this method is not quick and efficient)

(2) Do you currently use a processing strengths and weaknesses method when assessing for learning disabilities?

____ Yes

- ***If Yes****: What are your reasons for using this method for diagnosing learning disabilities? Select all that apply.*
  ____ District/schoolboard policy
  ____ Provincial policy
  ____ Obligation (e.g., supervisor)
  ____ Training (e.g., it was a method covered during graduate training)
  ____ Accessibility (e.g., the standardized tests I use facilitate this method)
  ____ Evidence (e.g., evidence supports the use of this method)
  ____ Ease (e.g., this method is easy to employ)
  ____ Time constraints (e.g., this method is quick and efficient)

____ No

- ***If No****: What are your reasons for not using this method for diagnosing learning disabilities? Select all that apply.*

____ District/schoolboard policy
____ Provincial policy
____ Obligation (e.g., supervisor)
____ Training (e.g., it was not a method covered during graduate training)
____ Accessibility (e.g., the standardized tests I use do not facilitate this method)
____ Evidence (e.g., evidence does not support the use of this method)
____ Ease (e.g., this method is not easy to employ)
____ Time constraints (e.g., this method is not quick and efficient)

(3) Do you currently use a response to intervention method when assessing for learning disabilities?

____ Yes

- ***If Yes:*** *What are your reasons for using this method for diagnosing learning disabilities? Select all that apply.*
  ____ District/schoolboard policy
  ____ Provincial policy
  ____ Obligation (e.g., supervisor)
  ____ Training (e.g., it was a method covered during graduate training)
  ____ Accessibility (e.g., the standardized tests I use facilitate this method)
  ____ Evidence (e.g., evidence supports the use of this method)
  ____ Ease (e.g., this method is easy to employ)
  ____ Time constraints (e.g., this method is quick and efficient)

____ No

- ***If No:*** *What are your reasons for not using this method for diagnosing learning disabilities? Select all that apply.*
  ____ District/schoolboard policy
  ____ Provincial policy
  ____ Obligation (e.g., supervisor)
  ____ Training (e.g., it was not a method covered during graduate training)
  ____ Accessibility (e.g., the standardized tests I use do not facilitate this method)
  ____ Evidence (e.g., evidence does not support the use of this method)
  ____ Ease (e.g., this method is not easy to employ)
  ____ Time constraints (e.g., this method is not quick and efficient)
  ____ Tiered instruction is often not evidence-based to support working within this method

(4) Do you currently use a low achievement method (e.g., persistently low academic achievement which is not better explained by another disorder or factor)?

____ Yes

- ***If Yes****: What are your reasons for using this method for diagnosing learning disabilities? Select all that apply.*
  ____ District/schoolboard policy
  ____ Provincial policy
  ____ Obligation (e.g., supervisor)

____ Training (e.g., it was a method covered during graduate training)
____ Accessibility (e.g., the standardized tests I use facilitate this method)
____ Evidence (e.g., evidence supports the use of this method)
____ Ease (e.g., this method is easy to employ)
____ Time constraints (e.g., this method is quick and efficient)

____ No

- ***If No****: What are your reasons for not using this method for diagnosing learning disabilities? Select all that apply.*
  ____ District/schoolboard policy
  ____ Provincial policy
  ____ Obligation (e.g., supervisor)
  ____ Training (e.g., it was not a method covered during graduate training)
  ____ Accessibility (e.g., the standardized tests I use do not facilitate this method)
  ____ Evidence (e.g., evidence does not support the use of this method)
  ____ Ease (e.g., this method is not easy to employ)
  ____ Time constraints (e.g., this method is not quick and efficient)

APPENDIX B

Diagnostic Terminology

Please indicate your response by making a checkmark on the line.

(1) When assessing a student with learning difficulties, what diagnostic terminology do you use? Select all that apply.
____ Learning Disability
____ Specific Learning Disorder

(2) Do you use the term dyslexia when you consider an individual as having met those criteria?
____ Yes
____ No

(3) Do you conceptualize the diagnosis of a learning disability and specific learning disorder as representing the same disability/disorder (i.e., the same group of people)?
____ Yes
____ No

***If No**: Please describe your perspective regarding the differences between a student with a specific learning disorder, and a student with a learning disability:*

_____

_____

_____

_____

(4) Which diagnostic framework do you typically use when assessing learning difficulties?
____ The LDAC (2002; re-endorsed 2015) Official Definition of Learning Disabilities
____ The Diagnostic and Statistical Manual of Mental Health Disorders (DSM-5-TR)
____ Other (Please specify):_____

General

- Participants will be categorized into one of four diagnostic framework options: Full LDAC; Partial LDAC; Full DSM; and Partial DSM.
- If a data point is missing, it will not be counted as endorsing a given criteria
- The "low academic achievement" criterion is integral to learning disability diagnosis across frameworks, so it is assumed for each category below. If a participant does not endorse this criteria, they will not be categorized.

LDAC Categorization

Full LDAC categorization requires both of the following two criteria be met; partial alignment requires only one of two:

1. Agree with the "average intelligence" criterion*** **AND/OR** select "yes" under "Do you currently use an IQ-discrepancy method when assessing for learning disabilities?"

   ******Exception:** If the participant endorses the "average intelligence criterion, and selects an IQ cut-score of 70 and above as average, they do not qualify as having met this criteria. However, they can still meet the requirements under criteria 1 if they endorse "currently using an IQ-discrepancy method"*

2. Agree with the "impairment in one or more cognitive processes" criterion **AND/OR** select "yes" under "Do you currently use a processing strengths and weaknesses method when assessing for learning disabilities?"

If the participant meets either criteria, **STOP** and categorize as Full LDAC (criteria 1 and 2 met), or Partial LDAC (either criteria 1 or 2, but not both).

If the participant does not meet either of the above criteria, **CONTINUE** and categorize as either Full or Partial DSM based on the information below.

DSM Categorization

Full DSM

1. In response to "How do you determine whether a "targeted intervention" has been implemented?" the participant must either:
   - select "the student has been given **extra help or programming** in the area of academic difficulty at home or at school" **OR**
   - not select either option (leave it blank)

Partial DSM

1. In response to "How do you determine whether a "targeted intervention" has been implemented?" the participant must select "The student has been given an **evidence-based intervention** targeting the area of academic difficulty