An Evaluation of Evidence-Based Information on Interventions for Learning Disabilities in Reading Found within Pinterest-Linked Websites: A Multi-Site Content Analysis

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Abstract

Social media platforms such as Pinterest are becoming a popular medium for locating and consuming health information. Nonetheless, no studies to date have explored the accuracy of intervention information for reading disabilities on Pinterest-linked web pages, leaving it unclear the extent to which it aligns with evidence-based practice. This study reviewed online information about interventions for reading disabilities from 41 Pinterest-linked web pages to analyze its accountability, presentation, alignment with evidence-based practice, and readability using a set of standardized criteria. The quality of intervention information was generally poor, with websites meeting less than 10% of the standardized criteria. Further, most information was published by unspecified authors or authors without formal experience providing evidence-based interventions for LDs in reading. Most sites also neglected to reference their sources or recommend follow-up with a professional. These findings, possibilities for future research, and practical implications for health care providers are discussed.

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CHAPTER ONE

Literature Review

Learning disabilities (LDs) are a group of disorders that affect learning in individuals who otherwise demonstrate average to above-average thinking and reasoning abilities. LDs are lifelong disorders and represent a significant cause of academic underachievement and behavioural problems in young children (Büttner & Hasselhorn, 2011; Johnson, 2017; Vidyadharan, 2019). LDs are globally documented and affect students in all societies where reading, writing, and arithmetic are necessary skills of everyday functioning (Büttner & Hasselhorn, 2011). Recently, LDs have emerged as the most studied category of special education (Tzouriadou, 2020; LDAC, 2017). Further, students with LDs currently represent the largest group of students receiving special education services in the US, exerting significant demands upon the American public education system (National Center for Education Statistics, 2018). In Canada, accurately reporting the prevalence of LDs is challenging; nonetheless, some estimates suggest LDs affect as many as 10% of all students (Stegemann, 2016).

History of Learning Disabilities

The early 19th century marks the beginning of what many historians consider the first scientific work of immediate relevance to LDs (Torgesen, 2004). At that time, Joseph Gall documented the relationship between brain injury and impairment in soldiers, describing multiple cases of loss of specific mental function due to brain damage (Hallahan & Mercer, 2001; Torgesen, 2004). Other European researchers, including Carl Wernicke and Paul Broca, soon followed suit and established connections between injuries to localized brain areas and specific behaviours (Pullen, 2016). In 1861, Broca examined the brains of patients with language production deficits and noted a relationship between damage to the inferior frontal lobe and

speech functioning. A decade later, in 1874, Carl Wernicke reported on cases of adult patients with language disorders involving fluent but disordered speech. He noted that they all had difficulty recognizing and comprehending words and traced the pathologies to an area located within the left temporal lobe (Pullen, 2016). This research was significant to the study of LD because it established a relationship linking specific types of mental impairments to damage in localized areas of the brain (Torgesen, 2004).

Around this time, William Broadbent documented case histories where brain injury in adult patients was linked to the loss of their ability to read and name familiar objects despite retaining the ability to write and converse (Pullen, 2016). After that, in 1877, Adolph Kussmaul introduced the label "word-blindness" to refer to reading disabilities after recognizing that one of his patients struggled to recognize written words in spite of typical intellectual functioning (Alnaim, 2016; Pullen, 2016). In 1880, Rudolph Berlin introduced the term "dyslexia" as preferable to "word-blindness" for a condition of neurological origin. Decades later, while working with children with reading disorders, Samuel Orton would note that many of them had average intelligence on the Stanford-Binet IQ test, indicating that their learning problems appeared to be specific to reading (Alnaim, 2016; Hallagan & Mercer, 2002; Pullen, 2016).

From this point, the study of brain-behaviour relationships continued, and learning difficulties gained widespread attention beginning in the 1960s. In 1963, with the Conference on Exploration into Problems of the Perceptually Handicapped Child, Samuel Kirk proposed the term "learning disabilities" as a descriptive title for unexplained academic difficulties (Hallahan & Mercer, 2002; Torgesen, 2004). Developments continued in 1969 when the US Federal Government mandated to develop the field of learning disabilities as a distinct entity within special education as part of the Children with Specific Learning Disabilities Act (Alnaim, 2016;

Hallahan & Mercer, 2001). With this, LD as a social, political, and educational movement began, and organizations related to LD started to receive funding from parents and professionals. Special educational programs for students with learning disabilities were also initiated (Alnaim, 2016). In 1975, the passage of the Education for All Handicapped Children Act (EHA) in the United States mandated that all states must provide appropriate public education for all children with LDs. Research into defining, identifying, and remediating LDs continued throughout this period (Alnaim, 2016), with the focus shifting toward developing effective educational methods for students with LDs. Moving ahead to the 21st century, the most significant development in the field of LDs for decades has been the reauthorization of the Individuals with Disabilities Education Act (IDEA) in 2004 to allow multiple frameworks for LD identification under US federal law (Benson et al., 2020).

In Canada, widespread awareness of LDs was slow to develop. Despite what was close to a century of globally aggregated research into the topic of LDs, it was not until the late 1950s that the concept of learning disabilities would receive significant recognition by Canadian researchers and legislators thanks to the efforts of psychiatrist Edward Levinson (Stegemann, 2016). Levinson later aided in the creation of the Montreal Children's Hospital Learning Centre in 1960 to investigate the learning difficulties of children with LDs and to study effective interventions (Klassen, 2002; Stegemann, 2016). In 1962, the Association for Children with Learning Disabilities, now the Learning Disabilities Association of Canada (LDAC), was founded, making it the first Canadian association dedicated to supporting children with LDs (Kozey & Siegel, 2008). Individual chapters were subsequently established in all 10 Canadian provinces by 1967, furthering awareness and services for individuals with learning disabilities (Stegemann, 2016). From this point, despite growing recognition of LDs across Canada,

legislating education for individuals with LDs remained the responsibility of each province or territory, unlike the United States, where education of individuals with LDs was federally specified (Stegemann, 2016). Thus, although the rights of persons with disabilities are specified and protected under the *Canadian Human Rights Act* and in the *Canadian Charter of Rights and Freedoms* (Canadian Human Rights Commission, 2017), it was not until 2012 with the Supreme Court of Canada's ruling in the case of *Moore v. British Columbia* that the country affirmed the legal right of students with LDs to "… adequate special education programs and services, including intensive evidence-based interventions for those who need them" (Philipott & Fiedorowicz, 2012; p. 2). This ruling was significant because, in a country where policy, practice, and discourse surrounding special education are differentiated across provincial and territorial jurisdictions, it established a common standard for all students with LDs to access special education services (Philipott & Fiedorowicz, 2012).

Practical Approaches to LD Identification

Considerable research has been devoted to understanding the identification of LDs. In the modern clinical landscape, three approaches to identifying LDs are broadly employed: the Intelligence-Achievement Discrepancy (IAD) model, the Response-to-Intervention (RTI) model, and the Pattern of Strengths and Weaknesses (PSW) model.

Intelligence-Achievement Discrepancy (IAD) Model

According to the IAD method, diagnosing a student with an LD requires them to demonstrate a significant discrepancy between intellectual ability measured by a standardized intelligence test and academic performance on a norm-referenced measure of achievement (Benson et al., 2020; Maki & Adams, 2019). According to this definition, two conditions must be met to establish a severe discrepancy. First, a significant difference must exist between actual

and expected achievement based upon intelligence scores that cannot be accounted for by simple measurement error. Second, the specified difference must be significant enough to be considered unusual among individuals without LD (Benson et al., 2020). Despite this focus on a difference being large enough to be deemed significant, the IAD method is unclear with respect to how this difference is defined, resulting in a lack of standardization and inconsistent implementation (Ihori & Olvera, 2015).

Historically IAD has been the most common approach to identifying LD. This is because, as the LD movement formally began during the 1960s, one of the significant challenges it faced was establishing a clear sense of identity separate from other pre-existing branches of remedial and special education. To this end, LDs were approached by emphasizing the differences between children with LD and others receiving special education services in schools. The crux of this distinction was that, unlike other students with learning challenges, the learning difficulties inherent to LDs resulted from specific difficulties in performing particular psychological processes or mental operations required for learning (Torgesen, 2004). Consequently, it was essential to establish that students with LDs were distinct from those with intellectual disability. Here, an emphasis was placed on the generally typical academic potential of children with LD (Torgesen, 2004).

Response to Intervention (RTI)

Response to Intervention (RTI) is a relatively new approach for identifying students with LD. In contrast to the IAD model, which functions only to identify students with LD, RTI also serves as an alternative for providing educational services that are schoolwide, tiered, individualized, proactive, and timely. In fact, providing information for the identification of LDs

is only a secondary goal of RTI, with the primary objective being to maximize learning for all students (McIntosh et al., 2011).

The RTI model involves layered systems of support offering students multiple levels of intervention, most commonly across three tiers (Tilly, 2008). At Tier I, students found to be at risk receive general education and classroom instruction while their progress is continually monitored. If students do not respond to Tier I instruction, they progress to Tier II. At this stage, students receive more intensive research-based general education interventions, frequently involving intensive systematic and explicit instruction of target skills within a small group format (Ihori & Olvera, 2015). At Tier II student progress continues to be monitored and those who do not respond to Tier II interventions proceed to even more intense interventions or special education assessment at Tier III. At Tier III, the amount and intensity of supports are increased, and they are delivered in the context of small group or one-on-one instruction. Tier III support involves interventions individualized to support the specific needs of students and features more frequent progress monitoring than Tier I or II. At Tier III the support team performs frequent adjustments to the methods of instruction to enhance student success.

Identification of students with and at-risk for LD using the RTI model involves the universal screening of all students to detect those who struggle to learn even when provided with scientific, evidence-based general education (Jenkins et al., 2007). Using RTI, students at risk for developing LD are identified based on their performance within each tier. The RTI model begins at Tier I, which consists of quality schoolwide instruction for all students through the implementation of universal evidence-based educational strategies (Ihori & Olvera, 2015; McIntosh et al., 2011). Although the point at which students are referred for special education assessment is variable and depends on the tier structure of the individual RTI model (Ihori &

Olvera, 2015), it is often at this stage that students who remain nonresponsive to intervention may be eligible for special education supports such as classroom accommodations and adaptations or individualized program plans (McIntosh et al., 2011). Thus, successful RTI programs can provide numerous benefits to students with and without LDs and can result in early identification and intervention for learning difficulties (Ihori & Olvera, 2015).

Pattern of Strengths and Weaknesses (PSW)

The third approach to the diagnosis of LD is the Pattern of Strengths and Weaknesses (PSW) method, which attempts to address concerns about RTI model's lack of acknowledgement of the importance of cognitive testing in the identification and treatment of LDs (McGill & Busse, 2017). The overarching goal of the PSW approach as a diagnostic method is to identify underlying cognitive processing deficits directly relating to LDs (Beaujean & Phipps, 2016). PSW methods inherently assume that individuals with LDs possess certain cognitive processing deficits that are not only causally and predictably linked to the exhibited learning difficulties but are also relevant to educational planning (Hale et al., 2006). In contrast to the IAD model, which places primacy on the interpretation of an individual's full scale IQ score, PSW models focus on interpreting patterns of factor or index level scores across a battery of tests (McGill & Busse, 2017). In doing so, PSW methods require that clinicians not only assess a student's overall cognitive abilities, but also examine their specific cognitive strengths and weaknesses (Lenehan, 2018).

PSW approaches have grown significantly in popularity over the past decade, becoming more widely embraced within the technical literature and being adopted as an LD identification model by many educational agencies across Canada and the United States (Beaujean & Phipps, 2016; McGill & Busse, 2017). Currently, there is no single PSW approach; rather multiple

specific methods for diagnosing LDs have been developed under the PSW model (Beaujean & Phipps, 2016; Lenehan, 2018). Particularly, three PSW approaches have risen above the rest regarding their relative research base and widespread clinical application, these being the concordance/discordance method (C/DM; Hale & Fiorello, 2004), the discrepancy/consistency model (D/CM; Naglieri, 2011), and the Catell-Horn-Carroll operational model (CHC; Flanagan et al., 2011).

Despite prominent PSW models differing in how they operationalize a PSW (i.e., their theoretical orientation and the statistical formulae applied to identify patterns of strengths and weaknesses; Maki & Adams, 2019; McGill & Busse, 2017), all involve identification of processing disorders/deficits which affect or influence a student's academic achievement within inherent areas of strengths and weaknesses (Ihori & Olvera, 2015). To this end, each of the most prominent PSW models include the same essential steps: (a) identifying an area of academic weakness; (b) judging whether there is an area or multiple areas of cognitive weakness that have been identified by research as linked to problems in the associated academic area, (c) establishing whether there are other areas of cognitive functioning that are average or above-average, and (d) analyzing findings for a pattern which rules out or confirms the presence of an LD (Schultz et al., 2012). Similarly, when determining LD eligibility, all PSW approaches are characterized by use of multiple data sources, specifically: (a) informal information, (b) non-standardized test scores (e.g., curriculum-based measures, current classroom records, and criterion-referenced tests) collected across time from a variety of assessment tools and strategies, and (c) standardized test scores (e.g., individually administered measures of academic achievement and cognitive ability).

Within a PSW context, tests are selected based upon research-based associations between the area of academic difficulty and the suspected cognitive processing deficit (Schultz et al., 2012). These tests are used to develop and explore hypotheses concerning a student's academic profile (i.e., their cognitive strengths and weaknesses) to drive targeted intervention (Miciak et al., 2016). Unfortunately, despite the popularity and perceived clinical utility of PSW approaches scientific support has thus far been inconsistent, with investigations of several profile analysis methods consistently finding that unique cognitive profiles are psychometrically weak and lack adequate reliability and validity for clinical interpretation (McGill, 2018).

Definition and Terminology of Learning Disabilities

The Canadian government currently lacks formal documentation explicitly detailing how LDs are defined (D'Intino, 2017). Rather, how LDs are defined for Canadian citizens depends on the policies mandated by their provincial Ministry/Department of Education (D'Intino, 2017; Kozey & Siegel, 2008). Despite such variability, all education systems across Canada currently endorse one of two competing classification systems. The first and most widely accepted of these is the Learning Disabilities Association of Canada (LDAC) definition (D'Intino, 2017). Alternatively, the Diagnostic and Statistical Manual of Mental Disorders – 5th Edition, Text Revision (DSM-5-TR) also offers its own definition and system of categorization.

Learning Disabilities Association of Canada Definition (LDAC)

The LDAC defines LDs as a number of disorders which may "affect the acquisition, retention, understanding or use of verbal or nonverbal information," and which "result from impairments in one or more processes related to perceiving, thinking, remembering or learning" (LDAC, 2015, para. 1-2). A critical element to the LDACs definition of LDs is that it stipulates individuals must have average to above average thinking and reasoning abilities, making

intelligence testing a crucial component of LD assessment and diagnosis. This requirement is intended to distinguish LDs from learning difficulties attributable to an intellectual disability.

The LDAC also defines LDs as lifelong disorders that may vary in their expression across an individual's lifetime. LDs may range in severity, but all are invariably due to genetic or neurobiological factors or injury which alter brain functioning in a manner that influences one or more processes related to learning. In this regard, LDs cannot be primarily attributable to other causes (e.g., ineffective teaching, hearing/vision problems, or cultural or linguistic differences). Since the diagnosis of an LD according to the LDAC definition requires evidence of impairment in one or more processes related to perceiving, thinking, remembering, or learning, the administration of cognitive tests is a requirement when using this diagnostic method. The LDAC notes that common cognitive processes linked to LDs include phonological processing, language processing, attention and memory, processing speed, visual processing, and executive functions (LDAC, 2015). Some researchers have proposed that these processing deficits are causally linked to LDs; however, research on the topic remains equivocal (McGill et al., 2018). The LDAC definition of LD does not separate LDs into subcategories (e.g., dyslexia, dyscalculia), instead classifying LDs according to the academic areas that are affected (e.g., LD affecting reading, written language, or mathematics).

Diagnostic and Statistical Manual of Mental Disorders – 5th Edition, Text Revision (DSM-5-TR) Definition

Learning Disability is not a diagnosis featured in the DSM-5-TR. Rather, the DSM-5-TR uses the label *Specific Learning Disorder* (SLD) to refer to a pattern of persistent unexpected academic underachievement (5th ed-TR; American Psychiatric Association, 2022). According to the DSM-5-TR, LDs begin during the school-aged years and are characterized by persistent

difficulties learning and using academic skills. Further, these difficulties continue despite interventions and appropriate classroom instruction. Academic difficulties must be substantially and quantifiably below those expected for an individual's chronological age and should not be 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. The DSM-5-TR definition does not require a discrepancy between IQ and achievement, nor does it require specific cognitive or other forms of standardized testing. Instead, it merely requires that students demonstrate persistent and significant academic underachievement in one of three key areas (i.e., reading, writing, or mathematics), as indicated by a psychometrically sound and culturally appropriate test of academic achievement. The DSM-5-TR uses SLD as a blanket term for all learning disorders while specifying the impaired academic domains and subskills. Notably, the DSM-5-TR qualifies that 'dyslexia' and 'dyscalculia' are alternative terms for referring to patterns of learning difficulties primarily characterized by reading and math impairments, respectively.

Types of Learning Disabilities

Despite their differences, both the LDAC and DSM-5-TR definitions for LDs are consistent in identifying the academic domains of reading, writing, and/or mathematics as being those typically affected by LDs. An overview of the types of LDs is provided in the following section.

Reading Disability

Since reading disabilities are the most common category of LD, they are also the best characterized and most broadly studied (Lee & Yoon, 2017). Commonly referred to as dyslexia, reading disability, reading disorder, or specific reading disorder (American Speech-Language-

Hearing Association, 2020), at their core, these disorders result from a deficit(s) in language processing abilities (Snowling, Hayiou-Thomas et al., 2019). Children with reading disabilities manifest a range of problems related to reading that affect accuracy and fluency as well as comprehension and the mapping of sounds to print (Snowling, Nash et al., 2019). Children with reading disabilities lag behind their peers when learning to decode words, develop fluency, and generalize or read novel words (Snowling, Nash et al., 2019). These language processing difficulties mean that students with reading disabilities also often have difficulties with spelling and writing relative to typical readers.

Decades of research investigating the processes underlying LDs has resulted in multiple studies evaluating the cognitive profiles of students with reading disabilities. Studies by Compton et al. (2012), Shankweiler et al. (1995), and Tobia and Marzocchi (2014) have suggested that students with reading disabilities typically demonstrate multiple deficits relating to skills across the phonological domain (i.e., phonological awareness, rapid automatized naming, verbal short-term memory, verbal recall, and visuospatial attention). Profile analysis of students with reading disabilities has resulted in the identification of several subtypes which are specified based upon the nature of an individual's most prominent deficit(s) and whether the deficit(s) occurs at the level of the word, at the level of text, or both levels (Fletcher & Grigorenko, 2017). Deficits at the word level are related to failures in auditory-phonemic processing, speeded lexical retrieval, and verbal short-term memory (Elwan et al., 2019). In contrast, deficits at the level of text are frequently attributed to failed visual-orthographic processing, poor vocabulary or listening comprehension, and weaknesses in attention/executive functioning, resulting in challenges when applying strategic knowledge for inferencing,

monitoring comprehension, and creating mental representations of what is being read (Cain & Barnes, 2017; Leach et al., 2003).

Critically, researchers recognize that reading deficits may be the product of a complex interaction of multiple factors attributable to many causes. Thus, it is important to distinguish reading difficulties due to LD from those stemming from factors including inadequate instruction or those compounded by environmental factors such as a home environment that is not conducive to academic success. The most important feature differentiating students with a reading disability from their typically developing peers is their slow response to high-quality reading instruction and persistent reading difficulties despite the remediation of other factors such as poor visual or auditory acuity or psychosocial adversity (Vellutino & Fletcher, 2008). Students with reading disabilities typically continue to struggle in spite of exposure to appropriate reading instruction and significant effort toward their studies. In turn, these pervasive difficulties, through their adverse effects on a child's ability to develop literacy skills, may contribute to further difficulties across multiple academic domains, complicating the LD identification process.

Writing Disability

At their core, writing disabilities are a disorder associated with impairment in the acquisition of writing skills, with writing performance below the level expected based on a child's age and grade (Döhla & Heim, 2016; McCloskey & Rapp, 2017). Historically, writing disabilities have been dichotomized by researchers into two categories: (1) those affecting the basic motor planning and production processes required for handwriting and transcription, resulting in difficulties with handwriting and spelling (McCloskey & Rapp, 2017), and (2) those involving the generation of coherent written content and text in the form of essays and stories

(Fletcher & Grigorenko, 2017). During written expression, transcription problems are related to difficulties with perceptual-motor skills, including fine motor control, finger recognition, and proprioception. Spelling, on the other hand, is related to phonological awareness and text generation is associated with executive processes affecting self-regulation and organization (Berninger, 2004).

To date, relatively little is known regarding writing disabilities, which have received comparatively less attention and have been the subject of fewer empirical studies than reading disabilities despite the significant influence that they have on learning (Döhla & Heim, 2016). Through the disruption of writing skills, writing disabilities often have broad harmful effects on academic performance not solely limited to literary endeavours (McCloskey & Rapp, 2017). For instance, children who struggle to write numbers legibly and align digits will most likely need to work longer and harder to complete math homework than their peers while simultaneously learning less (McCloskey & Rapp, 2017). Further, disorders of written expression and reading disabilities may often co-exist (Döhla et al., 2018). Indeed, it can often be difficult to discriminate students with a writing disability from those with a reading disability, as there is often considerable overlap between these two groups (Berninger et al., 2017). These groups frequently display similar cognitive profiles and demonstrate deficits in several shared cognitive processes that are dually involved in learning to read and write, namely working memory, visual-spatial processing, and phonological processing. Thus, like reading disabilities, writing disabilities are rather common. International reports of writing difficulties amongst middle school students have suggested that approximately 22% may experience difficulties in spelling, with 24% noting challenges in narrative composition (Fasting et al., 2009). Similarly, in an epidemiological study of written language disorders in over 5000 students from the United

States, Katusic et al. (2009) noted comparable results, indicating that the reported rates of writing disabilities ranged from 6.9% to 14.7% depending on the definition used.

Mathematics Disability

Relatively little is known about the etiology, course, characteristics, and prevalence of math disabilities (Lewandowski & Lovett, 2014). Despite this, the current consensus among researchers is that mathematics disability, often referred to as developmental dyscalculia or specific learning disorder with impairment in mathematics, is a disorder that affects the development of arithmetic and numerical skills. Mathematics is a complex skill with multiple components (Snowling et al., 2020). Like the relationship between decoding and reading comprehension, math development and instruction is hierarchical, with mastery of basic skills predicting the attainment of complex skills (Fletcher & Grigorenko, 2017). Thus, the term "mathematics disabilities" represents a broad term describing a heterogeneous disorder resulting not only from individual deficits in numerical or arithmetic functioning but other domain-specific and domain-general deficits (Lewandowski & Lovett, 2014). In effect, children with math disabilities have problems mastering a wide range of numerical understanding skills such as counting, magnitude processing, arithmetic, transcoding between number words, digits and quantities, spatial number representation or more domain-general skills like working memory or attentional processes (Garnett, 1998).

Beginning with Geary (1993), researchers have begun to conceptualize mathematics disabilities according to a collection of subtypes. In classifying mathematics disabilities, Geary (1993) suggested three categories, each linked to a specific cognitive process. Firstly, a procedural subtype characterized by deficits in executing the procedures necessary to solve arithmetic problems. Secondly, a semantic memory subtype defined by difficulties with the

retrieval of arithmetic facts from semantic memory. Lastly, Geary proposed a visuospatial subtype in which students have trouble interpreting visuospatial representations of numerical information, including numbers and symbols. Today most researchers recognize two subtypes of mathematical difficulties, specifically indicating that mathematical problems may be either computational (i.e., dyscalculia) or involve problem-solving, often in the form of word problems (Fletcher & Grigorenko, 2017). However, these subtypes are not formally recognized within any diagnostic framework and practitioners typically do not specify the subtype of mathematics difficulty when providing a diagnosis (Östergren, 2013). Notably, math problem-solving has been the subject of less study than computational skills (Fuchs et al., 2008). Concerning overlap between the subtypes, research by Fuchs et al. (2009) found only moderate overlap between the categories, suggesting that difficulty in one domain does not necessarily relate to difficulty in the other. They noted that difficulty occurred in a single math domain with similar frequency as across math domains. Further, the prevalence of specific difficulties across both domains is nearly identical, with univariate profile analyses of mean differences among the groups on multiple cognitive dimensions indicating that language and word identification problems clearly distinguished problem-solving from computational difficulties.

Since many aspects of mathematics depend on verbal skills, there is a significant overlap between reading and mathematics disabilities. Indeed, math disabilities are comorbid with reading disabilities in 30%-70% of cases (Landerl & Moll, 2010). Like reading, the development of mathematical skills may be influenced by a range of factors not limited to educational quality and home environment (Wilkey et al., 2018). Thus, in defining mathematics disabilities, excluding other limiting factors such as low intelligence, improper educational opportunities, and emotional disturbance is often a critical step (Júlio-Costa et al., 2015).

Cognitive Processes Associated with Learning Disabilities

Accuracy and consistency in LD eligibility decisions are critically important to their effective and timely intervention. Unfortunately, disagreement and inconsistencies regarding the identification of LDs severely complicate the process of developing and implementing interventions. Over the past 25 years, however, the differentiation of LDs according to academic domains has fueled an expansion of the research base, leading to a body of replicable research on cognitive processes and correlates underlying LDs, which demonstrates qualitative differences in processing between students diagnosed with LD and their typically developing peers ((Fletcher & Grigorenko, 2017; Ingvar et al., 2002).

Cognitive processing deficits are defined as problems with the processes of recognizing and interpreting information taken in through the senses (LD online, n.d.). Despite organizations such as the APA and LDAC insisting that LDs reflect biologically-based cognitive dysfunctions impeding the acquisition of requisite academic skills, cognitive processing deficits and their relationship to the academic challenges characteristic of students with LD remain a hotly debated topic among researchers and clinicians (McGill et al., 2018). In support of this position, researchers have demonstrated that cognitive skills are systematically and differentially correlated with academic skills across the domains of LDs (Fletcher & Grigorenko, 2017). Additionally, a growing body of research has emerged identifying specific cognitive deficits frequently associated with LDs, such as phonological processing for reading disabilities, orthographic processing for writing disabilities, and working memory for mathematics disabilities. However, much of this research has been primarily correlational and is thus equivocal in nature. Thus, it remains unclear whether these processing deficits represent causal factors underlying LD manifestation, covariates that moderate the expression of LDs, or are

merely the consequences of other conditions, a fact which has caused some to argue against requiring evidence of specific cognitive processing deficits when diagnosing LDs.

Meta-analytic research on cognitive processing deficits and learning disabilities has identified moderate to large differences in effect sizes for the presence of processing deficits in students with learning disabilities (Johnson et al., 2010). More recently, Döhla et al. (2018) demonstrated certain cognitive processing deficits in a sample of 45 students with developmental dysgraphia. Specifically, phonological awareness and phonological working memory were effective in distinguishing these children from typically developing writers. Similarly, other research conducted by Decker et al. (2018) investigating the relationship between Cattell-Horn-Carroll (CHC) cognitive abilities and reading comprehension across a sample of 835 students in grades 1-5 found that specific cognitive variables (e.g., auditory processing and long-term retrieval) predict reading comprehension above and beyond basic reading skills, further noting that such abilities mediated the effects of basic reading skills on reading comprehension. To date, among the cognitive processes most frequently and reliably implicated in the manifestation of LDs are phonological processing, long-term retrieval, attention, short-term memory, and working memory. However, there are also numerous other processing deficits that have been more tenuously linked to LDs. Furthermore, much of the research investigating the processing deficits underlying LDs has historically been conducted on reading disabilities, despite a more recent surge in studies addressing those underlying mathematics disabilities.

Evidence-Based Intervention for LDs

Recent advances in child developmental research have revealed that early educational experiences significantly affect the learning trajectory of children (Johnson, 2017). Additionally, providing earlier instructional interventions for students with LD is associated with superior

long-term outcomes and increased chances of success in school and later life (Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2021). Beyond the education-related consequences, these students also experience more emotional and behavioural challenges than students without LDs (Johnson, 2017). Hence, it is vital that intervention for students with LDs be provided promptly and effectively.

Defining Evidence-Based Intervention

At all points during the planning and implementation process for LD interventions, it is critical that clinicians, teachers, and parents base their decision-making on the best available evidence both for and against various treatment approaches (Heymann, 2020). Thus, psychologists and professionals within other health sectors look toward evidence-based interventions (EBIs), or more broadly, evidence-based practices (EBPs), approaches that research has consistently demonstrated to be effective. As noted by Kranzler et al. (2016), the goal of the EBP movement is to improve the quality of professional services (e.g., diagnosis, intervention, and evaluation) delivered to children, families, and schools. Widespread adoption of EBPs is important for the potential it holds to reduce the influence of subjective errors, use of obsolete information, and exercise of unsubstantiated practices based on limited personal experiences (Mohammadi et al., 2018).

One approach to implementing evidence-based practice in professional care systems has been through the development of guidelines for best practice that advocate for improved patient outcomes through informing clinical practice with relevant research (American Psychiatric Association [APA], 2016). In 2005, the APA published its policy statement on evidence-based practice in psychology (EBPP). In this document, EBPP was defined as “the integration of the best available research with clinical expertise in the context of patient characteristics, culture,

and preferences" (APA, 2005, p. 5). They described the purpose of EBPPs, as to promote effective psychological practice and apply empirically supported principles of psychological assessment, case formulation, therapeutic relationships, and intervention toward enhancing public health.

Influenced by the APA definition, in 2012, the Canadian Psychological Association (CPA) defined evidence-based practices of psychological treatments as involving "conscientious, explicit and judicious use of the best available research evidence to inform each stage of clinical decision making and service delivery" (CPA, 2012, p. 7). Integral to this definition is the required commitment to being continually informed by high-quality research evidence drawn from a series of diverse sources and levels of evidence. (CPA, 2012). As such, despite recognizing that all research methodologies hold the potential to provide relevant evidence, particular emphasis is placed on research findings published in peer-reviewed literature, which includes, at minimum, treatment process and outcome research (Dozois et al., 2014). Taking this further, the CPA Task Force on Evidence-Based Practice of Psychological Treatments delineates the criteria required for a treatment to be considered evidence-based. Interventions must be examined in multiple randomized controlled trials (RCTs) whose participants should be followed-up long term to assess their reactions, symptoms, and functioning to inform subsequent treatment planning, including modification or discontinuation. These specifications help to ensure that the research used to identify EBPs is comprehensive and explicit and has demonstrated a treatment's safety and effectiveness (Cleaver & Wood, 2018).

In summary, EBP represents a shorthand term to denote the quality, validity, and robusticity of the scientific evidence surrounding a practice (Hoagwood & Johnson, 2003), and an intervention may be considered evidence-based when it has been systematically evaluated and

determined to provide consistently positive results when implemented with a high degree of fidelity (Cleaver & Wood, 2018). Thus, using EBPs whenever possible is recommended, especially in the context of treating LDs, as it helps to ensure the best possible outcomes for the patient/client (Heymann, 2020).

Principles of Evidence-Based Interventions for Learning Disabilities

Despite the wealth of research dedicated to the effective intervention of LD, few interventions have withstood the rigorous scrutiny, much less received the necessary support required to be considered evidence-based. Rather, research investigating the effective instruction of students with LD has instead consistently identified 10 principles that characterize effective interventions for students with LDs (Fletcher et al., 2019). These principles are (1) instructional explicitness, (2) minimization of the learning challenge, (3) the use of proper and clear terminology, (4) speeded practice, (5) cumulative review, (6) the use of simple and direct language, (7) incorporation of self-regulation strategies, (8) comprehensive instructional approaches, (9) extended duration and time on task, and (10) progress monitoring.

Explicit instruction is essential for struggling students, particularly those with LDs (Fuchs et al., 2014). Specifically, explicit instruction demands that instructors involve the learner in the material to be mastered, purposefully and intentionally use direct explanations, model skills and strategies, and provide opportunities for supervised practice. In addition, speeded practice involving the rapid application and rehearsal of learned skills or concepts has been demonstrated to be superior to untimed practice for promoting automaticity (Fletcher & Grigorenko, 2017). Similarly, learning interventions are more effective when they are comprehensive, incorporating multiple instructional practices that promote structured engagement in authentic curriculum-based practices, as opposed to skill-focused approaches (Fletcher & Grigorenko, 2017). For

example, consistent with such findings, phonologically based interventions involving training in phonemic awareness and letter knowledge combined with structured reading practice have been shown to be the most effective intervention for children with reading disabilities (McArthur et al., 2018). Regardless of the subject of instruction, however, explicitness is a key aspect of effective instruction, so long as the instruction is differentiated according to a student's strengths and weaknesses in the academic domain (Connor et al., 2011; Al Otaiba et al., 2011) and with appropriate intensity relative to the degree of academic difficulty (Fuchs & Fuchs, 2009).

Notably, many effective interventions for LDs also involve a self-regulation component to address the organizational and attentional difficulties characteristic of many students with LD (Graham et al., 2012; Fletcher & Grigorenko, 2017). Further, research has also indicated several aspects of ineffective instruction for students of LD. Ineffective interventions frequently involve approaches that are not explicit and that are often based on constructionist and discovery-based approaches (Seidenberg, 2017). In addition, instruction must focus on academic content (Pennington, 2009). Interventions that train isolated skills such as working memory, low-level auditory and visual processing, or other non-academic interventions based on training the brain or eyes, do not generalize to academic improvements (Melby-Lervåg et al., 2016).

Direct Instruction

As noted, few manualized interventions for LD exist, and of those that do, even fewer may be considered evidence-based. One of the only LD interventions that has received consistent empirical support has been *Direct Instruction* (DI; Engelmann & Carnine, 1982). As defined by the National Institute for Direct Instruction (2015), "DI is a model for teaching which emphasizes well-developed and carefully planned lessons designed around small learning increments and clearly defined and prescribed teaching tasks." DI has been studied and used in

public schools throughout Canada, the United States, the UK, and Australia for almost 50 years and is based on the understanding that clear instruction can eliminate misinterpretations, significantly improving and accelerating learning. Central to the implementation of DI is the theoretical underpinning that all children can be taught and learn when provided with well-designed and evidence-based instruction. Owing to this, DI draws upon many of the previously mentioned principles of instruction for students with LD, recognizing that insufficient response to instruction may not always reflect a failure of the student, but rather ineffective instruction. According to this method, all students can learn new material when two criteria are met: (a) they have mastered the prerequisite knowledge and skills and (b) when instruction is sufficiently intense and unambiguous (Stockard et al., 2018).

Unsurprisingly, mastery learning represents an essential element of DI. DI programs reflect a bottom-up philosophy that involves breaking complex skills, behaviours, or concepts into their component parts so that students may develop the background skills and knowledge to learn new skills and content as it is presented (Huitt, 2009). Thus, DI theory posits that when students become fluent in a new task, fully grasping a new concept or skill, it becomes part of an existing repertoire making it easier to learn new things that build on that foundation (Stockard et al., 2018). As noted by proponents of DI, it is much easier to learn a new concept than to unlearn a faulty conceptualization. Two critical elements of DI programs derive from this theoretical point. First, it is important to ensure that students have mastered key concepts before moving forward. Second, proper placement in a curricular program is essential to make sure students have the prior knowledge needed to learn new concepts or skills and that they will not be wasting time on material they have already mastered (Stockard et al., 2018). Another critical feature of DI consistent with the principles discussed above is its explicitness. Explicit instruction reduces

the cognitive demand placed upon struggling students by removing the guesswork associated with determining what content is important to their learning. Likewise, compared to other methods of instruction, DI is highly standardized. Specifically, DI provides teachers with the materials to provide explicit teacher-led instruction and provides input on how correction, assessment, and feedback should be managed to ensure consistency and fidelity in its implementation (Stockard et al., 2018). The developers of DI materials carefully select which outcomes a particular program focuses on, carefully crafting and field-testing examples and scripts to ensure their explicitness, logical sequencing of materials, and to include regular testing of mastery and systematic review of previously learned material (Huitt, 2009).

The Internet as a Health Resource

Traditionally, consumer health information has been primarily shared across oral and print communications in the form of expert advice, fliers and pamphlets, tabloids, newspapers, and academic journals. In today's digital age, however, most people now seek health information online (Jia et al., 2021). Recent reports suggest that household internet penetration tops 90% in North America and much of Europe (Internet World Stats, 2021). Paralleling the rise in global internet penetration has been the corresponding increase in health-related internet use, with some hailing the internet as a revolutionary tool to support the emergence of informed and empowered health consumers by enabling individuals to play a more active role in their health care and make better informed decisions, potentially improving health outcomes in the process (Hardley, 1999; Powell et al., 2011). The internet has become a critical source of health information for many people, in some cases supplementing or even replacing health professionals as a source of health information (Dolce, 2011; Phillips, 2020). As many as 80% of internet users in developed countries may rely on the internet to search for health information, typically concerning

conditions, symptoms, diseases, and treatments (Pew Research Center, 2006; Fox, 2011). Additionally, more than half of adults in the United States use the internet as their primary source of health information (National Cancer Institute, 2018).

Research investigating the question of why individuals may turn to the internet as a health resource has suggested four primary motivations for seeking online health information: (1) the desire for reassurance; (2) the desire for a second opinion; (3) the desire for greater understanding to supplement other information; and (4) to circumvent perceived external barriers to accessing information through traditional sources (Powell et al., 2011). Furthermore, numerous large-scale studies indicate that as much as one-half of all online health-related searches may be conducted on behalf of others (Fox & Duggan, 2013; Reifegerste et al., 2017). Research also suggests that parents commonly use the internet to search for information about their child's health-related symptoms and guide health-related decisions across a range of diverse circumstances (Kubb & Foran, 2020).

Compared to traditional sources of health information, there are many benefits to seeking health information online, including public education through widespread access, convenience and reducing barriers to accessing information and services, and avoiding stigma relating to real-world consultation for certain problems (Fox et al., 2000; Powell et al., 2011). Unfortunately, concerns have also been raised regarding how limited online health literacy (i.e., the competencies, skills, and strategies that inform a person's capacity to find, understand, and use health information; Huhta et al., 2018), may contribute to negative outcomes including low participation in screening programs and poor adherence to treatments (Diviani et al., 2016).

The Accuracy of Online Health Information

Web technologies have created an unprecedented opportunity for internet producers to easily publish vast amounts of information online at a low cost (Borah & Xiao, 2018). In the past, substantial costs of information production and dissemination on a massive scale limited sources of information primarily to those with the authority and capital to justify and sell an information product (Metzger, 2007). This generally limited the number of information providers to those who had a substantial investment in the media apparatus and were incentivized to uphold information accuracy and credibility standards (Metzger & Flanagin, 2013). During the digital age, however, nearly anyone can be an author and expertise and authority are no longer a prerequisite for information distribution due to an absence of editorial overview (Metzger, 2007), resulting in an increase in the amount of easily accessible health information. In contrast to most traditional publishing, web-based information may not be subject to professional gatekeepers. Furthermore, online information frequently lacks indicators of authorship and reputation. In addition, no universal standards exist to govern the posting of information online. As a result, information may be easily plagiarized, misrepresented, altered, or otherwise created under false pretenses (Metzger, 2007). Indeed, internet-based information differs from information delivered through more traditional channels in that it is prone to more digital alteration that is challenging to detect (Metzger et al., 2003).

Another concern in this area relates to how recognizing the credibility status of online information is not as easy as during interactions with health professionals (Percheski & Hargittai, 2011). As previously noted, traditional distribution mediums have typically featured a limited number of sources enforcing high barriers to access for the public dissemination of information. In this environment of information scarcity, credible sources of information were often easily

recognized by virtue of their observable and verifiable credentials rooted in specific qualifications and training, meaning that credible sources were often characterized by formal positions indicating training, education, or relevant experience (Metzger & Flanagin, 2013). Furthermore, many of the common means by which people traditionally have reduced uncertainty about information credibility, including judgements based upon reputation concerning the trustworthiness of a source and relying upon traditional information mediaries (i.e., experts, opinion leaders) to help guide credibility decisions have been removed, leaving individuals to evaluate extensive quantities of information on their own (Metzger & Flanagin, 2013). This removal of traditional safeguards represents a serious problem, as multiple studies have found that users are seldom diligent in verifying the accuracy and integrity of the information that they obtain online (See Flanagin & Metzger, 2000; Scholz-Crane, 1998). Similarly, research also shows that people rarely engage in effortful information evaluation tasks, instead opting to base decisions on factors like website design and navigability (Fogg et al., 2003).

The increase in the availability of health information on the internet has been closely followed by a rise in the number of studies analyzing the quality of that information (Reavley & Jorm, 2011). Even considering the many concerns scholars pose, users continue to frequently turn to online sources, including social media, for health information (Record et al., 2018). Unfortunately, not all consumers may be able to readily distinguish between reliable and unreliable information, let alone evidence-based and non-evidence-based practices. In a systematic review of studies examining the quality of health information on the Internet, Eysenbach et al. (2002) found that 70% of studies considered information accuracy to be a problem. Overall, evidence suggests that information accuracy varies across health domains

(Reavley & Jorm, 2011), and that the quality of medical sites is highly variable (Khazaal, Chatton et al., 2008). For example, Eysenbach et al. (2002) suggested that up to 90% of diet and nutrition information online is unreliable in contrast to only about 5% of cancer information.

In the area of mental health, a study assessing popular sites on depression reported that although the sites contained useful information, content quality was generally poor and frequently failed to provide accurate information on treatment (Griffiths & Christensen, 2000). In addition, the authors noted that sites did not typically reference scientific evidence in support of their conclusions (Griffiths & Christensen, 2000). Similarly, another study addressing the quality of web-based information on social phobia spanning 58 websites found the overall quality of sites poor (Khazaal, Fernandez et al., 2008). Consistent with other research, in a study with the primary goal of systematically assessing the quality, accountability, and readability of online information about the treatment of schizophrenia and attention deficit hyperactivity disorder (ADHD), Kisely et al. (2003) found that the quality of information was generally poor and that agreement between websites and systematic reviews was lacking for both diagnoses. Indeed, depending on the recommendation, agreement with EBP for schizophrenia ranged between 2% and 55%. Agreement for ADHD was not much better, ranging between 12% and 54%. Even in more recent reviews of studies of online information about depression, anxiety disorders, eating disorders, substance use disorders, and schizophrenia, most studies conclude information quality to be poor (Reavley & Jorm, 2011). In a review of 43 concussion-related websites investigating their transparency, justifiability, financial disclosure, advertising policy, privacy, attribution, complementarity, and authoritativeness, Ahmed et al. (2012) concluded that 70% of the sites had information quality issues. Fortunately, the quality of online mental information is not unequivocally poor. Contrasting other studies on mental health-related websites, Morel et al.

(2008) noted that the content quality of bipolar disorder-related websites may be considered acceptable, the 34 sites reviewed achieving an average DISCERN score of 19/28: higher than the minimum 14 required to indicate mostly correct information.

Overall, despite some bright spots, the previously noted studies are concerning and emphasize the potential dangers associated with trusting online health information (Heymann, 2020). Further, they exemplify the importance of fact-checking the accuracy of the online information and raise questions surrounding how well treatment recommendations for LDs align with evidence-based practices.

Assessing Information Credibility

In response to concerns over website information credibility, much research has been devoted to identifying and establishing health-related website quality criteria (Khazaal, Fernandez et al., 2008). Researchers have investigated various platforms, including blogs (Huovila & Saikkonen, 2015), online discussion groups (Wang et al., 2008), and mobile applications (Peng et al., 2016), suggesting that the skills required when determining the quality and credibility of online information are primarily the same as those employed when evaluating information found through other communication channels (Alexander & Tate, 1999). Based upon this understanding, five criteria have been identified that users should employ in their assessment of the credibility of internet-based information: (1) accuracy, (2) authority, (3) objectivity, (4) currency, and (5) coverage/scope (Metzger, 2007). In this context, *accuracy* refers to the degree to which a website is error-free, the information contained within can be verified offline, and the information's reliability. The *authority* of a website relates to the author's identity, credentials, qualifications, affiliations, whether contact information is provided and whether the site is recommended by a trusted source. *Objectivity* involves identifying the site's

purpose and whether the information provided represents fact or opinion. *Objectivity* further involves recognizing whether there is commercial intent or a conflict of interest on the part of the source, including the nature of the relationships between linked information sources. *Currency* is concerned with whether the information is up to date and *coverage* pertains to the comprehensiveness and depth of information contained within a site (Metzger, 2007). Furthermore, other factors that some have suggested should be considered as indicators of content quality include design, aesthetics, readability, the dating of information, ease of use and accessibility, and disclosure of authors and sponsors (Khazaal, Fernandez et al., 2008).

The Role of Social Media

Despite being considered a relatively new technology compared to traditional media, social media, which can be defined as online platforms that people use to share opinions and experiences, including photos, videos, music, ideas, and perceptions with one another (Lai & Turban, 2008), have become a part of daily life. Recent reports examining the extent and scope of social media use suggest that nearly 45 percent of the world's population, or 80% of all internet users, have an active social media presence (Phillips, 2020). Considering the overwhelming prevalence of social media in modern society, it is unsurprising that individuals are increasingly turning to social networking websites to locate health information and engage in disease self-management (Paige et al., 2015). For instance, over the past decade, a series of studies have emerged examining the use and applications of Facebook, Reddit, Twitter, Instagram, and Pinterest in a health context (AlQarni et al., 2016; King et al., 2013; Paige et al., 2015; Record et al., 2018), with research suggesting that several aspects of social networking sites, including social support, empowerment, peer pressure, and interaction/information-emotion

sharing have the potential to influence patient health behaviours and increase adherence and engagement with interventions (Valente, 2010; Wicks et al., 2010; Rozenblum et al., 2010).

Studies investigating the role that social media sites play as a health resource are multitudinous, addressing a variety of diseases and conditions ranging from chronic obstructive pulmonary disease (COPD; Paige et al., 2015), to gout (Derksen et al., 2017), to diabetes mellitus (AlQarni et al., 2016). A study by Neely and colleagues (2021) surveying 1003 US-based adults to understand how individuals use social media to learn and stay informed about the COVID-19 pandemic indicated that more than three-quarters of respondents reported using social media at least occasionally to find information concerning the COVID-19 pandemic, with over 50% indicating that they read information about COVID-19 on social media at least once a week. In a survey of 389 university-aged Reddit users from across the globe conducted to explore health information engagement on social media, Record and colleagues (2018) inquired about participants' frequency of Reddit use, the extent of health-related information seeking on Reddit, the perceived credibility of health information posted to Reddit, and the application of information found on Reddit to daily living. Their findings indicated that nearly a third of all respondents were enacting, exchanging, or otherwise evaluating health-related information found on Reddit, suggesting that users seeking information on Reddit are also likely to attempt to implement it.

Relating to and further fueling developments in the prevalence of social media-related behaviours, the meteoric proliferation in mobile and social media technologies that characterized the 2010s has further precipitated changes in how people seek health information. Research into consumer practices suggests that internet users are increasingly shifting to mobile. On mobile, consumers do not use traditional search engines (e.g., Google and Bing to access media) as often

to access media (e.g., blogs, chatrooms, personal websites). This is because they instead have apps that cater to their specific needs, including those for social media sites (Dutton et al., 2013; Zhao & Zhang, 2017). This shift toward consumers primarily relying upon social networks in their search for health information means that a wide variety of social platforms have expanded their capacity to provide information on interventions for health and mental health conditions, including LD (Heymann, 2020; Zhao & Zhang, 2017).

Unfortunately, little research currently exists regarding what this has meant for the quality and validity of health information on such sites, even though much of this health information is easily accessible. Thus, consulting online information puts a person at risk of adopting one or more of the non-EBP LD interventions suggested online. For reference, examples of non-EBP interventions proposed online for LD include craniosacral therapy, chelation therapy, music therapy, magnetic field therapy, additive-free diets, prism glasses, or coloured overlays and this by no means represents an exhaustive list. Certainly, health information has traditionally been a principal victim of the miscommunication, misrepresentation, and misappropriation that has characterized the 21st century discourse and which has recently given way to the "fake news" phenomenon (Phillips, 2020). Some individuals have even voiced concern regarding how misinformation surrounding LD interventions may pose a barrier blocking students from receiving interventions which may truly benefit them due to parents and teachers mistakenly adopting ineffectual or even deleterious practices while believing them to be evidence-based.

Pinterest

One social media site which has been of particular interest to researchers for its relevance to health-seeking behaviours is Pinterest, a visual social media platform that functions like an

online virtual bulletin board where users can post content from around the internet and share "pinned" content among other users (Hall et al., 2018). Pins represent the content featured on Pinterest and are important or relevant images from a host webpage. Notably, each pin features integrated data which users may follow back to the site of origin.

Among social media sites, Pinterest is unique because it uses a combination of visual communication tools (e.g., videos, interactive games, photographs, maps, graphs, and diagrams) to convey information and allow users to share information and ideas. Founded in March of 2010, Pinterest is free and publicly assessable to anyone upon the creation of a unique user profile (Paige et al., 2015). Currently, Pinterest boasts more referral traffic and greater time spent per visit than other social networking websites and is the 14th most popular social networking site on the planet featuring 478 million monthly active users and 1.22 billion total visits between October 2020 and March 2021 (Omnicore, 2022).

Some researchers have proposed that the rising popularity and widespread appeal of Pinterest may, in part, be due to its use as an internet search engine (Hall et al., 2018). On Pinterest, users may locate content either by searching the pinboards of others or by using the main search engine to search for keywords, yielding a series of images relevant to the search parameters. In a 2014 study examining large-scale survey data on Pinterest usage patterns among U.S. participants, results indicated that 39 percent of respondents reported preferring to use Pinterest over traditional search engines such as Google or Bing, indicating that Pinterest may be beginning to supplant traditional search engines for many of its users (Gilbreath, 2014). Notably, health information seekers may prefer Pinterest to other platforms based on how it presents information in a visual format. Research suggests that individuals with low-health literacy prefer searching for and receiving health-related information via image-based formats as it allows low-

literacy users to obtain search results while requiring fewer literacy skills and without processing excessive amounts of text (Mackert et al., 2009).

Given the potential for dynamic learning provided by Pinterest, the platform may offer a practical and cost-effective medium of education for individuals with low health literacy and concurrent mental health difficulties (Heyman, 2020). In fact, a recent survey of Pinterest users conducted by researchers at the Pew Research Center between 2013 and 2014 indicated that a significantly greater proportion of internet users from traditionally underserved and hard-to-reach populations reported using Pinterest compared to other social networking sites. Notably, this figure included rural residents and individuals with annual incomes less than $30,000 (Duggan et al., 2015). Pertinent to the study of LDs, research has also noted that other significant categories of Pinterest users are mothers, school psychologists, and teachers. According to a survey by Opfer et al. (2016) of the RAND corporation, over 87% and 62% of teachers at the elementary and secondary levels, respectively, use Pinterest for professional purposes. Furthermore, in an exploratory study of 117 teachers assessing how educators engage with Pinterest, teachers reported Pinterest among their top five websites used for professional development (Schroeder et al., 2019). Additionally, 80% of mothers who use the internet use Pinterest (Omnicore, 2022), and recent reports suggest that school psychologists also use Pinterest professionally to locate intervention resources (Hall et al., 2018).

Summary

Despite the rising prevalence of research investigating the role of social media sites within the context of medical diagnoses and treatment management, few have examined the availability and accuracy of information about neurological disorders such as LDs, and even fewer have done so in the context of visual-based social media platforms like Pinterest

(Heymann, 2020). This is perhaps because public health researchers may dismiss the platform as solely a medium for viewing images or accessing information on special interests. In reality, though, the use of visual-based platforms is rapidly expanding. Since mothers make up a significant category of Pinterest users and teachers frequently use Pinterest to gather resources for teaching and generating ideas on how to differentiate instruction for different learners, it follows that they are likely to look toward Pinterest for information surrounding LDs as well. Considering the often incomplete or inaccurate nature of online health-related information, there is an urgent demand for research investigating the availability and credibility of LD-related information on Pinterest. Additionally, owing to Pinterest's character as a pseudo search engine, there is likewise significant demand for research investigating these qualities within the sites embedded in pins, specifically regarding topics such as general information (e.g., signs/symptoms, diagnosis, terminology) and management (e.g., interventions, resources). Pinterest's policies and safeguards to ensure information accuracy do not extend beyond the confines of the platform, and no study (to our knowledge) has investigated these attributes for the web pages integrated within individual pins. Thus, it is critically important that researchers gain a better understanding of the information availability and accuracy of LD-related information contained within Pinterest-linked sites to further clinicians' understanding of how to provide the highest quality service to their clients and to offer guidance on health-information seeking behaviours outside of time spent with the clinician.

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CHAPTER TWO

An Evaluation of Evidence-Based Information on Interventions for Learning Disabilities in Reading Found within Pinterest-Linked Websites: A Multi-Site Content Analysis

Evidence-based practice (EBP) of psychological treatments involves the "conscientious, explicit, and judicious use of the best available research evidence to inform each stage of clinical decision-making and service delivery" (Dozois et al., 2014, p. 155). Consistent with ethical codes and professional standards, evidence-based practice requires clinicians to identify and select interventions and treatment strategies that aim to maximize benefit and minimize harm (CPA, 2012). Specifically, the goal of EBP in psychological treatments is to promote and implement psychotherapies that are safe, consistent, and cost-effective (Cook et al., 2017). Widespread implementation of EBPs in psychology is important because they can reduce the influence of subjective errors, use of obsolete information, and the application of unsubstantiated practices based on limited personal experiences (Mohammadi et al., 2018).

A critical component of EBP in psychological treatments centers around the discussion and recommendation of evidence-based treatment options with clients (Drisko & Grady, 2019) and clinical decisions associated with EBP are optimally made in collaboration with clients (Cook et al., 2017). As global internet penetration has increased, the internet has become a powerful source of health information (Merten, Roberts et al., 2020), supplementing or, in some cases, even replacing health professionals as a source of information (Dolce, 2011; Philips, 2020). As many as 80% of internet users in developed countries may rely on the internet to search for health information about conditions, symptoms, diseases, and treatments (Pew Research Center, 2006; Shuyler & Knight, 2003). Additionally, more than half of all adults in the United States use the internet as their primary source of health information (National Cancer

Institute, 2018), and many individuals with psychiatric diagnoses and their caregivers frequently access mental health information online (Reavley & Jorm, 2011).

Despite acknowledgements that online health information-seeking may have multiple benefits compared to conventional sources of health information, including public education through widespread access, convenience, reducing barriers to accessing information and services, and avoiding stigma related to real-world consultation for certain problems (Fox et al., 2000; Powell et al., 2011), concerns have been raised over how limited online health literacy (i.e., the competencies, skills, and strategies that inform a person's capacity to find, understand, and use health information; Huhta et al., 2018), may contribute to adverse outcomes and misinformed decision making (Diviani et al., 2015). It can be difficult for untrained individuals to accurately judge the veracity of information or the reliability of its source (e.g., King et al., 2021; Nichols, 2017). For instance, people are more likely to endorse information as credible when it is provided by a recognized source (Metzger & Flanagin, 2013) or endorsed by large numbers of testimonials, irrespective of their own assessment of information content and quality (Metzger et al., 2010). Such uncritical acceptance of online information is problematic in the context of locating online evidence-based mental health information, considering that much of the information online is not evidence-based (Griffiths & Christensen, 2000; King et al., 2021; Kisely et al., 2003).

One area of clinical practice featuring a significant body of literature guiding evidence-based approaches to treatment are learning disabilities (LD) in reading. LDs in reading are referred to by many names (e.g., dyslexia, specific learning disorder with impairment in reading, reading disability) and are the most common categorization of LD, with an estimated prevalence rate ranging between 5% and 20% of the school-aged population (Wagner et al., 2020).

Frequently associated with deficits in phonological awareness (i.e., awareness of the individual sound units in spoken words; Brady, 2020), LDs in reading are characterized by a range of problems related to reading accuracy, fluency, comprehension, and the mapping of sounds to print (Snowling et al., 2020). Children with LDs in reading lag behind their peers when learning to decode, often struggling to develop fluency and read novel words (Snowling et al., 2020).

Early educational experiences significantly affect the learning trajectory of children (Johnson, 2017), and considering that reading is a foundational skill for many academic subjects, youths with LDs in reading may perform poorly in school (Lyon, 1998). Students who do not develop strong early reading skills quickly begin to experience negative academic consequences, which grow progressively worse with time and may even impede access to the curriculum in other subjects (Ontario Human Rights Commission [OHRC], 2022). Thus, untreated LDs in reading are associated with more unfavourable learning outcomes in school and later in life (Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2018). Research suggests that youth with LDs in reading are less likely to complete high school or attend post-secondary education (Stoep et al., 2003). Further, difficulties learning to read can diminish students' confidence in their academic abilities and lead to significant mental health concerns (OHRC, 2022). Consistent findings across the literature indicate that difficulty learning to read is associated with significantly lower academic and total self-concepts, as well as higher rates of depression and anxiety, school avoidance, bullying and victimization, self-harm, and suicidal ideation (Johnson, 2017; Meyer, 2002; OHRC, 2022). Challenges persist beyond schooling and can also negatively influence employment, being associated with lower incomes, increased poverty and homelessness, increased substance use and higher rates of involvement in crime and subsequent incarceration (OHRC, 2022).

Considering the potential for untreated LDs to adversely affect multiple aspects of an individual's learning, self-concept, and behaviour, effective evidence-based treatment for LDs in reading are critical to ensure optimal outcomes for this group. Research investigating the effective instruction of students with learning challenges has consistently identified 10 principles that distinguish effective interventions for all learners: (1) instructional explicitness, (2) minimization of the learning challenge, (3) the use of proper and clear terminology, (4) speeded practice, (5) cumulative review, (6) the use of simple and direct language, (7) incorporation of self-regulation strategies, (8) comprehensive instructional approaches, (9) extended duration and time on task, and (10) progress monitoring (Fletcher et al., 2019).

Decades of research have identified direct systematic phonics interventions as the gold standard for improving literacy in young readers, both with and without LDs, with multiple meta-analytic reviews and randomized control trials indicating the effectiveness of this approach (e.g., Savage & Cloutier, 2017; Suggate, 2016). Furthermore, evidence suggests that improvements resulting from early phonics interventions persist for years, benefiting students throughout their academic careers. Systematic phonics approaches that instruct students in converting letters into sounds and then blending sounds into words have been consistently effective across studies at improving literacy for at-risk and average readers alike (Brady, 2020). Finally, despite reports of greater benefits in younger students (National Early Literacy Panel, 2008), research has been linked to statistically significant improvements for students of all ages (Connor et al., 2007).

Although phonics instruction programs vary somewhat in terms of their instructional methods, all typically involve teaching associations between phonemes and orthography, thereby differentiating them from pure phonemic awareness interventions, which specifically target

awareness of the sounds composing spoken words in that they directly incorporate letters and text into instruction (Suggate, 2016). Nonetheless, nearly all systematic phonics instruction involves explicit teaching of phonological awareness and grapheme-phoneme-correspondence (GPC; Yeung & Savage, 2019), and phonemic awareness training has consistently demonstrated benefits not only to a child's ability to spell but also to write (Brady, 2020). In fact, research has demonstrated a reciprocal benefit between phoneme awareness for learning to read and phonics skills augmenting phonemic awareness (Brady, 2020; Clayton et al., 2020). Moreover, recent research suggests the positive effects of explicit instruction in phonological awareness when coupled with education in letter knowledge (i.e., letter name and sound) among both first and second language learners (Li et al., 2018). In combination with phonics-based approaches, sight word instruction that involves teaching groups of high-frequency words has also been found to benefit students who struggle with reading (Hayes, 2016).

Despite the considerable literature on evidence-based interventions for LDs in reading, guidelines surrounding effective universal instructional practices, and numerous online EBP databases and depositories that provide school leaders, teachers, and parents with wide access to research and strategies pertaining to EBPs (Ecker, 2016), students with LDs in reading frequently receive suboptimal interventions in the classroom. For an example of how students frequently receive suboptimal interventions, one needs to search no further than Reading Recovery®. Despite no evidence demonstrating the effectiveness of Reading Recovery® at accelerating reading progress in students experiencing early literacy learning difficulties (Chapman et al., 2007), the program has been widely embraced in New Zealand, Canada, the United Kingdom, Australia, and most American states (Reading Recovery Community, 2021). Similarly, increasing evidence suggests that children with LDs in reading are being treated with

complementary alternative medicine (CAM) to supplement traditional approaches. For instance, Bull (2009) surveyed the parents of 148 school-aged children with LD in reading and noted that lifetime use of CAM was 55.4% in the sample. The therapies most frequently reported within the sample were nutritional supplements/special diets (63 children, 42.75%), homeopathy (29 children, 19.59%), and chiropractic/osteopathic manipulation (29 children, 19.59%). Examples of other alternative methods that have been offered to children with LDs in reading include biofeedback (Tansey, 1991), sensory integration therapy (Davis, 2002), music therapy (Aldridge et al., 2002), and the neural organization chiropractic technique (Ferrari & Wainright, 1984). These alternative treatments have either received scarce empirical support, have been found to be marginally effective, carry the potential to cause harm or are superseded by other more efficacious interventions.

Recently, the OHRC released the report on its public inquiry into issues facing students with LDs in reading in Ontario's public education system, finding that "despite decades of multi-disciplinary research on what is most effective for teaching students early reading skills…Ontario is systematically failing students with reading disabilities and many other students" (OHRC, 2022, p. 2). They noted that with few exceptions, "Ontario students are not being taught foundational word-reading skills using an explicit and systematic approach to teaching phonemic awareness, phonics, decoding and word reading fluency" (OHRC, 2022, p. 21). Concerningly, the report also suggested that teacher education and professional development in Ontario places little emphasis on how skilled reading develops in students or how to teach word reading using direct and systematic instruction in fundamental word reading skills. By extension, teachers also had difficulty identifying evidence-based reading interventions and were thus often unable to effectively respond to the needs of struggling readers (OHRC, 2022).

Specifically, the current Ontario Curriculum and teacher education emphasizes teaching word-solving skills using a three-cueing system. Under this system, students are encouraged to guess or predict words using cues or clues from context or their prior knowledge rather than by applying foundational word-reading skills (OHRC, 2022). Thus, although the internet has allowed access to EBPs to proliferate, researchers have acknowledged that this has not translated into increased identification and use of EBPs by special educators or improved student outcomes (Greenway et al., 2013; Jones, 2009; Test et al., 2015).

Considering the ubiquity of LDs in reading and their far-reaching consequences at both the individual and societal levels, it stands to reason that this would be an often-searched diagnosis among parents and teachers wishing to meet their children's treatment needs. Unfortunately, it is unclear the extent to which online information about treatment for LDs in reading is aligned with evidence-based practice. King et al. (2021) recently conducted a scoping review of 31 ADHD-themed websites identified using three popular internet search engines (i.e., Google, Bing, and Yahoo). They found that the quality of information about ADHD treatment was generally poor, with websites meeting less than half of the standardized criteria outlining evidence-based practice and few presenting information consistent with treatment guidelines proposed by the American Academy of Pediatrics (2019). These findings suggest that online information about ADHD may be inaccurate in its alignment with evidence-based practice and should be consumed with caution.

Although traditional search engines (e.g., Google and Bing) have long represented the primary web search tool (Lang, 2004), recent reports suggest that individuals have begun to rely less upon these tools in favour of social networking apps to search for health information (Zhao & Zhang, 2017). One social media platform which has been of particular interest to researchers

for its relevance to health-seeking behaviours is Pinterest (Paige et al., 2015). Pinterest functions somewhat like an online virtual bulletin board where users can post content from around the internet and share pinned content with other users (Hall et al., 2018). Pins represent the content featured on Pinterest and are important or relevant images from a host webpage containing integrated data users may follow back to the site of origin. On Pinterest, users may locate content either by searching the pinboards of others or using the main search engine to search for keywords, yielding images relevant to the search parameters (Paige et al., 2015). Pinterest also allows users to collect pins posted by others containing information on different topics and interests to create "boards" (Miller et al., 2019). Among social media sites, Pinterest is particularly unique for how it uses a combination of visual communication tools (e.g., videos, interactive games, photographs, maps, graphs, and diagrams) to convey information and allow its users to share information and ideas (Paige et al., 2015). Research examining typical Pinterest use patterns suggests that it may be beginning to replace traditional search engines for nearly 40% of its users (Gilbreath, 2014) and holds the potential to serve many underrepresented populations as its nature as a visual-based medium may allow low-literacy users to obtain search results while requiring fewer literacy skills (Mackert et al., 2009).

Recently, significant research has been devoted to exploring the scope and implications of health information on Pinterest as well as its potential as a medical resource. To date, numerous studies have been conducted examining information on Pinterest in the context of various conditions and illnesses, including breast and skin cancer, chronic obstructive pulmonary disorder, depression, chronic pain, and HPV, among others (see Guidry & Benotsch, 2019; Guidry, Jin et al., 2016; Guidry, Zhang et al., 2016; Guidry, O'Donnell et al., 2020; Miller et al., 2019; Paige et al., 2015; Wilner & Holton, 2020). Further, recent studies have also begun to

extend their scope to encompass how the portrayal of information on medical and health-related practices through Pinterest may influence public perceptions of vaccinations, the use of cannabis and CBD, and even specific approaches to weight loss and fitness (see Dedrick et al., 2020; Guidry, Zhang et al., 2015; Laestadius et al., 2019; Merten, Gordon et al., 2020). Although some of these studies have found the quality of health information available on Pinterest to be quite high (Dagar & Falcone, 2019; Heymann, 2020), others have reported significant misinformation propagated through the site (Wilner & Holton, 2020).

Regardless of the quality of health information available on Pinterest, research has noted that significant categories of Pinterest users include mothers, school psychologists, and teachers (Cleaver & Wood, 2018; Hall et al., 2018), a fact which suggests that among social media sites, Pinterest may be uniquely positioned to become a practical educational resource for educators and caregivers of students with LDs in reading (Heyman, 2020). Specifically, statistics indicate that 80% of all mothers who use the internet also use Pinterest (Omnicore, 2021). Moreover, according to a 2016 survey by Opfer and colleagues, over 87% of teachers at the elementary level and 62% at the secondary level use Pinterest for professional purposes, frequently to enhance their professional activities and supplement the needs of their students. School psychologists also commonly turn to Pinterest in a professional capacity to locate intervention resources (Hall et al., 2018). As previously noted, research suggests that many information consumers are ill-equipped to critically differentiate EBP from non-EBP interventions, parents and teachers being no exception (Sonnenberg, 1997). Individuals seek, find, and share health information online not only for themselves but for others, particularly friends; family; or in the case of teachers, their students (Song et al., 2016). Some reports suggest that as much as half of all online information seeking is conducted on behalf of another person (Fox & Duggan, 2013).

In this regard, parents and teachers are typically the primary decision-makers when selecting and implementing interventions for students with LDs, frequently using the internet as a source of information about a child's health-related symptoms and to guide health-related decisions (Kubb & Foran, 2021). Thus, the information these populations are exposed to online about LDs in reading may have immediate and highly tangible consequences for implementing various interventions and, by extension, a student's long-term outcomes.

Despite the wealth of online information about LDs in reading, there is surprisingly little research addressing the nature of this content or its alignment with evidence-based intervention. To our knowledge, no other research has specifically examined the alignment between evidence-based interventions for LDs in reading and treatment information found online, let alone what is available through popular social media sites such as Pinterest. Since Pinterest is quickly growing as a resource for those seeking health and psychology-related information, the purpose of this study is to conduct a content analysis of LD in reading-related sites linked through Pinterest to evaluate the quality of the intervention information available to searchers. Gaining an understanding of the availability and accuracy of intervention information about LDs in reading found on Pinterest-linked sites may assist clinicians to better understand the information their clients have access to and inform them in providing guidance around evidence-based interventions.

Current Study

This study examined: (1) the categories of websites linked by pins containing information relating to LDs in reading, (2) the extent to which information in linked sites aligns with evidence-based practices, (3) general presentational and accountability-related features of linked sites, (4) the readability of linked sites, and (5) whether linked sites include recommendations for

readers to follow-up with a certified health professional. Based on the results of similar research for other mental health conditions, it was predicted that there would be limited alignment between recommendations for intervention made within Pinterest-linked sites and evidence-based interventions for LDs in reading.

Method

Research Design

This study's methodology adopted a descriptive approach to exploring intervention information for LDs in reading that is available through Pinterest-linked websites and is based upon research conducted by Heymann (2020), Kisely et al. (2003), King et al. (2021), and Paige et al. (2015). Specifically, the pin selection and inclusion criteria used by Paige et al. (2015) and Heymann (2020) was modified to focus on LDs in reading. Additionally, the *pro forma* used by King et al. (2021) to evaluate the quality of online ADHD information was adapted to focus on LDs in reading.

Measures

Pro Forma

The *pro forma* used by King et al. (2021), is an adapted version *of pro forma* developed by Kisely et al. (2003) to systematically assess the four major elements of health-related information: (1) Accountability, (2) Presentation, (3) Content and Alignment with Evidence-Based Practice, and (4) Readability. The *pro forma* used in the present study is identical to that described by King et al. (2021), except for Section 3, which adapts the criteria to align with current knowledge on evidence-based interventions for LDs in reading. The *pro forma* is presented in Table 1.

Accountability. To examine whether the information provided in sites is credible, reasonable, and useful for informing intervention decisions (Silberg et al., 1997), the first section of the *pro forma* explored accountability using a 9-point scale that included features of authorship (i.e., whether the authors clearly identified their name, affiliations, and credentials), attribution (i.e., whether the authors provided sources and references), disclosure (i.e., mention of site ownership and sponsorship), and currency (i.e., whether a creation date was specified and whether the site had been modified within the previous month).

Presentation. Section two of the *pro forma* assessed aesthetic features on a 5-point scale. Features assessed in this section included the presence of headings and subheadings, diagrams and visuals, hyperlinks to external sites, and the absence of advertisements.

Content and Alignment with Evidence-based Practice. Section three scored information on a 17-point scale according to its alignment with evidence-based recommendations for interventions for LDs in reading. In consultation with an expert in reading, guidelines for intervention were created based upon a review of the current literature surrounding interventions for LDs in reading. One point was awarded for each guideline achieved.

Readability. The Flesch-Kincaid Grade Level score was used to assess each site's readability and rates text according to grade levels within the U.S. public school system. Sites featuring a grade level of eight or lower were awarded a point, as this is the recommended level for public documents. Such a grade level ranking suggests that texts should be easily understandable to individuals with commensurate levels of education (Queens University, n.d.).

Qualitative Information. Supplementing the quantitative data collection, field notes were recorded in a spreadsheet documenting the types of websites that are linked (e.g., blog, wiki, community formula, social networking, or news); the manner that LD in reading

information was presented (e.g., the presence of ad content, whether sites were geared toward a specific gender or parent); whether sites make mention of alternative treatments; and whether classroom accommodations are suggested. These field notes were included with the goal of qualifying the sort of information sources individuals are directed to while searching Pinterest; the features of websites that may help, hinder, or otherwise inform a reader's understanding of the information presented within each site; and to better understand the types of intervention recommendations presented within.

Procedure

Profile Creation

To minimize confounds relating to Pinterest's search and recommendation algorithms (See Mullery, 2021) and to standardize search results, data collection was performed on a designated laptop computer that was reformatted prior to beginning this study and all searches were conducted using a newly generated Pinterest user profile.

Pin and Site Selection

The selection of websites for analysis involved two steps: (1) the assessment and selection of pins and (2) gauging the suitability of embedded websites for inclusion in the final sample.

Although little data exist regarding typical Pinterest search patterns, research suggests that users on traditional search engines rarely proceed beyond the first 20 hits when seeking information (see Farkas et al., 2015). To emulate the search pattern of a typical information-seeker, the decision was made to limit analysis to the first 20 pins to meet the inclusion criteria (see below) after entering the key phrases into Pinterest's main search bar or until 100 pins were sampled.

Search terms were selected based upon combinations of terms often used interchangeably to refer to an identical pattern of reading difficulties (i.e., dyslexia, reading disability, and learning disability in reading) and phrases related to addressing challenges (i.e., intervention, treatment, and management). The goal when crafting search terms was for them to remain simple, thereby reflecting the most likely search strategy of a parent or teacher. Thus, no refinement was performed following the initial searches.

For each pin identified in the initial round of searches as meeting the inclusion criteria, the first 20 pins suggested by Pinterest's *"more like this"* feature were sampled using identical inclusion criteria. Any of these pins meeting the criteria were added to the final sample of pins. Websites included for the current study were selected based on the links embedded in the sampled pins.

Inclusion/Exclusion Criteria

As per Heymann (2020) and Paige et al. (2015), to meet basic inclusion criteria, pins were required to demonstrate four key characteristics. First, pins needed to contain functioning web links capable of directing to active websites. Second, each pin was required to present content on interventions, strategies, approaches, or techniques that the searcher or other individuals can or may have used to aid struggling readers in managing LD symptoms. As such, because the focus of this review was to explore the quality of evidence-based intervention information available online, emphasis was placed on selecting pins that centred on helping the searcher develop a knowledge of and capacity to provide direct support and develop interventions for struggling readers, rather than those outlining games, apps, resources, or tutoring services. Thus, pins that focused on general information relating to LDs in reading, identification/screening methods, apps/resources, or tutoring/therapy services were not included

unless they also contained an explicit reference to the types of content outlined above. Third, pins were required to contain at least one of the following keywords or phrases: “learning disability,” “learning disability in reading,” “reading disability,” “specific disability in reading,” “dyslexia,” “developmental dyslexia,” “specific reading disorder,” “developmental learning disorder with impairment in reading,” “specific learning disorder affecting reading,” “struggling reader(s),” or “reading difficulties.” Lastly, pins were not included if the text on a pin’s image or user-generated caption was not written in English or when text was absent entirely. Each pin included in the final sample was screenshot and assigned a unique number identifier for coding purposes.

All web pages linked by the pins in the final sample were included in the analysis unless they were duplicates, paywalled/locked behind a subscription, written in a language other than English or if they did not contain one or more of the keywords detailed above. All searches to locate and identify pins for the sample were conducted between March 10th and March 13th, 2022, with the assessment of websites for informational and content-related features occurring throughout April 2022. Examination of select sites by the second coder was completed between July 4th and July 20, 2022.

Site Evaluation

To evaluate the intervention-related information available to parents and teachers through internet searches, included sites were quantitatively coded by the principal researcher using the modified *pro forma* described above (see Table 1). Following quantitative coding, websites were reviewed a second time to collect qualitative observations and record notes surrounding presentational and functional features pertinent to how searchers may use or interpret the information within.

Results

Analytical Approach

The current study applied both quantitative and qualitative approaches to analysis. Quantitative analysis of the final sample used frequency statistics to examine the extent to which the sites fulfilled the individual *pro forma* criteria. Frequency statistics were also applied to explore how well the sites performed collectively across each domain (i.e., accountability, presentation, content and alignment with evidence-based practice, and Readability). Qualitative analysis of the sample involved the exploration of themes and patterns across sites in a manner consistent with the qualitative descriptive approach outlined by Sandelowski (2000), using both descriptive statistics and qualitative descriptors to describe and analyze the data.

Descriptive Statistics

Nine-hundred search results were sampled using a non-probability quota sampling procedure. These pins consisted of the first 100 pins presented for each combination of search terms: (1) dyslexia intervention, (2) dyslexia treatment, (3) dyslexia management, (4) reading disability intervention, (5) reading disability treatment, (6) reading disability management, (7) learning disability in reading intervention, (8) learning disability in reading treatment, and (9) learning disability in reading management. Each of these pins was reviewed for inclusion in the final sample. As demonstrated in Figure 1, 871 were removed for not meeting the inclusion criteria. Of these, 489 were excluded because they did not contain a keyword, 226 were removed for not containing reference to interventions for LDs, 62 for not concerning LDs in reading, and 94 were excluded due to being duplicates or containing non-functional links.

Of the 29 pins that remained, the first 20 pins suggested by Pinterest's "More Like This" feature were reviewed, yielding an additional 18 pins that were non-duplicates and fulfilled all

inclusion criteria. The sites linked by each pin were reviewed to collect the final sample of sites. One site was excluded due to a non-functioning link and another due to being blocked behind a paywall ($N = 45$). Of the 45 websites included in the sample, four contained functionally no information on LDs in reading due to being e-commerce pages devoted to selling LD-related products (e.g., textbooks, worksheets, or instructional courses). These pages were noted as sites that individuals searching Pinterest may be linked to and considered for qualitative review but were not included in the quantitative analysis.

Website Descriptions

Examination of the websites indicated that most were maintained by a single or small group of authors. Of the 45 websites examined as part of this study, nearly all represented personal educational websites or blogs, with those that were not representing e-commerce pages. Overall, 78% of the sites contained advertisements. Although some websites provided advertisements for their own products (e.g., educational resources, programs, manuals), it was more common for them to present advertisements for commercial goods and services. Despite ad content being somewhat variable between sites, recurring examples included advertisements from insurance companies, banks, travel agencies and airlines, automobiles, computer software, phone plans, and large corporate retailers (e.g., Walmart). Often, these advertisements took the form of sidebar ads or were located along the bottom of the page. On other occasions, ads were interspersed between sections of text. Notably, the ads were often distracting and detracted from the overall experience of navigating the site and consuming its content. As ads popped in and changed, some web pages scrolled up and down, requiring the reader to once again find their place to resume reading. Upon entering the page, many sites also

featured pop-ups recommending readers sign up for newsletters or other email subscription services.

The sites were not perceived to be geared toward one gender over the other with respect to visual representations, colour themes, or verbal references. Nonetheless, some website titles featured references to motherhood, which may be perceived as being written for a primarily female audience. The websites were mostly well laid out, featuring simple but visually appealing designs. Many websites featured tabs organizing their numerous internal hyperlinks to improve the ease of navigation around the site and it was common for sites to include blog pages, comment sections, and built-in store pages. Sites also frequently included social media integration for searchers to access the website's associated social media accounts (e.g., Facebook, Instagram, Pinterest).

Pro Forma Scores

Scale descriptive statistics and the percentage of time that each scale item was present are detailed in Table 2. The maximum *pro forma* score was 33, with higher scores indicating better quality and alignment with evidence-based practices. Within the sample, the total scores for the included websites ranged from 0 to 17, with an average of 8.92 (*SD* = 3.58; see Table 1). As shown in Table 2, of all the multi-item subscales (i.e., *Accountability*, *Presentation*, *Content and Alignment to Evidence-Based Practices*), the lowest total score was on the alignment to EBP subscale. The interrater reliability for the data presented was moderate (Kappa = 0.612, $p < 0.001$) and the agreement across all items for 20 websites from two independent raters was 84.5%.

Accountability. The mean score on the accountability subscale, which assessed for features such as authorship, attribution, disclosure, and currency was 3.66 (*SD* = 1.53) out of a

possible 9 points. Nearly all sites (93.5%) disclosed site ownership and most clearly credited the author or contributors (82.9%). Over half of all sites shared the author's credentials (53.7%), but indication of the authors' institutional affiliations was much more infrequent (14.6%). Further, although nearly one-third of the sites specified the date they were created or last modified (36.6%), few sites had been modified or updated in the previous month (7.3%). Similarly, few sites indicated information sources (12.2%) or provided references (9.8%). Sponsorship or financial affiliation with a commercial brand or company was often disclosed regularly (65.9%).

Presentation. The mean score on the presentation subscale was 2.78 (*SD* = 0.91) out of a possible 5 points. Although most sites included headings to guide the reader through the site (95.1%), few used diagrams to help explain concepts or communicate information (9.8%). In most cases, hyperlinks directing readers to external sites were present (80.5%), although not all hyperlinks were functional (68.3%). It was also common for sites to contain hyperlinks within text linking to other pages on the same site. Overall, 78% of all the pages reviewed contained some form of advertisement.

Content and Alignment with Evidence-Based Practice. The mean score on the alignment with evidence-based practice subscale was 1.68 (*SD* = 2.56) out of a possible 17 points, making it the lowest score of all the subscales despite containing the most items. Overall, the element of evidence-based practice mentioned most frequently was the need for explicit instruction, although fewer than one in four sites discussed the topic (24.4%). It was similarly uncommon for sites to emphasize intensive or systematic approaches to instruction (19.5% and 12.2%, respectively) or recommend using scaffolding approaches to support learning (9.8%). Further, few mentioned instructing students in elements of core phonics skills, including letter-sound correspondence (14.6%), segmenting words into phonemes (12.2%) or blending phonemes to

form words (14.6%), and sites rarely mentioned applying phonic analysis to decode unfamiliar words (4.9%). It was also uncommon for the sites to discuss teaching students to use higher-level word recognition and metacognitive strategies to support reading development. Specifically, only two pages (4.9%) mentioned teaching students to find familiar parts in unknown words to assist in decoding or attempting variable vowel sounds to help students identify morphologically appropriate words. Similarly, two sites mentioned using decoding through analogy (4.9%) and only one (2.4%) mentioned assessment for and management of comorbid conditions that may complicate a student's learning (e.g., ADHD).

Readability. Flesch-Kincaid scores ranged from 5.0 to 14.1, with a mean score of 7.62 (*SD* = 1.89). Overall, most sites scored close to the recommended grade 8 reading level to ensure accessibility to most audiences. Specifically, 66% of sites were written at a reading level of grade 8 or below and all but one fell below a grade 12 reading level.

Recommendation for Follow-up. Few sites (14.6%) recommended for follow-up with a professional for more information about interventions for LDs in reading or managing LD symptoms. Of those sites that did recommend follow-up, the target and method of follow-up were inconsistent. Although some sites recommended follow-up with psychologists or other educational specialists, most recommendations related to follow-up to address potential auditory or visual issues (i.e., audiologist or behavioural optometrist). Two sites recommended follow-up with a pediatrician.

Discussion

The purpose of this study was to conduct a scoping review of online information regarding interventions for LDs in reading to evaluate the quality of this information and its alignment with evidence-based practice. Using a standardized pro forma modified from earlier

studies (Kisely et al., 2003; King et al., 2021), this study evaluated 41 websites across four dimensions: (1) Accountability, (2) Presentation, (3) Content and Alignment with Evidence-Based Practice, and (4) Readability. Sites were also reviewed to note qualitative features that may influence the reader's information searching experience.

In general, the websites sampled were clearly laid out, easy to navigate, and visually appealing. Additionally, many of the pages attributed their authors; disclosed site ownership; and contained functioning hyperlinks to external sites. Unfortunately, this was often to e-commerce pages (e.g., Teachers Pay Teachers or Amazon) rather than sources readers to seek additional information. Sites generally did not provide sources or author credentials, either. It was found that most sites presented little information about evidence-based interventions for LDs in reading but that what information was presented was usually written at a reading level suitable for most readers. The quality of intervention information was concerning, with sites on average meeting few of the criteria on the *pro forma*. In fact, some sites contained no recommendations aligned with evidence-based interventions for LDs in reading. This is consistent with other similar studies that have reported that the presence of online health information for conditions such as ADHD, Schizophrenia, and tobacco addictions is generally poor (King et al., 2021; Kisely et al., 2003; Diniz-Freitas et al., 2017). Finally, it was noted that sites frequently contained advertisements or sponsorships selling products or services.

Regarding accountability, the results of the present study indicated that most sites disclosed authorship but that many authors neglected to provide a formal account of their credentials. Further, when describing their experience, several authors did not appear to have formal training or education related to teaching children with LDs in reading and were unaffiliated with any training institution or supervisory body. Rather, many were mothers whose

only notable experience was homeschooling their own children. This finding is consistent with other research exploring mental health information on Pinterest which noted little of the available information coming from professional or public health sources (Guidry, Zhang et al., 2016; Guidry, O'Donnell et al., 2020a; Guidry, Vraga et al., 2020; Miller et al., 2019). The lack of disclosure of formal training or experience is problematic because author credentials are an important metric by which searchers may gauge the credibility and expertise of a source and thereby feel assured of the quality of the information provided (Phillips, 2020).

In most instances, the lack of author credentials was further complicated by the small number of pages that listed sources or provided hyperlinks directing readers to their references. If an author is not an expert, it is important to know when they are incorporating the works, publications, and information from professional sources (Phillips, 2020). This finding was not altogether unsurprising considering previous research, which has also found a lack of citations to be a significant shortcoming of online information sources (Patha et al., 2017). In this context, the absence of sources may suggest that the authors are simply speaking from anecdotal experience concerning what they have noted to be effective interventions for LDs in reading, as often appeared to be the case. Similarly, consistent with other studies into health-related information online, when sites did contain hyperlinks to external sites, they primarily linked to commercial websites or other social media platforms (Guidry et al., 2016). This indicates an absence of scientific and empirical backing behind their recommendations. Further, the lack of listed sources also means that when the authors do provide empirically supported recommendations, searchers cannot follow the trail of information back to a peer-reviewed source.

Evaluation of the websites indicated that approximately four in five websites sampled contained advertisements for services or products. Often the ads were intrusive and interfered with the viewing experience, overlaying text, popping in and out, or flashing. Further, it was common for sites to contain internal product placements that promoted the use of goods or services that the author has for sale directly (e.g., phonemic awareness daily task cards) or for which they receive a share of the profits through affiliate links. Evaluation of the included websites also revealed that most featured internal shops, products available for purchase, or links to external pages (e.g., Teachers Pay Teachers, Amazon) selling products. Further, most of the sites contained product placement, affiliate links, or some sort of financial incentive to promote certain products or treatments. Certain linked sites were even solely devoted to selling training programs for parents of children with LDs in reading. It was also common for sites to have pop-up advertisements or subscriptions for newsletters/mailing lists immediately upon entering a site. As noted by King et al. (2022), the presence of advertisements or endorsements in web pages framed as providing intervention information may lend credibility to these treatments and encourage caregivers to adopt practices they otherwise may not. Thus, psychologists should caution their clients to consider how their perceptions and practices may be influenced by the information they read online.

In contrast to previous studies, which have noted shortcomings surrounding sites' disclosure of sponsorships, many sites in the current study were transparent in indicating sponsorships and affiliations. Indeed, most sites identified affiliate links or other sponsorships. This finding is even more surprising because research has often found that consumers perceive sponsorship of endorsed information as less helpful and overall hurts consumers' attitudes and purchasing intentions (Kim et al., 2019; Wang et al., 2022), meaning that authors may be taking

a financial risk in disclosing sponsorship. Together, these findings indicate that readers should be mindful of sources and where information originates from when searching for information about interventions for LDs in reading through Pinterest-linked sites. Additionally, they are advised to consider the role that website sponsorships and other product placement may play in influencing the information and recommendations so that they can make informed decisions regarding what they read and how it may relate to relevant interventions.

Perhaps the most concerning finding was surrounding the content of the sites and its alignment with evidence-based practice, the subscale that produced the lowest mean score on the *pro forma*. Consistent with findings from similar studies assessing the quality of intervention information found online for other mental health conditions (see Kisely et al., 2003 & King et al., 2021), the alignment with evidence-based practice was poor. Overall, few sites presented evidence-based intervention strategies for LDs in reading, and when they did the explanations were often superficial or provided little guidance for how readers should conduct such interventions. On average, the sites met less than 10% of the criteria on the *pro forma*. Instead of presenting well-established interventions for LDs in reading, they contained anecdotal accounts of the author's experiences teaching children with LDs in reading.

The lack of alignment with evidence-based practices and abundance of anecdotal information is concerning, as parents and caregivers of students with LDs in reading may possess limited health literacy in the field of LDs, potentially rendering them particularly susceptible to LD-related misinformation online (Scherer et al., 2021). Research suggests that approximately a quarter of all adults in the United States have low levels of health literacy (Levy & Janke, 2016). Further, research suggests that Pinterest as a medium may appeal to people with lower levels of information literacy (Mackert et al., 2009), meaning that such individuals may be more likely to

search for information through Pinterest and, by extension, encounter the sites reviewed in this study.

Although multiple sites noted that phonics instruction is important for supporting struggling readers, most provided little detail regarding what this meant or how a caregiver may follow such advice. Instead, sites tended to focus more on promoting the use of multisensory methods of instruction, reading games, assistive technology, or formalized reading programs (e.g., Orton-Gillingham, All About Reading, Logic of English), among other strategies as methods of supporting struggling readers (e.g., listening to audiobooks). Although it is acknowledged that such approaches are important tools and strategies for supporting struggling readers and that reading programs such as the Orton-Gillingham approach are evidence-based, it is critical to note that the sites make recommendations about what to do (e.g., teach phonics) without guiding educators and/or caregivers in how to translate knowledge into evidence-based practices. This is significant because research suggests that the passive dissemination of information is generally an ineffective way of altering behaviour and that translating evidence into effective practice and intervention is highly challenging, even for medical professionals (Armstrong & Kendall, 2010).

Beyond a general failure to provide evidence-based recommendations or to specify how caregivers can translate recommendations into effective interventions, some sites even provided information that either lacks empirical support altogether or which has been disputed by the available literature. For example, some sites recommended using dyslexic fonts and coloured overlays (see Henderson et al., 2013; Kuster et al., 2017). When comparing a special font designed to facilitate reading in children and adults with dyslexia to standard fonts, several studies have noted no improvements to single word reading speed or accuracy and report

inconsistent findings concerning text reading (Marinus et al., 2016). Notably, when controlling for within- and between-word spacing, these fonts demonstrated no benefits to dyslexic readers over standard fonts (Marinus et al., 2016). Thus, what benefits special dyslexia fonts may have are most likely due to their spacing settings rather than their specially designed letter shapes. Likewise, a systematic review of the effects of coloured overlays and lenses on reading by Griffiths et al. (2016) suggested minimal benefits. Specifically, the authors noted that of the 51 studies reviewed, although most reported improvements, the effect size was generally small and similar improvements were noted in placebo conditions. Further, most studies were subject to high risk of bias in one or more areas of their design, with studies at lower risk of bias reporting less support for the benefit of overlays on reading ability (Griffiths et al., 2016).

In addition to special fonts and coloured overlays, one site mentioned that a gluten-free diet might benefit students' decoding abilities. Presently, however, there is no research in favour of dietary interventions in the treatment of LDs, excluding such approaches from being considered evidence-based. Similarly, some sites also endorsed techniques such as localized brain stimulation or brain integration therapy as treatments for LDs in reading despite research into such brain-based treatments remaining in their early stages. Only a few studies have used neurostimulation to influence the reading network in children and adolescents with reading difficulties (Turker & Hartwigsen, 2021). Specifically, although a recent systematic review of 15 studies using non-invasive brain stimulation (NIBS) techniques suggested potential improvements in pseudoword reading fluency and accuracy, few longitudinal studies have investigated the long-term outcomes of NBIS approaches to treatment. Furthermore, the authors noted that NBIS approaches were most effective when paired with behavioural training (Turker & Hartwigsen, 2021), making it difficult to isolate the therapeutic element contributing the

greatest benefit. When paired with the limited applications of NBIS approaches outside of research settings, this means that although brain-stimulation methods show promise for treating LDs in reading, it is premature to consider them a well-established evidence-based intervention approach. Overall, compared to the enormous body of scientific research endorsing explicit, systematic instruction in phonemic awareness and phonics as the most effective approach to teaching students, each of the approaches above lacks sufficient support to be considered evidence-based. It was also concerning to note that some sites endorsed neuromyths such as teaching students according to their preferred learning styles, a misconception that persists despite significant evidence showing no improvements to learning despite information is presented in people's preferred format (Westby, 2019). Some sites even displayed a misunderstanding of LDs in general, suggesting that they may sometimes be attributed primarily to attentional issues or auditory/visual impairments and that they are reversible conditions.

Overall, the poor alignment of intervention information with evidence-based practice is unfortunate, given that the Internet has become a key source of health and mental health information for parents (Kubb, 2020). Currently, the only evidence-based intervention for LDs in reading involves explicit, systematic instruction in phonemic awareness and phonics (including spelling and decoding) that is sufficiently intense to build word-reading accuracy and speed (Jeffes, 2016; OHRC, 2022). Although it can be helpful for educators and/or caregivers to access the around-the-clock health information these sources provide, this can be problematic if they do not seek additional guidance after searching for interventions online (Heymann, 2020). Non-clinical influences on decision-making may be the most important and underrecognized obstacle to implementing evidence-based practices (Hajjaj et al., 2010). Considering the general absence of evidence-based intervention information on most of the sites included in this review, it is

important for clinicians working in the area of LDs be aware of the non-clinical influences on their clients' decision-making so that they are prepared to help them distinguish between scientifically valid and invalid intervention information when browsing Pinterest-linked sites. Doing so is important so clients can avoid the financial and opportunity costs of adopting ineffective practices.

In contrast to other studies, which have identified readability as a shortcoming of many of their sampled sites, this study found that the readability for most sites was generally consistent with guidelines suggesting a recommended reading level of grade 6-8 (see Government of Canada, 2019, July). The easy-to-understand nature of many of the sites may have to do with most either being blog or informational websites with commercial elements, a finding that mirrors research by Dedrick et al. (2020) exploring weight loss recommendations on Pinterest, which noted that nearly half of all pins in their sample linked to personal blogs. Concerning communicative competence, blogs and similar sites require their authors to consider factors such as age, social class, educational level, and culture when publishing so that they may appeal to the broadest audience possible (Zafari, 2019). Indeed, recent research has even been devoted to studying the effectiveness of using blogs as tools for second-language learning partly for this reason (Fattah, 2016; Yakut & Aydin, 2017). Further, as noted above, the authors of many of the pages are homeschooling parents or individuals who do not appear to have formal education in intervention for LD in reading. As such, it may be that these individuals do not have experience using technical language or are not familiar with LD-related jargon, and thereby write in a simple and easy to understand fashion by default when discussing these topics.

Finally, it was concerning, although unsurprising, that few of the sites recommended that readers consult or follow up with a clinician when seeking interventions for students with LDs in

reading. As many of the sites reviewed were written and published by non-experts in the field of LDs, it is advisable for information seekers to consult with an expert before acting upon any intervention recommendations found in Pinterest-linked sites to ensure that they are consistent with evidence-based practices.

Limitations

This study has a few notable limitations. First, the Pinterest search algorithm is one of the largest problems around exploring intervention information for LDs in reading within Pinterest-linked sites. How the algorithm populates pins is influenced by an individual's search history, the popularity of the individual(s) posting the pins, and the relevancy of the pin to the search criteria (Harpel & Vollmer, 2017). Thus, although all searches for this study were performed using a newly generated Pinterest account, other users' search results are likely to be affected by factors that are difficult to account for in research. Secondly, as noted by Harper and Vollmer (2017), the Pinterest algorithm does not hide repeated pins linking back to identical sources, thus complicating data collection, and somewhat limiting the data available for analysis due to the presence of duplicate sites. Third, because the results populated by Pinterest searches are influenced by the information contained within a pin's caption, several searches yielded pins that appeared multiple times, further limiting the data available for analysis. Fourth, this study cannot account for changes and updates that will eventually be made to how Pinterest returns search results or updates to information curation online as a whole. Thus, this study and its findings represent merely a snapshot of the current information landscape surrounding intervention information for LDs in reading within Pinterest-linked sites. Consequently, due to the ever-changing nature of online media, caution should be taken when interpreting the information in the future.

Another limitation of this study is the imperfect agreement between raters. Although there was noteworthy accordance between raters overall, interpretation of Kappa according to the standards suggested by Landis and Koch (1977) indicates only a moderate level of agreement. The imperfect alignment between raters means that there is still room for potential error and means that caution is warranted when interpreting the data. Consequently, efforts toward increasing consistency would contribute to greater confidence in this study's results. Throughout this study, minimal time was devoted to training the second coder in the use of the *pro forma* to evaluate websites. Thus, a factor which may have contributed to some of the inconsistencies between raters is inexperience on the part of the raters in judging sites according to the *pro forma* criteria. If this study were be repeated, providing the second coder with additional training in using the *pro forma* to evaluate websites and ensure consistency across raters may be beneficial for improving overall confidence in the findings. Further, rewording some of the items, particularly in the Content and Alignment with Evidence-Based Practice section may lead to improved consistency across raters by more clearly indicating the types of statements that count toward meeting each criterion. In its current form, a degree of ambiguity remains concerning the amount of detail required in websites for them to count as adequately addressing any given topic.

Finally, relatively little research has been conducted concerning Pinterest user search patterns or the features that attract them toward certain pins. As such, this study instead relied upon a set of standardized criteria for choosing which pins and websites to include in the final sample. Likely, some of the sites included in the sample do not match those that would be visited by typical Pinterest users and some users may be linked to sites that have not been included. Thus, the data may not represent the extent of information LD in reading-related intervention information online and may instead reflect biases in the researcher's search strategy. Future

studies may benefit from sampling methods that consider user input when conducting searches to help researchers replicate typical user search patterns with more fidelity. To accomplish this, researchers could sample parents and teachers to interview them about the features they look for in health-related pins to inform which pins, and by extension sites, are viewed as particularly salient or consistent with user search patterns.

Future Research

The analysis in this study was limited to LDs in reading to limit the scope of this research project. Nonetheless, the methodology of this study lends itself well to the examination of other common categories of LD as well, namely those affecting writing and math. Further, this study may easily be replicated for other diagnosable neurodevelopmental conditions, including ADHD and ASD. This study also did not explore how certain features, including the presence or absence of certain accountability and presentational features (e.g., advertisements, disclosure of sponsorship) within sites influence users' perceptions of information credibility. Searchers are more likely to act upon information that they perceive as credible and accurate (Harris et al., 2011). Future research could explore this relationship in more detail to assess how likely users are to implement the recommendations they are exposed to on Pinterest-linked sites. Finally, this study found that most sites presented little information surrounding evidence-based interventions for LDs in reading as measured by a standardized *pro forma*; however, it did not feature an in-depth analysis of what information was presented regarding LDs in reading within each site. Future studies should explore in greater detail the information provided by these sites concerning both general information surrounding LDs in reading and the recommendations for intervention they provide to inform clinicians of the sorts of information their clients may be exposed to.

Implications for School Psychology Practice

The results of this study have implications for school psychologists and other clinicians working with children and families affected by LDs in reading. As more and more people turn to image-based social media platforms such as Pinterest as a source for mental health information (Fung et al., 2020), psychologists must be aware of the poor quality of intervention information for LDs in reading found through Pinterest-linked sites. Awareness of the quality of information available to parents and educators is important to help school psychologists be mindful of the sorts of interventions being implemented in the home and school settings. It is also important knowledge when working collaboratively with parents and teachers for treatment planning and when recommending resources to clients. Effective collaboration requires that clinicians be knowledgeable of their clients' experiences and pre-existing knowledge surrounding effective interventions for LDs in reading so that they may provide supplemental information. As noted by Heymann (2020), by being mindful that clients are likely to do their own information-searching at home and keeping informed on the quality of information that their clients are likely to be exposed to, psychologists are in a better position to minimize many of the dangers that surround clients independently researching health information online. In accordance with this, the more knowledgeable psychologists are concerning the quality of information available to individuals online, the better they can consult with parents and educators to efficiently direct them toward higher-quality sources. Further, as it seems that few Pinterest-linked sites contain evidence-based information, it is all the more important that psychologists be aware of those that are so they can incorporate them into their repertoire of professional resources.

Beyond solely considering the factual accuracy of information online, it is equally vital that psychologists be aware of the sources of said information. As most sites featured authors

with no formal credentials and who failed to reference sources for their information, this suggests that it will be critical for psychologists working with parents and educators to ensure they possess the information literacy skills necessary to critically evaluate the information they find online. By being more aware of the accountability features of Pinterest-linked sites surrounding LDs in reading, school psychologists can position themselves to more effectively teach important information literacy skills to their clients when it comes to authorship, information sources, and source accountability, as well as to point clients to good sources of information they can access to further their research.

Although the focus of this study was to explore the quality of intervention information rather than sponsorship or advertising practices, clinicians must be aware of the strong financial incentive many sites have to endorse certain products or programs. Several of the sites reviewed contained direct or indirect monetary benefits for their publishers in the form of item sponsorships, affiliate links, or the distribution of goods and services. Sponsored recommendation posts typically present products in a more positive light because authors are motivated by the compensation they receive. Despite this, some research suggests that consumers do not feel bloggers or content creators alter their recommendations based upon sponsorships or other financial bases (Lu et al., 2014). As such, information seekers may be likely to take authors at their word and be less critical of the recommendations they read online, incurring direct financial and opportunity costs when the recommendations do not align with evidence-based practices. Further, research suggests that brand experience and familiarity have a direct positive relationship with brand trust and loyalty. This suggests that consumers may be more likely to trust recommendations when they come from a familiar source (Akoglu & Özbek, 2021). As many of the pages linked in this study frame themselves as familiar businesses and many of the

sites were linked multiple times, it follows that individuals may be especially likely to perceive these sources as more trustworthy and be more likely to follow these recommendations to their potential detriment. Awareness of advertising practices and potential financial associations in Pinterest-linked sites is important for school psychologists so they can clearly communicate to clients how such factors may influence the types of recommendations sites provide and the information they endorse. Overall, it is recommended that clinicians speak openly with their caregivers about how sponsorship may influence the information they read online so that they can make more informed treatment decisions that will optimally benefit children with LDs in reading.

Conclusion

Consistent with other similar studies investigating the quality of online information about common neurodevelopmental diagnoses, the present study found that the quality of intervention information on Pinterest-linked sites is low and poorly aligned with current evidence-based interventions. Despite the meteoric rise of the internet and social media platforms such as Pinterest as media for accessing mental health information, there remains considerable room for improvements that will benefit information seekers. This is the first study (to our knowledge) that has explored the quality of information about LDs in reading contained within Pinterest-linked sites. Boasting millions of daily users, many of whom seek health information through the site, clinicians need to be knowledgeable of the quality of information available to searchers through Pinterest. Overall, sites would benefit from increased use of graphics and visuals to communicate information. Further, increased transparency surrounding author credentials and improved listing and referencing of information sources would improve accountability, especially in the face of financial incentives surrounding the recommendation of products and

services. In the era of online misinformation, it is essential that treating clinicians be diligent in ensuring that their clients are well informed of evidence-based interventions. The results of this study could be used to enhance healthcare providers' knowledge and understanding of the quality of information available through Pinterest so they can be better prepared to meet their clients' needs and ensure optimal outcomes for students affected by LDs in reading.

Figure 1

Search Strategy for Pins Included in the Final Sample

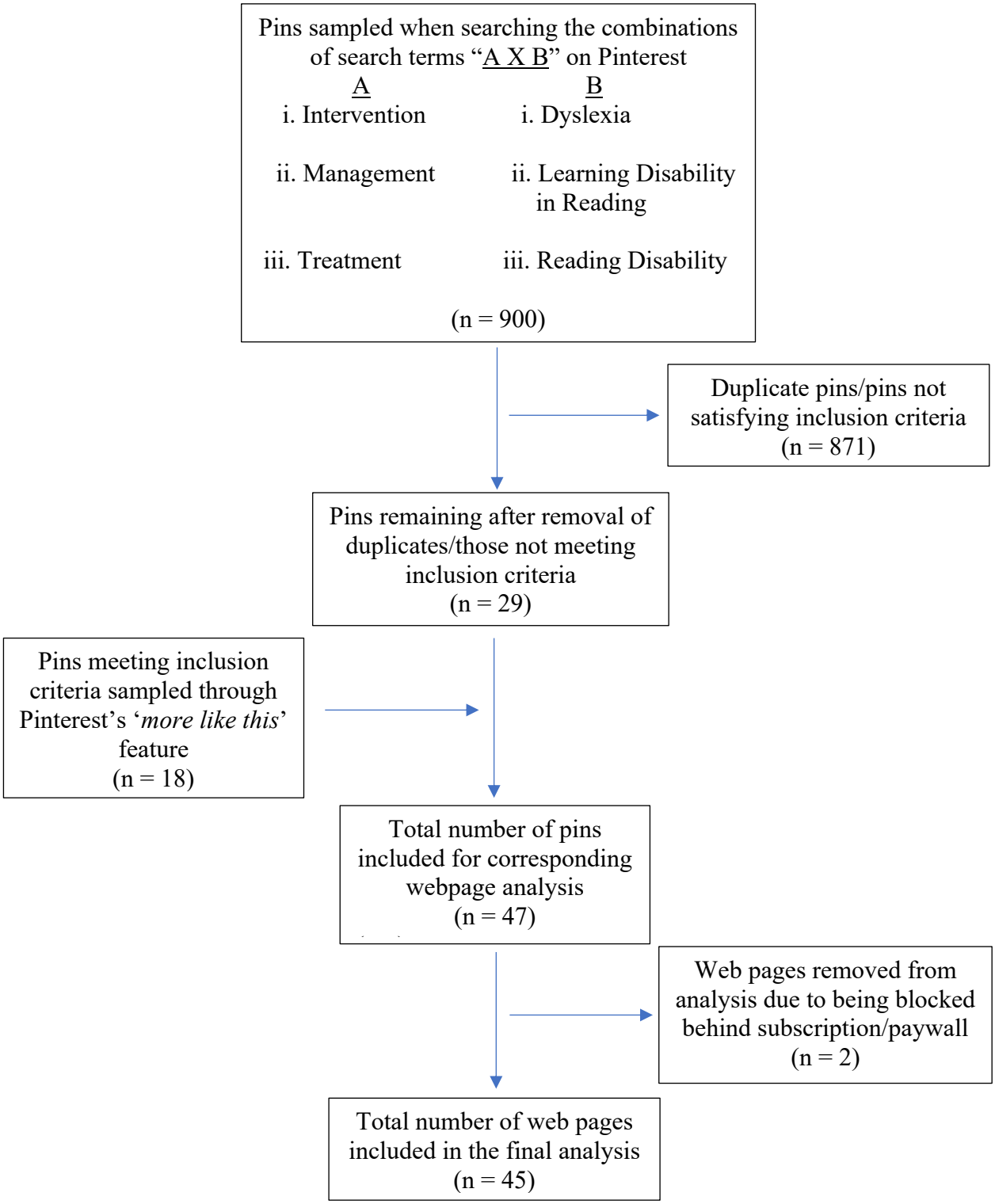

Table 1

Evaluation of Accountability, Presentation, Content and Alignment with Evidence-Based Practice, and Readability of Websites Describing Interventions for LDs in Reading

Website Element	Percentage of Sites	Scale Mean (Standard Deviation)
Section 1: Accountability (Maximum possible score = 9)		3.66 (1.53)
Were authors/contributors credited?	82.9	
Were author/contributor affiliation(s) provided? (e.g., University, Hospital, Clinic)	14.6	
Were author/contributor credentials provided? (e.g., MD, PhD)	43.9	
Were information sources provided?	12.2	
Were references provided/hyperlinked?	9.8	
Was site ownership disclosed?	92.7	
Was sponsorship/financial affiliation disclosed (e.g., pharmaceutical company, natural products company)?	65.9	
Was date created/last modified specified?	36.6	
Was site modified in the last month?	7.3	
Section 2: Presentation (Maximum possible score = 5)		2.78 (0.91)
Were headings provided to guide the reader through the site?	95.1	
Were diagrams provided to explain concepts?	9.8	
Were advertisements absent?	22.0	
Were hyperlinks to external sites present? (i.e., the authors provide follow up through hyperlinks)	80.5	
Were hyperlinks functional?	68.3	
Section 3: Content and Alignment with Evidence-Based Practice (Maximum possible score = 17)		1.68 (2.56)
Mentions explicit instruction (i.e., student learning is guided, clear, and specific explanations and examples are provided with modeling of skills and tasks).	24.4	
Mentions systematic instruction (i.e., instruction follows a planned set of lessons).	12.2	

Emphasizes the importance of intensive instruction (i.e., individualized, one-on-one or small group instruction; repeated monitored practice; clear, immediate feedback correcting mistakes; dedicated practice and cumulative review).	19.5
Phonological awareness	
a) Instruction on Blending large units (i.e., blending onsets and rimes or syllables).	7.3
b) Instruction on blending phonemes (i.e., combining individual sound units to produce words).	14.6
c) Instruction on segmenting large units (i.e., breaking words into syllables and syllables into onsets and rimes).	9.7
d) Instruction on segmenting phonemes (i.e., breaking words and syllables into individual sound units).	12.2
Phonics	
a) Instruction in letter-sound correspondence (i.e., relationships between letters or letter blends of written language and the sounds they represent).	14.6
b) Instruction in the use of phonic analysis to decode unfamiliar words (i.e., applying knowledge of letter sounds and the alphabetic principle to decode words).	4.9
Higher-level word recognition and metacognitive strategies	
a) Instruction to increase sight-word vocabulary (i.e., automatized recognition of high-frequency words) through exposure and speeded practice.	4.8
b) Instruction in identifying words through analogy (i.e., comparing unfamiliar words to familiar words to assist decoding).	7.3
c) Instruction in finding familiar parts of unknown words (i.e., seeking known words within unfamiliar words).	4.9
d) Instruction in how to attempt variable vowel sounds (i.e., using different vowel sounds for words to see which results in orthographically plausible words).	7.3
e) Instruction in peeling off prefixes and suffixes (i.e., segmenting prefixes and suffixes to identify word roots).	7.3
Mentions instruction in spelling and orthographic rules (e.g., q is always followed by a u; all words have at least one vowel; all syllables have at least one vowel; C can say /k/ or /s/. It says /s/ before an e, I, or y and /k/ before everything else; words do not end in v or j and a silent e is added at the end of words that would).	4.9

Mentions sequencing instruction. [i.e., Skills are gradually added, progressing from simple to most complex and building upon what has been learned. In phoneme awareness: identifying initial, final, and middle sounds in simple word structures (CV, CVC) before more complex word structures (e.g., CCVC; CVCC). Teaching simple and most frequent grapheme-phoneme correspondences; teaching decoding within simple word structures (CVC) before progressing to more complex consonant blends (CCVC; CVCC – e.g., blot; jump -focused on single and multi-letter units].	9.8	
Recommends the use of scaffolding approaches (i.e., modeled reading, shared reading, guided reading, and independent practice), and progress monitoring. Mentions management of comorbid conditions (e.g., anxiety, depression, ADHD).	2.4	
Section 4: Language (Maximum possible score = 1)		0.66 (0.48)
Mean Flesch-Kincaid score[a]		7.62 (1.89)
Is Flesch-Kincaid score < 8?	65.9	
Section 5: Miscellaneous (Maximum possible score = 1)		0.15 (0.33)
Is there a recommendation to follow-up with a health professional (e.g., psychologist, GP, pediatrician)?	14.6	
Mean Overall Score (Maximum possible score = 33)		8.93 (3.58)

Note. This *pro forma* is Adapted from King et al. (2021) and Kisely et al. (2003).

[a]Flesch-Kincaid Grade-Level is scored as follows: (.39 x ASL) + (11.8 x ASW) –15.59 where:

ASL = average sentence length (the number of words divided by the number of sentences) and

ASW = average number of syllables per word (the number of syllables divided by the number of words).

Table 2

Included Websites and Total Scores on Pro Forma

Website and Address	Total *Pro Forma* Score
Adventure Travel Family https://adventuretravelfamily.co.uk/2019/09/28/dyslexia-reading-programs-top-resources-to-help-children-with-dyslexia/	11
All Students Can Shine http://www.allstudentscanshine.com/2017/01/reading-intervention.html#more	6
All Students Can Shine http://www.allstudentscanshine.com/2017/01/reading-intervention-k.html#more	8
Different by Design Learning https://differentbydesignlearning.com/hands-activities-struggling-reader-really-work/?utm_medium=social&utm_source=pinterest&utm_campaign=tailwind_tribes&utm_content=tribes	7
Dyslexic Strategies https://www.dyslexicstrategies.com/dyslexia-treatment/?utm_medium=social&utm_source=pinterest&utm_campaign=tailwind_smartloop&utm_content=smartloop&utm_term=61573120	7
Good Sensory Learning http://learningspecialistmaterials.blogspot.com/2015/06/fast-remedial-results-for-dyslexics.html	8
Good Sensory Learning https://goodsensorylearning.com/blogs/news/types-of-dyslexia	8
Homeschool Hideout https://homeschoolhideout.com/dyslexia-toolkit/	9
Homeschooling Mastery Academy https://homeschoolmasteryacademy.com/encourage-reluctant-reader/	8
Homeschooling with Dyslexia http://homeschoolingwithdyslexia.com/reading-methods-work-dyslexia/	15
Homeschooling with Dyslexia https://homeschoolingwithdyslexia.com/parent-dyslexia-training-course/	5
Homeschooling with Dyslexia http://homeschoolingwithdyslexia.com/what-every-child-with-dyslexia-needs/	7

Website and Address	Total *Pro Forma* Score
Homeschooling with Dyslexia https://homeschoolingwithdyslexia.com/teach-profoundly-dyslexic-child/	7
Homeschooling with Dyslexia http://homeschoolingwithdyslexia.com/dyslexics-learn-teaching-dyslexic-strengths/	6
Learning at the Primary Pond http://learningattheprimarypond.com/blog/phonics-interventions-for-struggling-readers-in-k-2/?pp=1	17
Learning Success System https://www.learningsuccesssystem.com/get-started/child/dyslexia	4
Life Abundantly Blog https://www.lifeabundantlyblog.com/lifeabundantlyblog/2018/1/21/how-i-taught-my-profoundly-dyslexic-daughter-to-read-on-grade-level?u=	8
Meagan Gets Real https://meagangetsreal.com/things-dyslexic-children-struggle-with/	10
Meraki Lane https://www.merakilane.com/8-classroom-reading-comprehension-strategies-for-struggling-readers/	7
Minds in Bloom http://minds-in-bloom.com/reading-disabilities-15-causes-and-10/	8
Mother's Lifestyle https://www.motherslifestyle.com/dyslexia-tests-and-effective-treatment-options-for-kids/	8
My Three Readers http://mythreereaders.com/how-to-teach-reading/how-to-teach-reading-skills-struggling-readers/	16
Playdough to Plato http://www.playdoughtoplato.com/10-ways-help-struggling-readers/	11
Rocking Resources https://rockinresources.com/2019/02/promising-strategies-that-actually-support-dyslexia.html	10
Rosalind Jukic https://rosilindjukic.com/4-powerful-tools-to-teach-your-dyslexic-child-to-read/?utm_source=pinterest&utm_medium=social&utm_campaign=social-pug	9

Website and Address	Total *Pro Forma* Score
Sarah Snippets https://sarahsnippets.com/all-about-dyslexia/	10
Schooling With Grace https://www.schoolingwithgrace.com/learning-to-read/	9
Sherry M Lee https://sherrymlee.com/2019/10/the-key-to-overcome-reading-difficulties/	6
Sherry M Lee https://sherrymlee.com/2019/11/how-to-help-your-child-read/	8
Solve Learning Disabilities https://www.solvelearningdisabilities.com/dyslexia-faq/	0
The Classroom Key https://www.theclassroomkey.com/2018/09/5-simple-ways-to-help-kids-withdyslexia.html?utm_medium=social&utm_source=pinterest&utm_campaign=tailwind_tribes&utm_content=tribes&utm_term=462819550_15997440	12
The Literacy Nest https://www.theliteracynest.com/2017/02/5-steps-you-should-take-to-help-your.html?m=1	10
The Underrated Teacher https://theunderratedteacher.com/teaching-strategy-for-dyslexia-9-teaching-tips-you-need-to-know/	5
This Reading Mama http://thisreadingmama.com/2011/08/16/struggling-readers-need-part-8/	10
This Reading Mama https://thriveedservices.com/phonemic-awareness-strategies-activities-for-struggling-readers/?pp=1	9
Thrive Ed Services https://thriveedservices.com/highly-effective-dyslexia-interventions-and-programs/?pp=1	17
Thrive Ed Services https://thriveedservices.com/phonemic-awareness-strategies-activities-for-struggling-readers/?pp=1	16
Top Notch Teaching https://topnotchteaching.com/lesson-ideas/essential-reading-intervention-student-with-dyslexia/	9

Website and Address	Total *Pro Forma* Score
Top Notch Teaching http://topnotchteaching.com/time-saving-tips/new-teacher/	7
Understood https://www.understood.org/en/learning-attention-issues/child-learning-disabilities/dyslexia/qa-how-do-you-teach-a-child-with-dyslexia-to-read?utm_source=pinterest&utm_medium=social&utm_campaign=under	13
Weird, Unsocialized Homeschoolers https://www.weirdunsocializedhomeschoolers.com/resources-for-dyslexic-students/	7

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