Pinterest as a Resource for Health Information on Learning Disabilities (LD): A Social Media Content Analysis

by

Carlotta Heymann

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ABSTRACT

In the last decade, there has been a shift towards using online social networks to search for and consume health information. Pinterest, a social media platform that is frequently used by parents and teachers, provides a virtual environment where health information can be communicated and shared among users through images. Learning Disabilities constitutes the largest field of Special Education in North America, yet no study thus far has explored the accuracy of Learning Disabilities-related content on Pinterest. This study examined how information about Learning Disabilities is presented on Pinterest. Results indicated that there is a vast amount of Learning Disability content on Pinterest, although users have to sift through many irrelevant pins when using this platform to search for information about Learning Disabilities. Infographics were, by far, the most used visual communication tool to present Learning Disability content. Furthermore, the findings showed that a large majority of the Learning Disability information on Pinterest in scientifically valid, suggesting that Pinterest is a good source of information for LDs. These findings, along with possibilities for future research, and practical implications for health care providers are discussed.

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CHAPTER ONE

Literature Review

A Learning Disability (LD) is a disorder which, despite average to above average thinking and reasoning abilities, affects an individual's ability to learn (LDAC, 2017). LDs are a widespread phenomenon in societies in which reading, writing, and arithmetic are necessary skills in everyday life (Buttner & Hasselhorn, 2011). In Canada, the estimated prevalence of LDs among children is 3.2% (Learning Disabilities Association of Canada, 2017). Similarly, Bizier et al. (2015) report that 2.0% of the Canadian population between the ages of 15 and 24 have a diagnosed LD. In the United States, about 50% of the children identified for special educational services are children with an LD, meaning that LDs constitute the largest field of special education (Kavale & Forness, 2006).

History of Learning Disabilities

In the 1800s, physicians started to note and document symptoms in patients that were similar to what would now be described as an LD (Sleeter, 1986). Whereas researchers such as Broca and Wernicke established connections between injuries to specific areas of the brain and specific behaviors in the mid-19th century, Sir William Broadbent first approached the issue of reading disorders, suggesting in 1872 that reading difficulties could be a result of a head trauma, specifically to the left hemisphere where speech and language were located (Pullen, 2016). Broadbent reported the case of a man who, following a head injury, lost the capacity to read, despite being able to write with little difficulty (Elliot & Grigorenko, 2014). Meanwhile, in Germany in the 1880s, ophthalmologist Rudolf Berlin first coined the term 'dyslexia', referring to it as a 'reading blindness' (Hagw & Silver, 1990). In 1917 Hinshelwood argued that 'reading/word blindness' was due to faulty visual memory for words and letters (Pullen, 2016). In the 1900s in the United States, the field of LDs, particularly reading disabilities, became more popular among researchers, and practitioners

started to focus on treatment approaches, particularly in the field of education. Up until the mid- to late 1900s the field of LDs was dominated by physicians and medical research (Llyod, 2005), although this has changed over the last 100 years. Samuel Orton, Grace Fernald, Marion Monroe, and Samuel Kirk were four psychology researchers who examined the importance of phonics in reading and started to work with children who were labelled with "word blindness" (Hallahan & Mercer, 2000). In the 1940s more psychologists and educators started to speak out about the fact that children with LDs were not intellectually challenged, hearing impaired, or emotionally disturbed, nor did they have brain damage (Duchan, 2001). From there, research and awareness of LDs has continued to grow and become of greater interest to psychologists and educators, rather than just physicians. Despite the history of research on LDs in the medical field, as well as the growing interest in LDs in the psychological and educational field, in the United States, LDs were not recognized officially by the Department of Education until 1975, with the passage of the Individuals with Disabilities Education Act (IDEA; Pullen, 2016).

The concept of learning disabilities formally came to the awareness of Canadians in the late 1950s when psychiatrist Edward Levinson described a group of students who struggled academically, despite having average intelligence (Stegemann, 2016). With Levinson's efforts, the Montréal Children's Hospital Learning Centre was created in 1960 to explore the concept of LDs and to develop effective interventions (Klassen, 2002). In 1962, the Association for Children with Learning Disabilities, the first association to support children with learning disabilities, was founded by a group of concerned parents and is now called the Learning Disabilities Association of Canada (LDAC) (Kozey & Siegel, 2008).

Practical Approaches to LD Identification

Currently, there are three practical approaches to identifying an LD: The Regression Discrepancy Model (RDM), the Response-To-Intervention Model (RTI), and the Pattern of

revised multiple times since it was first proposed to include the consideration of significance and severity (Evans, 1992).

Although it has been argued that the RDM is the most objective method of assessing LDs if followed closely (Ross, 1992), this model is not without controversy; it has been the target of several criticisms and challenges, with clinicians and researchers arguing that the use of the RDM could result in an under-identification of low IQ students with LDs. Furthermore, the RDM has been criticized for its ethnic bias and its inability to predict the prevalence of severe discrepancies (Ihori & Olvera, 2015). Specific concerns include whether the RDM truly differentiates students with low achievement without an LD from those with low achievement due to a true LD (Ihori & Olvera, 2015). An additional concern regarding the RDM relates to the inconsistent manner in which it has been traditionally used by government agencies (e.g., departments/ministries of education) and practitioners. The inconsistency with which the RDM has been defined and implemented has resulted in situations in which a student may be eligible for special education under the category of LDs in one jurisdiction but not in another (Cahan, Fono, Nirel, 2012; Van den Broeck, 2002). One of the largest criticisms of the RDM is that is has made early identification and intervention of children with suspected LDs difficult. For the most part, young children experiencing academic problems in the early elementary grades do not demonstrate the IQ-achievement discrepancy necessary to meet eligibility for LD (Speece, 2002). As a result, it is not uncommon for these students to continue to fail for an additional two or three years, and often longer, before their achievement is sufficiently low compared to their IQ and they are eligible to receive special education services. Thus, the RDM has also been labeled a "wait to fail" approach (Restori et al., 2009; Reynolds & Shaywitz, 2009). Research has clearly demonstrated that children do not generally exhibit a severe discrepancy in the early years of schooling and therefore miss out on early intervention, which has proven vital for this age

group (Burns & Riley-Tillman, 2009). Given the above-mentioned factors, the RDM is fraught with many challenges and therefore alternative methods of diagnosing LDs have been proposed.

Response to Intervention (RTI)

In response to the concerns outlined above regarding the RDM, the 2004 reauthorization of IDEA added the option for American practitioners to adopt a Response to Intervention (RTI) approach when diagnosing LDs. The key tenets of RTI are: (a) that instruction across multiple tiers is evidence-based; (b) all students are regularly screened for academic and behavior problems; (c) student response to instruction is assessed frequently; (d) teachers make instructional decisions based on data; and (e) if data indicate the need for more educational support, children move to higher tiers in the model, in which instruction becomes progressively more intense, specific, and individualized (Burns et al., 2007).

The RTI model proposes a tiered intervention approach by which students at risk of developing LDs are identified based on their performance at each tier. In this tiered intervention approach, Tier 1 refers to the implementation of universal evidence-based teaching strategies. A key focus in RTI is to ensure that the curriculum provided by general education classroom teachers is supported by research, showing that it is effective for the vast majority of children. In Tier 2, students receive intensive systematic and explicit instruction and additional opportunities to practice target skills in addition to their classroom instruction, often in a small group setting. The intervention provided in Tier 3 is more individualized and intense than in Tier 2 with smaller groups of students (e.g., 1- 4 students) and increased teaching time (e.g., 45–60 min daily) for up to 20 weeks (Vaughn et al., 2007).

At-risk students are identified via universal screenings and follow-up curriculum-based measures (CBMs) to monitor their progress and response to intervention (Fuchs & Fuchs, 2001). CBM is an approach to measuring the academic growth of individual students

and its essential purpose is to aid teachers in evaluating the effectiveness of the instruction they provide to individual students (Deno, 2003). Examples of CBMs include weekly multiplication sheets or spelling tests. Students found to be at risk of developing LDs then receive general education classroom instruction and their progress is monitored for a predetermined period of time. If the student does not respond to Tier 1 instruction in the general education classroom, then the student moves to Tier 2, in which he or she receives more intensive, systematic, and explicit instruction and additional opportunities to practice target skills, often in a small group setting (Fuchs & Fuchs, 2001). For example, an intervention for grade one students might involve practice to increase student sight-word vocabulary and practice decoding unfamiliar words. Students receiving Tier 2 intervention are assessed more often using CBMs (e.g., once per week or every other week) to monitor their response to intervention (Grosche & Volpe, 2013). If students do not show adequate progress in Tier 2, the intervention can be adjusted or replaced. Students who do not respond to the Tier 2 interventions proceed to even more intensive interventions or special education assessment at Tier 3.

In Tier 3, a multidisciplinary problem-solving team applies a more individualized and complex problem-solving model. Tier 3 involves an in-depth identification and intervention process of special learning needs with comprehensive evaluation and frequent progress monitoring to develop interventions, remediation or curriculum adaption to best address the needs of individual students (Grosche & Volpe, 2013). An intervention plan directly tailored to the individual needs of a child is then developed and implemented. When children make adequate progress and perform above benchmark on CBMs, they are then referred back to Tier 1 or 2 and their learning progress is monitored to assess the stability of responsiveness. If children do not show adequate progress to the highly individualized and intensive interventions afforded in Tier 3, problem-solving teams may choose one of the following five

options for each individual child (Vaughn & Fuchs, 2003): (1) continuing the diagnostic trial period in Tier 3 until an effective intervention is found; (2) using alternative curricula with de-emphasized academic and behavioral goals; (3) placing the student in another classroom with more resources and specialists; (4) placing the student in general education with special education accommodations to achieve good skills in other domains despite basic skill limitations in specific areas; and/or (5) placing the student in a more restrictive environment (e.g., special classes or special schools).

A successful RTI program is capable of providing numerous benefits to students with and without learning disabilities. For example, unlike the RDM, RTI results in early identification of and intervention for learning difficulties (Stecker, Fuchs & Fuchs, 2008), improved treatment validity, contextualized decision-making, improved accuracy in identifying learning disabilities, and the use of more effective interventions (Van Der Heyden & Jimerson, 2005). However, critics of the RTI approach note that consensus regarding what constitutes "response" to an intervention has not yet been achieved, resulting in inconsistent decision-making (Hale et al., 2006; Reynolds & Shaywitz, 2009). Furthermore, critics have noted that the cut-off point for defining a child as having a learning disability remains unspecified. This is reflected in the question of how many tiers the RTI approach should include (Reschly, 2005). Since each tier leads to a smaller number of children requiring more intensive intervention, the prevalence of children with LDs depends on the number of tiers included in the approach. Related to the issue of a cut-off point is the question of how to deal with children who successfully pass a tier, return to their regular classroom and fail again, implying that they need some additional support (Vaughn et al., 2003). Critics of the RTI approach have therefore questioned whether this model, because of a lack of clear guidelines about cut-offs, runs the risk of being another wait to fail model, just like the RDM.

Pattern of Strengths and Weaknesses (PSW)

The third approach to LD diagnosis explores whether a child exhibits a pattern of strengths and weaknesses in performance, achievement or both. This method is commonly referred to as the Pattern of Strengths of Weaknesses (PSW) method (Ihori & Olvera, 2015). Using the PSW model, a student must demonstrate a processing deficit, as well as a significant interaction between the cognitive/neuropsychological process and achievement, thereby suggesting the presence of an LD (Ihori & Olvera, 2014; Miciak et al., 2014). When determining an LD, the PSW approach is characterized by the following features: (a) multiple sources of data collected over a period of time using a variety of assessment tools and strategies; (b) data analyses which are grounded in the techniques of pattern seeking; (c) predictive and treatment validity; and (d) the use of logical and empirical evidence to guide decision making (Maki & Adams, 2020; Schultz, Simpson, Lynch, 2012). Although there are varied methods of implementing the PSW model, the essential steps in the process include: (a) identifying of an area of academic weakness; (b) determining whether there is an area or areas of cognitive weakness that have a logical and/or research-based link to problems in the identified academic area; (c) establishing whether there are other cognitive areas which are average or above average; and (d) analyzing these findings for a pattern that will rule out or confirm the presence of an LD (McGill et al., 2016). This approach allows clinicians and researchers to conduct a comprehensive assessment of a student's academic and cognitive processing skills and allows for instructional recommendations that are directly tied to the student's profile of strengths and weaknesses (Schultz et al., 2012). If a student is suspected of struggling with learning, a review of the educational history to develop an initial theory about the student is completed. If a cognitive processing problem is suspected, then this and related areas are assessed. Tests are selected based on the research-based association with the academic problem (Fiorello et al., 2006). For example, if the student exhibits difficulties in

reading comprehension, then the cognitive processes associated with reading comprehension are evaluated. These processes include working memory, processing speed, long-term storage and retrieval (i.e., rapid automatic naming), and auditory processing (i.e., phonemic awareness). Hypotheses are then developed about the student's cognitive strengths and weaknesses and are analyzed in the context of test results and environmental data (Miciak, 2015). These assessment data are then used for a targeted intervention phase, which makes this approach not only useful for identification, but also for treatment and remediation. However, a recent study has found that the consistency of LD identification with the PSW model is lower than with an RTI model (Maki & Adams, 2020).

Definition and Terminology of Learning Disabilities

With increasing numbers of students with an LD diagnosis in the educational system, there is a growing body of research devoted to them in the fields of educational science, psychology, sociology, medicine, and other associated disciplines (Bizier et al., 2015). Despite research across many disciplines, there is much inconsistency with respect to definition, classification, identification, and treatment of LDs. There are currently three major competing definitions or classifications of an LD used in Canada: (1) the Learning Disabilities Association of Canada definition; (2) the Diagnostic and Statistical Manual of Mental Disorders – 5th Edition (DSM-5) definition; and, much less frequently, (3) the International Classification of Diseases – 11th Revision (ICD-11) definition.

Learning Disabilities Association of Canada Definition (LDAC)

LDAC defines LDs as "disorders which may affect the acquisition, organization, retention, understanding or use of verbal or nonverbal information. These disorders affect learning in students who otherwise demonstrate at least average abilities essential for thinking and/or reasoning. […] Learning disabilities result from impairments in one or more processes related to perceiving, thinking, remembering or learning." (LDAC, 2017). LDAC

clearly stipulates that a student with an LD has at least average to above average thinking and reasoning abilities, which are typically assessed by psychologists who conduct formal psychoeducational testing. Additionally, because the LDAC definition requires evidence of processing deficits that can be logically linked to learning challenges, it is necessary to administer tests of cognitive processing such as phonological processing, language processing, attention and memory (i.e., working memory, long-term memory, and short-term memory), processing speed, visual perception, visual-motor processing, and executive functions (LDAC, 2015). Researchers have argued that these processing deficits may be causally linked to the LD (Price & Zwiers, 2012). Overall, the LDAC definition does not differentiate between subtypes of LDs, namely dyslexia, dyscalculia, and dysgraphia, but rather classifies LDs broadly with clarification of the areas of academic functioning (i.e., oral language, reading, written language, and mathematics) that are affected by the LD (LDAC, 2015).

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

The DSM-5 does not use the term *Learning Disability*, but rather *Specific Learning Disorder* (SLD), the diagnostic criteria for which differ from the LDAC definition in a number of ways. When the DSM-5 was released in 2013, the diagnostic criteria for SLD were altered significantly from the DSM-IV criteria. The DSM-IV approach recognized three explicitly defined diagnostic categories: (1) reading disorders; (2) mathematics disorders; and (3) disorders of written expression, whereas in the DSM-5 the term SLD has become the umbrella term for mathematics, reading, and written expression disorders. Furthermore, in the DSM-IV, students were diagnosed when achievement on individually administered standardized tests of academic achievement was substantially below that expected for age, schooling, and level of intelligence (APA, 2000). With the introduction of the DSM-5 in 2013, the previously required discrepancy between IQ and achievement was removed. One of

the biggest criticisms of this discrepancy requirement was that waiting for a student to have a statistically significant discrepancy between IQ and achievements score to be diagnosed and receive interventions often wastes important time (i.e., a "wait to fail" approach) (Ihori & Olvera, 2015). In place of the ability-achievement discrepancy, academic underachievement in three key areas (i.e., reading, writing, and mathematics) became a determining criterion for SLD in the DSM-5. Specifically, a student's scores on measures of academic achievement are now required to be significantly lower than what is expected for the student's age to meet criteria for SLD (APA, 2013). Furthermore, the DSM-5 does not use the terms 'dyslexia' and 'dyscalculia', although it is noted that these are alternative terms to refer to reading and math impairments.

International Classification of Diseases, 11th Revision (ICD-11) Definition

In the International Classification System (ICD-11; World Health Organization, 2019), LDs are described as Specific Developmental Disorders of Scholastic Skills, although the term *Learning Disability* is not used in the ICD. The ICD used the term Specific Developmental Disorders of Scholastic Skills in the ICD-10 (ICD-10; World Health Organization, 1992), which was further subtyped into specific reading disorder, specific spelling disorder, disorder of arithmetical skills, and mixed types. Specific Developmental Disorders of Scholastic Skills were renamed as Developmental Learning Disorder in the recently released ICD-11, with four subtypes: (1) impairment in reading; (2) impairment in written expression; (3) impairment in mathematics; and (4) other specified impairment of learning. Similar to the LDAC criteria, the ICD-11 notes that Developmental Learning Disorders are believed to be the result of abnormalities in cognitive processing. Similar to the DSM-IV criteria, the ICD-11 criteria specify that both cognitive and academic achievement testing must be conducted to determine whether there is a significant discrepancy between a student's intelligence and academic achievement (World Health Organization, 2019).

Summary and Comparison of Definitions

Overall, there are several similarities between these three sets of diagnostic criteria. Specifically, they all require a student to have academic difficulties which cannot be explained by an Intellectual Disability or any other neurodevelopmental disorder, the impairment must be present in early years, and the impairments cannot be due to poor instruction. However, there are some important differences between these three sets of criteria. First, both the LDAC and ICD-11 criteria suggest that cognitive processing deficits are the basis of the academic underachievement, whereas the DSM-5 does not provide a hypothetical explanation of the learning difficulties. Furthermore, the ICD-11 diagnostic criteria includes subtypes with which a student can be diagnosed (i.e., specific reading disorder, specific spelling disorder, disorder of arithmetical skills, and mixed types), whereas both the LDAC and DSM-5 criteria simply use the umbrella terms LD or SLD with the specification of the affected academic impairment; this does not change the person's overall diagnosis (Büttner & Hasselhorn, 2011). Nonetheless, terms such as 'dyslexia', 'dyscalculia', and 'dysgraphia' are often used by clinicians when talking about a child's LD.

To add to the confusion surrounding LD terminology and approach to diagnosis, the term *Learning Disability* is used in the United Kingdom to refer to a person who would meet DSM-5 diagnostic criteria for Intellectual Disability (ID; Grünke & Cavendish, 2016). In the DSM-5, an ID is defined as a disorder in which individuals have deficits in intellectual functioning (i.e., IQ < 70) and adaptive functioning (APA, 2013). These differences in terminology mean that it is very complicated to examine the area of LDs cross-culturally. Additionally, different countries may use other diagnostic tools or country-specific disability-related legal provisions to determine what scholars, practitioners, and laypersons consider to be key components of an LD. Although many countries diagnose individuals with an LD by either the DSM-5 or ICD-11, some countries' approaches to acceptance of these diagnoses or

intervention models differ significantly, leading practitioners to seek out other definitions or models (Sideridis, 2007). For example, in Portugal, students with an SLD diagnosis do not constitute a special education category and hence often do not receive appropriate interventions (Sideridis, 2007).

Types of Learning Disabilities

As mentioned above, the terms reading, writing, and math disability, or dyslexia, dysgraphia, and dyscalculia are often used interchangeably with the term LD (Shafir & Siegel, 1994). All three definitions discussed above agree on the fact that an LD, SLD or Specific Developmental Disorders of Scholastic Skills typically affect the academic domains of reading, writing, and/or mathematics. However, some researchers and clinicians argue that there is an additional subtype of LD, namely non-verbal LD (NVLD). Below these types of LDs are discussed.

Reading Disability

A reading disability, also often referred to as dyslexia, affects a student's ability to process language; affected students typically have difficulty with reading, writing, and spelling. A reading disability is neurobiological in origin and impedes the development of accurate or fluent word reading (Fletcher, 2009). It is the most well-characterized specific learning disability, both neurobiologically and behaviorally (Fletcher et al., 2006). As one of the most researched types of LDs, researchers have identified several subtypes of reading disabilities. The subtypes are identified based upon whether their most prominent deficits are related to auditory-phonemic processing failures (i.e., inability to sound out words, blend sounds or spell phonetically) or visual-orthographic processing failures (i.e., inability to recognize irregularly spelled words, poor sight word vocabulary, letter and word reversals, but good phonetic skills), or failures in both processing domains (Howes et al., 1999). Readers with auditory-phonemic impairments are often categorized as having dysphonetic

dyslexia, those with visual-orthographic impairments as having dyseidetic dyslexia and those with both types of processing failures as having mixed or global dyslexia (Howes et al., 1999; Shaywitz & Shaywitz, 2008). Reading underachievement has many causes, including lack of appropriate core reading instruction, which can be compounded by environmental factors such as a home environment that does not support academic success (Fletcher et al., 2006; Pennington, 2006). Yet, some children struggle to read in spite of being provided with appropriate reading instruction, exerting a great amount of effort on their part, and having a home environment conducive to academic success. These students are classified as having a reading disability, and what consistently distinguishes students with reading disabilities from other students is their slow response to instruction (Vellutino & Fletcher, 2008). The cognitive profiles of students with reading disabilities often show a deficit in phonology-based skills such as phonological awareness, rapid automatized naming (RAN), and verbal short- term memory (Compton et al., 2012; Tobia & Marzocchi, 2014). These deficits, in turn, affect a student's reading ability and can lead to difficulties in multiple academic areas (e.g., language arts, math, written expression). The DSM-5, ICD-11, and LDAC definitions all include reading impairments in their criteria, albeit in different ways.

Writing Disability

A writing disability, also often referred to as dysgraphia, affects a student's written expression; affected students typically exhibit trouble with handwriting, spelling, and the ability to express ideas on paper. In the research literature the term dysgraphia has two different meanings: some researchers use the term to refer to impaired spelling and written expression of ideas (Berninger, 1999), whereas others apply the label to deficits affecting the motor planning or production processes required for handwriting (McCloskey & Rapp, 2017). Although these areas are often treated as separate in the literature, Roux et al. (2013) argue that these are indeed not separate in reality, but that the spelling processes are ongoing

during the production of written output and may affect the motor processes in handwriting. The researchers conclude that the greater than normal cognitive load imposed by spelling processes may lead to handwriting deficiencies, including slow and dysfluent writing.

Furthermore, writing and reading disabilities are often compared to one another, as they have similar impairments and more than likely have similar underlying cognitive processes (Döhla, Willmes & Heim, 2018; Hepner, McCloskey & Rapp, 2017). Students with a reading or writing disability often have similar cognitive profiles, in that similar cognitive processes, such as phonological processing, working memory, and visual spatial processes are all involved in learning to read and write (Berninger et al., 2015). All three diagnostic systems refer to writing impairment in their LD criteria, however the DSM-5 specifically does not use the term *dysgraphia*, despite using the terms *dyslexia* and *dyscalculia* to describe reading and mathematics disabilities, respectively.

Mathematics Disability

A mathematics disability, also often referred to as dyscalculia, affects a student's mathematics and computational skills; affected students typically exhibit difficulty with computation, concepts of time/money, remembering mathematical facts, or grasping math concepts. A mathematics disability is a specific, severe, persistent disability in learning arithmetic, not primarily attributable to factors such as low intelligence, gross neurosensory impairment, emotional disorders or lack of proper education and opportunity (Júlio-Costa et al., 2015). The development of mathematical skills can be affected by a range of factors including education, home environment, and reading ability (Wilkey, Pollack & Price, 2020). In the research literature, the term *math difficulty* is often used instead of mathematics disability or dyscalculia, making it difficult to fully assess the extent of researchers' and clinicians' understanding of dyscalculia, as well as any statistics of students diagnosed with dyscalculia (Nelson & Powell, 2018). However, the term *math difficulty* is not a diagnosis,

contrary to dyscalculia. Mathematics impairments are mentioned in all, DSM-5, ICD-11, and LDAC criteria for an LD or SLD.

Non-Verbal Learning Disability

A Nonverbal Learning Disability (NVLD) is a subtype of learning disabilities that is proposed to involve central processing deficits that lead to both learning difficulties and psychosocial problems (Palombo, 2001). One of the leading researchers in this field, Rourke (1987), characterized NVLD impairments in three areas: (1) poorer visual-motor skills than verbal skills; (2) lower mathematical achievement than sight-word reading ability; and (3) relatively limited success at solving abstract, nonverbal problems. Neither the DSM-5, the ICD-11, nor LDAC include NVLDs as an area of impairment in their criteria. Children with NVLD have been described as having social impairments in the areas of social perception, social judgment, and social interaction skills (Petti et al., 2003). However, there is limited research in the area of NVLDs and the majority of the existing research compares the profiles of children with a diagnosed NVLD to children who are diagnosed with DSM-IV Asperger's Disorder or high-functioning Autism (Nydén et al., 2010; Ryburn et al., 2009). Although many researchers have concluded that the two profiles are distinct, there remains doubt among many clinicians over whether these two diagnoses are significantly distinguishable from one another (Hagberg et al., 2013).

Cognitive Processes Associated with Learning Disabilities

The role of cognitive processing deficits and their relation to the impairments exhibited by people with LDs is a much-debated topic among clinicians and researchers working in the field of LDs (Consortium for Evidence-Based Early Intervention Practices, 2010; Hale et al., 2010; Siegel et al., 2018). Processing deficits are defined as problems with the processes of recognizing and interpreting information taken in through the senses (Ashkenazi et al., 2013; LD OnLine, n.d.). and many clinicians and researchers, along with

organizations such as LDAC, posit that some children have biologically-based cognitive deficits or cognitive dysfunctions that hinder their adequate acquisition of fundamental academic skills (Ashkenazi et al., 2013; Malekpour, Aghababaei & Abedi, 2013; Vicari et al., 2003). Some research has identified specific cognitive deficits as being closely associated with specific LDs, such as phonological processing for reading disabilities, working memory for mathematics disabilities, and orthographic processing for writing disabilities (Landerl et al., 2009; Swanson, Harris, & Graham, 2006). However, given that the relation between processing deficits and LDs is correlational, other clinicians and researchers argue that evidence of a cognitive processing deficit should not be necessary to make an LD diagnosis (Siegel at al., 2018; Lyon et al., 2001). Currently, it remains unclear whether the identified cognitive deficits are causal factors or a mere consequence or even a covariate of the disability (Vellutino et al., 2004).

Types of Cognitive Processing Deficits

Many researchers hypothesise that people with LDs have a deficit in one or more cognitive processes, such as phonological processing, auditory processing, long-term retrieval, attention, short-term memory, and/or working memory (e.g., Fletcher & Grigorenko, 2017; Malekpour, Aghababaei & Abedi, 2013; Masoura, 2006; Vicari et al., 2003). The majority of research on cognitive processing deficits in LDs has been conducted in the area of reading disabilities. Below, the most common cognitive processes that have been linked to reading, writing, and math disabilities are discussed.

Reading

Historically, reading disabilities or dyslexia were attributed to visual impairments; however recent studies have concluded that reading disabilities are not caused by impairments in visual processing but are linked to cognitive processing deficits in the areas of phonological coding, auditory processing, and semantic and syntactic skills (Ashkenazi et al.,

2013; Grünke & Cavendish, 2016; Stothers & Klein, 2010). The most consistently reported of these impairments are problems with phonological awareness (i.e., the ability to recognize, work with, and manipulate the sounds of language) (Powers et al., 2016; Snowling, 1995). Much research in recent years has shown that children who perform well on tests of phonological awareness before school entry go on to be good readers (Bar & Nevo, 2019; Dandache,Wouter & Ghesquière, 2014). It is now accepted that direct instruction in phonological skills has a beneficial effect on reading and spelling performance, especially when combined with teaching of letter-sound relationships (Ferraz et al., 2018; Johnston, 2019).

Reading disability research has been further dominated by the question of whether a single cognitive deficit is necessary and sufficient to cause all behavioral characteristics of the disorder. The dominant hypothesis of this kind has been the phonological-deficit hypothesis (e.g., Snowling, 1995; Wagner, 1986). However, assuming that a single cognitive deficit is responsible for causing reading impairments has a number of shortcomings. First, there is no single cognitive processing deficit found that can explain all behavioral symptoms of all cases with reading disability (e.g., Ramus & Ahissar, 2012). For example, not all individuals with reading disability show a phonological deficit (e.g., Pennington et al., 2012; Valdois et al., 2011). Conversely, not all individuals with a phonological deficit have a reading disability (e.g., Snowling, 2008). This raises doubts about a causal link between the cognitive process and the behavioural manifestation of the disorder and points to the possibility that various constellations of underlying cognitive deficits can lead to the behavioral symptoms of a reading disability. In a more recent study (Menghini et al., 2010), the complex associations between reading deficits and cognitive deficits was examined. These researchers investigated the hypothesis that reading disabilities might be accompanied by a large number of independent deficits, as proposed by the multiple cognitive deficit

model of reading disabilities (Pennington, 2006). In a sample of children between 8 and 17 years of age, the researchers found that only about half of the variance in two reading efficiency tests could be explained by phonological impairments. Other cognitive processes that have been linked to the development of a reading disability are phonological/auditory processing, verbal working memory, processing speed, long-term retrieval (specifically RAN), and executive attentional skills (Frisk, 1999). These, however, have not been researched in as in-depth a manner as phonological processing has. It has been hypothesized that executive attentional skills may not be the root cause for a reading disability but may interfere with a student's ability to learn reading (Démonet et al., 2004). Furthermore, researchers have shown that verbal working memory and processing speed deficits are very often associated with reading comprehension difficulties (Snowling & Hulme, 2012).

Writing

Unlike a reading disability, there exist only few studies examining writing disability/disorder of written expression or dysgraphia. However, research has demonstrated similarities between the cognitive profiles and underlying cognitive processes in students with reading and writing disabilities (Döhla et al., 2018). There is evidence for a link between reading and spelling and phonological processing abilities (Döhla et al., 2018; Winkes, 2014). Overall, the important influence of phonological processing on reading and spelling performance has already been established, but the evidence of this is much richer for the field of reading disabilities than writing disabilities.

In addition to phonological processing, orthographical processing has been examined as a potential deficit in students with writing disabilities (Brunsdon et al., 2005; Hanley et al., 1992; Romani, Ward & Olson, 1999). Orthographic processing is the ability to understand and recognise writing conventions as well as recognising correct and incorrect spellings of words. Several studies have found that students with a writing disability have an orthographic

processing impairment (Miceli & Capasso, 2006; Brunsdon et al., 2005; Hanley, Hastie & Kay, 1992). However, these studies also state that orthographic processing is often not the only underlying cognitive processing deficit in these students and often occurs in addition to a phonological processing deficit.

Mathematics

A number of studies have suggested a link between working memory storage and mathematics abilities (Ashkenazi et al., 2013; Attout & Majerus, 2015; Layes et al., 2018). Memory difficulties that affect arithmetic are mainly related to problems in storing and retrieving arithmetic facts in long-term memory and/or problems with working memory (Andersson & Östergren, 2012). Swanson and Beebe-Frankenberger (2004) reported a moderate correlation between working memory and mathematics problem solving. Hitch et al. (1988) found that preschool children rely on visuospatial working memory more than older children do, and Rasmussen and Bisanz (2005) found visuospatial working memory to be the best and only unique predictor of preschool performance on standard nonverbal arithmetic problems. Despite the consistency of researchers reporting on the link between working memory and mathematics abilities, research on the effectiveness of working memory training has been mixed, and working memory interventions have not been found to be as effective in students with math disabilities (Layes et al., 2018; Praet & Desoete, 2019; Shi & Liu, 2016) as phonological awareness interventions are with students with reading disabilities.

Intervention

The field of LD assessment and diagnosis remains very controversial, due to varying definitions, diagnostic approaches, and intervention approaches. When designing and implementing interventions, it is particularly important that clinicians, parents, and teachers be aware of the evidence for and against various interventions. Psychologists and other health

professionals refer to interventions that have been shown to be consistently effective as *evidence-based interventions* (EBI) or, more broadly, as *evidence-based practice* (EBP). The American Psychological Association (APA; 2016) describes EBP as "the integration of the best available research with clinical expertise in the context of patient characteristics, culture, and preferences" (American Psychological Association, 2016, p. 273). Similarly, the Canadian Psychological Association (CPA) describes EBPs as treatments and interventions that are based on research findings published in the peer-reviewed scientific literature (CPA, 2012). The CPA further states that, for an intervention to be considered evidence-based, it must be examined in multiple randomized controlled trials (RCTs) and participants should be followed-up long-term to assess their reactions, symptoms, and functioning; these findings are then used to inform further decisions about treatment planning, modification, completion, and discontinuation. Evidence-based interventions must be subjected to many systematic reviews and meta-analyses to ensure that they are effective and safe. Overall, an intervention is considered evidence-based if it has been evaluated systematically and produces consistently positive results when implemented with fidelity (Cleaver & Wood, 2018). Hence, when treating LDs, or any other disorder, the goal is to use EBPs whenever possible to ensure the best outcome for the patient/client.

One of the few LD interventions considered to be evidence-based is Direct Instruction (DI; Wieber et al., 2017). DI is a model for teaching that emphasizes well-developed and carefully planned lessons designed around small learning increments and clearly defined and prescribed teaching tasks (Swanson, 1999). This intervention has mostly been shown to be effective in youth with LDs that affect reading, rather than mathematics and writing (Ritchey, 2011). This may be due to the fact that the majority of LD research has been done in the field of reading and not mathematics and writing. DI builds on the assumption that all students can learn with well-designed and evidence-based instruction. When a student does not learn, it

does not necessarily indicate a shortcoming in the student but could also be due to ineffective instruction (Wieber at al., 2017). DI therefore assumes all students can learn new material when (a) they have mastered prerequisite knowledge and skills and (b) the instruction is unambiguous (Stockard et al., 2018). Mastery learning is a key element of DI. 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. It is then easier to learn new material that builds on that foundation. DI programs are developed in a multistage, multiyear process that begins with a detailed logical analysis of the concept to be taught. Carefully worded examples and teaching scripts are developed and tested with small groups to help ensure that they are unambiguous. Materials are logically sequenced, with placement tests, systematic review of previously taught material, and regular testing of mastery (Huitt et al., 2009).

Despite research and clinical evidence pointing to the effectiveness of DI, many parents and teachers are not very familiar with the idea and importance of DI, leading to a lack of DI interventions in schools and other settings (e.g., private practices or learning centres) (VanDerHeyden, 2018). A recent study of American teachers found that many do not receive any training in EBPs, and only a small percentage have access to professional development sessions on EBP (Cooper et al., 2018). Additionally, there are many school psychologists who use non-EBP practices, which researchers suggest is due to a lack of training (VanDerHeyden, 2018). Becker and Domitrovich (2011) state that for any good EBP to be sustainable in the education field, the system or infrastructure must be supportive of the practice or intervention. Often, according to these researchers, this can be a hurdle for the implementation of EBPs for professionals. Kratochwill and Shernoff (2004) suggested that another reason for the lack of EBP implementation in schools may be due to theoretical or philosophical beliefs of practitioners and trainers and that when a problem arises during implementation of an EBP, there is no shared responsibility or problem-solving between

practitioners, trainers, and the system in which the EBP is being implemented. A study found that parents and teachers report three main barriers to accessing health information for their children and students: (1) trustworthiness (i.e., how confident are they in the research that is conducted); (2) usability (i.e., practicality of a practice); and (3) accessibility (i.e., how easy the information is to obtain) (Carnine, 1997).

The Role of the Internet as a Health Resource

The Internet has become a key means to accessing health information and for some people, the Internet may be replacing or supplementing health professionals as a source of health information (Dolce, 2011; Phillips, 2020). The perceived benefits of online health information-seeking include widespread access to health information, convenience (i.e., ease and speed), and anonymity (Fox et al., 2000). These benefits are expected to enable individuals to play an active role in their health care, make better-informed decisions, and possibly improve health outcomes (Powell, Darvell & Gray, 2003). There are also concerns that the variable quality of online health information combined with limited ability to critically evaluate health information may contribute to negative outcomes, such as unnecessary physician visits, delays in seeking necessary medical care, change in treatments, and seeking alternative treatments that can be harmful (Cline & Haynes, 2001; Powell et al., 2011). Exploration of people's everyday engagement with online health information has highlighted researchers' concerns with the reliability of health information on the Internet (Nettleton et al., 2005). However, developments in mobile and social media technologies have precipitated changes in information-seeking practices. In the UK, for example, users' reliance on search engines (e.g., Google) is decreasing, with users choosing to consume information through their online social networks, such as social media, blogs, chat rooms, and personal websites (Dutton et al., 2013).

This shift towards relying on online social networks to search for and consume health information means that there are many social media platforms that provide information about interventions for various health and mental health conditions, including LDs. This information is easily accessible, but many consumers may not be able to distinguish between EBP and non-EBP interventions. With respect to interventions for LDs, many websites and

health care team. The majority of them indicated that they were most often looking for support, advice, and companionship from others with the same condition when using social media as a resource. Findings indicated that only a quarter of adolescents view social media as a useful source of health information and that they primarily view it as a means to gain social support and understanding within the health community. Although these studies did not examine the medical or scientific accuracy of information found on social media, a recent study has found that only approximately 19% of the medically-oriented cancer information shared on Facebook was scientifically false (Gage-Bouchard et al., 2018). There is a particular danger in the amount of false information being spread on social media, as researchers have found that posts, regardless of the source of the poster or the information contained in the post, are often perceived as more credible if they have high user engagement (i.e., likes) (Borah & Xiao, 2018). When this false information is perceived as credible due to high user engagement, panic can quickly spread among groups and populations (Strekalova, 2017) or dangerous movements such as the anti-vaccination movement can be started (Jang et al., 2019). These studies shed light on the danger of blindly relying on social media for health information and emphasize the need for consumers to fact-check all the information they read, ideally with a health care professional.

Researchers have suggested that Rogers' (2003) Diffusion of Innovation (DoI) theory can explain how health information online is perceived and forwarded to others, which is important to understanding the validity of health information on social media (Record et al., 2018). According to Rogers (2003), innovation diffusion is a process whereby innovations spread via communication channels between and among members of a social system over time. The ultimate acceptance of innovations by members of the social system depends primarily on five user perceived innovation characteristics: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). The end result of this diffusion is

that people, as part of a social system, adopt a new idea, behaviour, or product. Record et al. (2018) argue that there are five key stages in applying the DoI theory to individuals' behaviours on social media: (1) obtaining knowledge (i.e., awareness of health information on social media); (2) persuasion (i.e., evaluation of health information); (3) decision making (i.e., intention to seek/not seek health information); (4) implementation (i.e., seeking of health information); and (5) confirmation (i.e., evaluation of information found). The researchers sampled Reddit users from a university population (n = 389), who were asked to complete online surveys in which they were asked about the frequency of their Reddit use, the frequency with which they seek health information on Reddit, and their perceived credibility of the found information. The researchers found that over 30% of Reddit users exist somewhere between the implementation (i.e., behavioral enactment) and confirmation (i.e., behavioral evaluation) phases of DoI with respect to health information. In other words, almost a third of users are enacting, exchanging, and evaluating health-related information sought on this platform. Interestingly, the findings of this study suggest that users who seek health information on the platform are likely to try to enact the found information regardless of whether or not they perceive the information to be credible. This suggests that there is a level of trust in the information found on Reddit such that it does not matter whether the source is credible, the advice is worth implementing. These results suggest that there is a growing population that is willing to accept much of the information found on social media without questioning it.

Pinterest

Social networking websites, such as Pinterest, are growing in popularity, and are gaining recognition as having the potential to reach diverse groups of individuals with health-related information (Paige, Stellefson, Chaney & Alber, 2015). Pinterest is a publicly accessible and free social networking website (www.pinterest.com) that only requires

development of a unique user profile to engage with the platform. On Pinterest, there are a variety of visual communication tools (e.g., videos, interactive games, photographs, maps, graphs, diagrams) used to convey information. In 2014, a large-scale US survey found that Pinterest is beginning to replace traditional search engines for many active Pinterest users, with 39% of Pinterest users indicating that they choose Pinterest over traditional search engines such as Google (Gilbreath, 2014). In light of the dynamic learning potential of Pinterest, this popular image-sharing social networking website could become an effective patient education resource for individuals with low health literacy and mental health difficulties. A recent study found that a significantly greater proportion of Internet users from traditionally medically underserved and hard-to-reach populations, including rural residents and individuals with an annual income less than $30,000 reported using Pinterest to obtain information about medical diagnoses (Duggan et al., 2015). There is research to suggest that women are more likely to use Pinterest as a resource, regardless of the topic (Paige et al., 2015); however, there is also research that shows women are more likely to use any type of social media to gather health-related information compared to men (Nikoloudakis et al., 2018).

Another target group that often uses Pinterest are teachers and school psychologists (Cleaver & Wood, 2018; Hall et al., 2018). A study by Schroeder, Curcio & Lundgren (2019) found that elementary school teachers used Pinterest to gather ideas for items such as project-based learning, anchor charts, worksheets, science explorations, workstations, crafts, opportunities for differentiation, and creative ways to save money as a teacher, whereas secondary teachers used Pinterest more to search for specific items such as primary-sources readings, novels, world maps, content-specific websites (e.g., French news), and interactive math notebooks. School psychologists have been reported to use Pinterest for finding

intervention materials and handouts, especially those of social-emotional and behavioral nature (Hall et al., 2018).

Recently, Pinterest was one of the first social media platforms to announce their intention to monitor pins related to widespread conspiracy theories, such as anti-vaccination and flat-earth believers. They have even gone a step further and have engineered their search algorithm to only show content from leading public health institutions, such as the World Health Organization (WHO), Centers for Disease Control (CDC), and American Academy of Pediatrics (AAP), when users look up search terms such as 'measles' and 'vaccine safety' (Pinterest, 2019). In 2020, during the global Covid-19 pandemic, Pinterest included any search terms related to 'Covid-19' to also only result in pins from leading public health institutions.

Usability of Pinterest

Users on Pinterest are able to search, virtually bookmark or "pin," important and relevant images from host webpages using an image placed on a "pinboard." Pinboards are topic-specific virtual bulletin boards that allow users to post, save, and share pins related to each pinboard's designated topic or purpose. Group pinboards enable collaborative sharing of pins among Pinterest users who join designated groups. These group-oriented pinboards are conducive to social interaction, because they allow Pinterest users with similar interests to connect with one another by repinning (i.e., sharing), commenting on, and liking content pinned on one common pinboard (Wilkinson, 2013). After entering keywords into a search bar, Pinterest yields lists of images associated with webpages relevant to the keyword search. Research suggests that searching for health-related information via image-based resources is preferred among individuals with limited health literacy skills, because it allows low-literate users to obtain search results without having to read and process an excessive amount of text (Mackert et al., 2009). Although Pinterest does not officially publish users' search habits or

their algorithms, a Pinterest software engineer, Jenni Liu, has explained in interviews that about 40% of pins on Pinterest are found through Pinterest's 'more like this' algorithm (Sehl, 2020).

A study by Paige, Stellefson, Chaney and Alber in 2015 examined the health information on Pinterest about Chronic Obstructive Pulmonary Disease (COPD). The authors evaluated 514 pins that related to COPD in any way and found that half of the pins were about self-help management for patients and that infographics and photographs of real people were more likely to be liked and re-pinned. These findings are important for researchers to understand, as they explain how patients obtain health information and the types of information and visual display that patients find most helpful. Using social media platforms such as Pinterest could be an effective way for clinicians and researchers to reach patients who have low literacy or who live in rural areas for the purpose of information dissemination. However, despite the usefulness of the findings with respect to patients' preferences, this study did not assess the accuracy of the information found on Pinterest.

As noted above, previous studies have examined the role of social media in the treatment and management of various other medical diagnoses, however no study (that we know of) has examined the availability and accuracy of information about LDs on social media platforms such as Pinterest. Since research has shown that teachers, school psychologists, and mothers are frequent Pinterest users and that these individuals often provide the majority of support to students with LDs, it is important to investigate the availability and credibility of LD-related information on Pinterest, as well as user engagement with this information. Of specific interest are topics such as general information (e.g., signs/symptoms, diagnosis, terminology used) and management (e.g., interventions, resources). Gaining an understanding of the information availability and accuracy of LD-related information on Pinterest could assist clinicians in understanding how their

patients/clients obtain information and how to better communicate about EBP to various groups.

Summary

LDs are a widespread phenomenon in modern societies and schools report rising numbers of students who have an LD diagnosis. With these rising numbers, understanding how social media may be a resource to parents and teachers has become crucial. Research has shown that Pinterest has become a resource for individuals who are seeking out health-related information. It is important for researchers and clinicians to understand where children and families affected by LDs obtain information about these disorders and how to effectively communicate evidence-based information to these target groups. Understanding whether the information about LDs presented on Pinterest is evidence-based could help clinicians understand where their patients may be getting their information. This understanding could lead to more effective clinician and researcher engagement with sites such as Pinterest. To our knowledge, no researchers have explored how Pinterest can be used as a health resource for LDs. With this in mind, the current study examined the availability and accuracy of information about LDs on Pinterest with the goal of developing recommendations about how clinicians and researchers can educate families and teachers on the topic of LDs.

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CHAPTER TWO

Pinterest as a Resource for Health Information on Learning Disabilities: A Social Media Content Analysis

Increasingly, the internet is being used as a health resource, at times even as a substitute for seeking out a health professional's opinion (Basch et al., 2018; Fergie et al., 2013; Phillips, 2020). In particular, user-generated content on social media websites provides instant access to other people's experiences of a variety of health issues (Centola, 2013). When people use social media as a health resource, they have a variety of information at their disposal that is easily accessible, available, and free of charge. With the availability of countless health resources online, people are now managing health issues more independently and seeking information frequently for themselves and for others, especially when access to care is limited (Bhandari et al., 2014; Bratucu et al., 2014). In 2014, a large-scale US survey found that Pinterest is beginning to replace traditional search engines, with 39% of Pinterest users indicating that they choose Pinterest over traditional search engines such as Google (Gilbreath, 2014). With this in mind, exploring the availability and reliability of health information on Pinterest is becoming of increasing importance to researchers and clinicians.

Pinterest as a Health Resource

Pinterest is a social medium which is growing in popularity and is gaining recognition as having the potential to reach diverse populations with health-related information (Paige, Stellefson, Chaney & Alber, 2015). Users on Pinterest are able to search virtually for any keyword. After entering keywords into a search bar, Pinterest yields lists of images associated with webpages relevant to the keyword search. On Pinterest, there are a variety of visual communication tools (e.g., photographs, infographics, checklists, graphs, diagrams) used to convey information. Although Pinterest does not officially publish users' search habits or their algorithms, a Pinterest software engineer recently explained in interviews that

about 40% of pins on Pinterest are found through Pinterest's 'more like this' algorithm (Sehl, 2020).

Research suggests that searching for health-related information via image-based resources is preferred among individuals with limited health literacy skills because it allows low-literate users to obtain search results without having to read and process an excessive amount of text (Mackert et al., 2009). A recent study found that a significantly greater proportion of Internet users from traditionally medically underserved and hard-to-reach populations, including rural residents and individuals with an annual income less than $30,000 USD reported using Pinterest to obtain information about medical diagnoses (Duggan et al., 2015). Other groups that frequently use Pinterest are women, mothers (Paige et al., 2015), teachers, and school psychologists (Cleaver & Wood, 2018; Hall et al., 2018). A study conducted by Schroeder, Curcio & Lundgren (2019) found that teachers use Pinterest to gather ideas for items such as worksheets, science explorations, and strategies for differentiation. School psychologists have been reported to use Pinterest for finding intervention materials and handouts, especially those of social-emotional and behavioral nature (Hall et al., 2018).

This shift towards using Pinterest to search for and consume health information means that Pinterest currently provides general health information and information about interventions for various health and mental health conditions, including a very common disorder in the field of education: Learning Disabilities (LD). With Learning Disabilities (LD) becoming an increasing phenomenon in the educational system and constituting the largest field of special education in North America (Benson et al., 2019), it is important that the availability and reliability of LD-related information on Pinterest be explored. This is particularly important considering Pinterest's target audience includes parents, teachers, and school psychologists.

Learning Disabilities

A Learning Disability is a disorder which affects a person's ability to learn effectively, despite average to above average thinking and reasoning abilities (Learning Disability Association of Canada, 2017). In Canada, the estimated prevalence of LDs among children is approximately 3.2% (Learning Disability Association of Canada, 2017). In the United States, during the 2015–2016 academic year, 34% of children and youth who received special education and related services in schools had an LD as their primary disability (National Centre for Education Statistics, 2018). Most commonly, LDs affect a child's reading, written expression, and mathematical abilities. These three forms or types of LD are sometimes referred to as dyslexia, dysgraphia, and dyscalculia.

The field of LD assessment and diagnosis remains very controversial, due to varying definitions, diagnostic approaches, and intervention approaches. Although researchers and clinicians agree that an LD is a disorder resulting in academic impairments despite average intellectual abilities, there remain inconsistencies in terminology. Whereas the Learning Disabilities Association of Canada (LDAC, 2017) uses the term *Learning Disability*, the Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5) does not use the term *Learning Disability*, but rather *Specific Learning Disorder* (SLD; APA, 2013). The various terms used when describing a student with an LD (e.g., LD, SLD, dyslexia, reading disability) can make it difficult for parents and teachers to find scientifically valid information when researching the disorder online.

A further difficulty for parents and teachers trying to understand and find resources in the field of LDs is the lack of evidence-based treatments/available for these disorders. In the health field, professionals refer to interventions that have been shown to be consistently effective based on research findings published in the peer-reviewed scientific literature as evidence-based interventions (EBI) or, more broadly, as evidence-based practices (EBP)

(CPA, 2012). One of the few LD interventions considered to be evidence-based is Direct Instruction (DI; Wieber et al., 2017). DI is a model for teaching that emphasizes well-developed and carefully planned lessons designed around small learning increments and clearly defined and prescribed teaching tasks (Swanson, 1999). This intervention has mostly been shown to be effective in youth with LDs that affect reading, rather than youth with LDs that affect mathematics and writing (Ritchey, 2011). DI builds on the assumption that when a student does not learn, it does not necessarily indicate a shortcoming in the student but could also be due to ineffective instruction.

Despite the importance of EBP to health- and mental healthcare professionals, many parents, teachers, and school psychologists are not familiar with the idea and importance of EBPs or the types of EBPs needed/available, leading to a lack of such interventions in schools (Van der Heyden, 2018). A recent study of American teachers found that many do not receive any training in EBPs and only few have access to professional development sessions on EBP (Cooper et al., 2018). With the ease of which information is accessible, as well as a lack of familiarity with accurate scientific information, it can be difficult for Pinterest users to differentiate between information that is scientifically supported, versus information that can be considered pseudo-science (Dutton et al., 2013; Phillips, 2020). One study found that parents and teachers report three main barriers to accessing health information for their children and students: (1) trustworthiness (i.e., how confident are they in the research that is conducted); (2) usability (i.e., practicality of a practice); and (3) accessibility (i.e., how easy the information is to obtain) (Carnine,1997).

Previous studies have examined the role of social media in the treatment and management of various other medical diagnoses, however no study (that we know of) has examined the availability and accuracy of information about LDs on social media platforms such as Pinterest. Since research has shown that teachers, school psychologists, and mothers

are frequent Pinterest users and that these individuals often provide the majority of support to students with LDs, it is important to investigate the availability and credibility of LD-related information on Pinterest. Of specific interest are topics such as general information (e.g., signs/symptoms, diagnosis, terminology used) and management (e.g., interventions, resources). Gaining an understanding of the information availability and accuracy of LD-related information on Pinterest could assist clinicians in understanding how their patients/clients and/or colleagues obtain information and how to better communicate about scientifically accurate information to various groups. With this in mind, the current study examined the availability and accuracy of information about LDs on Pinterest with the goal of developing recommendations about how clinicians and researchers can educate families and teachers on the topic of LDs.

Current Study

This exploratory study examined both quantitative and qualitative properties of pins on Pinterest. Quantitatively, this study examined (1) the types of LD information presented on Pinterest LD group pinboards; (2) the types of embedded visual communication tools presented within Pinterest LD pins; and (3) whether embedded visual communication tools presented within Pinterest LD pins varied by categories of LD information. Qualitatively, this study examined (1) the scientific accuracy of information presented in the pins; (2) types of information generated when searching for information on LDs; and (3) the accuracy of LD representation within the images and tone of the pins. Based on previous research, it was expected that there would be limited scientific accuracy in the pins, a vast amount of information not necessarily relevant to LDs, and a skewed representation of LDs due to the amount of inconsistencies and controversies in the LD research.

Method

Research Design

The methodology of this exploratory study is based on a study conducted by Paige, Stellefson, Chaney and Alber (2015), although Paige et al.'s (2015) coding rubric was modified to fit the area of LD and the method by which parents and teachers might search for information on Pinterest. Although Paige et al.'s (2015) methodology was followed closely at first, it became clear that the likely search method of many parents and teachers would yield different search results than our methodological approach. Hence, the measures and procedures were adapted accordingly. Both methodological procedures are described below.

Measures

Coding Rubric

The researchers designed a coding rubric, closely aligned with the coding rubric used by Paige et al. (2015), with which the data were coded. The coding rubric initially included four primary variables: (1) category of information on LD; (2) embedded visual communication tool(s); (3) engagement metrics (i.e., comments and/or likes); and (4) evidence-based information.

Category of Information on LDs. To classify the type of LD information present on each pin, two categories of information were used: (1) general information and (2) intervention information. General health information on LD was identified using the following 6 subcategories: (1) causes; (2) signs/symptoms; (3) diagnosis; (4) complications; (5) awareness; and (6) other. Information on LD intervention was identified using the following three subcategories: (1) reading interventions; (2) writing interventions; and (3) mathematics interventions. A dichotomous scale was used to record whether each category of information was present (1) or not present (0) on each retained pin.

Embedded Visual Communication Tool(s). Based on Paige et al.'s (2015) coding rubric, ten mutually exclusive categories of embedded visual communication tools were decided upon: (1) graph; (2) map; (3) table/chart; (4) infographic; (5) photograph of real person/people; (6) photograph of an item; (7) checklist; (8) comic/drawing; (9) diagram; and (10) other. A dichotomous scale was used to record whether each embedded visual communication tool was embedded (1) or not embedded (0) on each pin.

Engagement Metrics. Engagement is a key performance indicator that measures the level of action undertaken by followers of a social media channel (Lehmann et al., 2018). In this study, engagement was measured as the number of comments on each pin. However, given that there were no comments on any of the selected pins, this variable was removed from the final analysis.

Evidence-Based Information. Whether the information provided in a pin is evidence-based was coded by using a dichotomous scale, (1) evidence-based, (2) not evidence-based. If the information in a pin refers to direct instruction of foundational skills, it was considered evidence-based. However, as only very few of the pins were in reference to potential interventions, it was decided that it was best to remove this variable and instead examine how scientifically accurate the information in the pins is within the qualitative descriptive analysis. By discussing the scientific accuracy in qualitative terms, there was a greater amount of interpretations and clinical implications to be drawn from the results.

Qualitative Information. To better understand the type of information that can be found by parents and teachers on Pinterest, all pins, including those that were excluded for a lack of key words, were included in the qualitative examination of pins. There were three main qualitative areas by which the pins were examined: (1) the scientific accuracy of information presented in the pins; (2) types of information generated when searching for information on LDs; and (3) the accuracy of LD representation within the images and tone of

the pins. To examine the scientific accuracy of the information in the pins (e.g., statistics/epidemiology, intervention suggestions, symptom checklists, and adaptations), the information was cross-referenced with peer-reviewed studies. To examine the types of other information being presented in the pins, all pins were categorized by the topic or diagnosis mentioned in the pin. Following, the pins were examined by the most common topics or diagnoses by looking at the frequency statistics. Finally, examining the representation of LDs in each pin was the most subjective component of the examination; pins were examined according to whether the tone of any wording or any images used in the pins accurately represented a student with an LD.

Procedure

Inclusion/Exclusion Criteria

To meet inclusion criteria, pins were required to have active web links and the content on each pin had to present general LD information or LD intervention information. General LD information referred to content about the factors that define and contribute to the incidence of LD and intervention information referred to information about skills or behaviors used by patients to manage LD symptoms. Pins were excluded if the text on a pin's image or user-generated caption was not written in English. Pins were excluded if at least one of the following keywords was not included in the pin: "LD," "Learning Disability", "reading disability", "writing disability", "math disability", "dyslexia,", "dysgraphia", and "dyscalculia." Pins were coded based on the coding system described below.

Original Pin Selection Procedure

Based on Paige et al.'s (2015) methodology, a nonprobability census sampling method was used to collect pins from the 10 LD group pinboards with the greatest number of followers. The researcher identified the 10 most followed LD group pinboards after entering

in the keyword “Learning Disability” using the main Pinterest search bar. Each of the 10 LD group pinboards was reviewed to collect the final sample of pins.

Since this was an exploratory study, the methodological process was an iterative process that was adapted throughout the data collection. The sampling of pins through group pinboards led to a skewed sample with very little variability in information, as these pins were mostly all from the sameag0 G[7(ns)-6(ke)7-6<00520055004700[7(ns)-6(ke)7-6<00520055u612r] TJrn

Descriptive Statistics

A non-probability census sampling procedure was used to sample 369 pins on June 3, 2020. These pins consisted of the first 123 pins that resulted when searching the term "Learning Disabilities" on Pinterest, as well as 246 additional pins generated by Pinterest's algorithm within the first 123 pins. Each of the pins were reviewed to collect the final sample of pins (N = 91). As shown in Figure 1, 240 pins were excluded because they did not contain any of the key words, 32 pins were excluded for lacking written information in the pin, nine pins were excluded due to duplication, and one pin was excluded as it was not written in English.

The most common type of LD mentioned in the pins was dyslexia (i.e., reading disability; n=35), followed by pins that did not mention a specific type of LD, but were rather about LDs in general (n=27). Pins on dysgraphia (i.e., writing disability; n=15) and on dyscalculia (i.e., math disability; n=8) were less common. It is noteworthy that nonverbal LDs were mentioned in several (n=6) pins.

Quantitative Findings

Types of LD Information on Pinterest. Over half of the of pins presented general information about LDs, whereas a little over a quarter of pins presented information about LD interventions. The majority of pins presenting general information about LDs included signs/symptoms, followed by awareness, causes, complications, and diagnosis. The "other" category for general information about LDs included pins related to celebrities who have an LD (n=3; 4.8%), writing samples of students with an LD (n=2; 3.2%), information about conditions that are often comorbid with LDs (n=2; 3.2%), and common myths about LDs (n=1; 1.6%). The percentage of pins in each information category can be found in Table 1.

Embedded Visual Communication Tools Used on Pinterest. Of all embedded visual communication tools considered, infographics were the most commonly used. The

other two most common visual communication tools used were photographs of real people and checklists of symptoms. In the photographs of real people, children (*n*=14; 87.5%) were depicted far more often than adults (*n*=2; 12.5%). The distribution of pins by visual communication tools can be found in Table 2.

Embedded Visual Communication Tools by Category of LD Information. An examination of the distribution of communication tools by category of LD information indicated that infographics were used most often to present general health information about LDs. Infographics were more likely to be used to represent general health information than LD intervention information, χ_2 (1, *n*=91) = 2.9, *p* = 0.086. Checklists were more commonly used to represent general health information than LD intervention information, χ_2 (1, *n*=91) = 4.3, *p* = 0.037. Pins with a photograph of a real person were more likely to be used to represent LD intervention information than general health information, χ_2 (1, *n*=91) = 9.2, *p* = 0.002. Table 3 shows the distribution of embedded visual communication tools by categories of LD health information among pins.

Qualitative Findings

Scientific Accuracy of Information. Two key areas of scientific accuracy of LD information in pins were examined qualitatively: (1) whether the information in the pin was scientifically accurate and (2) whether any of the scientifically inaccurate information presented could be harmful to a student with an LD. For the majority of the pins, the information appeared to be consistent with recent peer-reviewed studies and was thus considered to be scientifically accurate. However, approximately 9% of pins (*n*=8) recommended forms of intervention for LDs which are not considered to be EBI. The two most common scientifically inaccurate interventions for LDs found were working memory (WM) exercises and physical reflex training (i.e., the retained asymmetrical tonic neck

reflex). The information in these pins implied that WM exercises and physical reflex training can improve or alleviate the symptoms of an LD.

Information Contained in Excluded Pins. From the original 369 sampled pins, 240 pins were excluded for not containing one of the target words in the pin itself or in the title of the pin. In an effort to understand what users would find when searching LDs on Pinterest, these excluded pins were categorized by overarching thematics and the diagnostic areas referred to in each pin was examined. It was difficult to establish overarching themes, as many of the pins addressed individual niche-diagnostic areas (e.g., vision milestones, hemisphere localization). The five themes that stood out, however, were Attention Deficit Hyperactivity Disorder (ADHD), Executive Functioning (EF), Special Education, Working Memory (WM), and Autism Spectrum Disorder (ASD). About 9% (*n*=20) of excluded pins were exclusively about ADHD, 6% (*n*=13) about EF, 4% (*n*=8) about Special Education, and 3% (*n*=7) about WM and ASD respectively. It is important to note that, among the included pins, the themes of ADHD, EF, Special Education, WM, and ASD were often present in addition to LDs (e.g., LD & ADHD). ADHD was the most common theme to emerge in the excluded pins, as well as with LD topics in the included pins. It is also noteworthy that a number of the visuals used in the excluded pins were of children with visually identifiable/physical disabilities, such as Down Syndrome. Finally, although never explicitly mentioned by name, six pins (2.5%) alluded to Intellectual Disability (by, for example, suggesting educational adaptations/recommendations that are typically used for students with an Intellectual Disability).

Accuracy of LD Representation. Overall, most of the images in the included pins depicted a seemingly typical child with an LD (i.e., a neurotypical-looking student). Furthermore, the tone of the written information was very informative and had little emotionally-loaded terminology/phrases (e.g., statistics and tips on how children with LDs

can succeed rather than any life-long struggles children with LDs will/may face). However, six pins depicted the typical LD student inaccurately and could therefore potentially induce fear in the target audience. Information in these pins was determined to be inaccurate due to the fact that pictures, text in the pins, and captions of the pins conveyed information about LDs that was not necessarily true. For example, the captions of three pins appeared to describe the author's own opinions or anecdotal experiences but were written in such a way as to convey generalizability and scientific accuracy. Specifically, two pins implied that school boards and systems do not consider an LD diagnosis sufficient for students to access supports. One pin suggested that the diagnostic process is far more complicated than it actually is, that an Occupational Therapist is needed to carry out a gross-motor assessment, and that only a Clinical Neuropsychologist can perform an LD assessment. Not only is this information incorrect, but it could also induce fear in parents or teachers who are trying to better understand LDs. Some of these statements may be true for individual parents and students: however, contrary to the impression provided in the pins, it cannot necessarily be generalized to all parents and students.

With respect to the images that were pictured in some of the pins, most of them were either of young children or celebrities who have spoken out about having an LD. However, among excluded pins, several depicted children with Down Syndrome or other visually noticeable disabilities. This could lead parents who are searching for LD-related pins to believe an LD is comparable to diagnoses that are pictured in those images, that LDs are a result of a known genetic/chromosomal abnormality or that LDs are equivalent to an intellectual disability.

Discussion

This study investigated how LDs are presented on Pinterest to better understand the type of information parents and teachers might find when they search LDs on Pinterest.

Based on previous research (e.g., Gage-Bouchard et al., 2018; Swire-Thompson & Lazer, 2019), it was expected that there would be limited scientific accuracy in the pins, a vast amount of irrelevant information in pins, and a skewed representation of LDs due to the amount of inconsistencies and controversies in the LD research.

The majority of the content in the included pins was related to general information about LDs such as symptoms, prevalence rates, and hypothesized causes. This finding is contrary to the findings of an earlier study examining information related to COPD on Pinterest (Paige at al., 2015), which found that the majority of pins contained specific information about self-management or intervention. These opposing findings could be due to the nature of the disorders, as COPD requires more self-interventions (Stellefson et al., 2012) than an LD does. In the field of LDs, there might be less medical and clinical long-term guidance for students with LDs and/or their parents and teachers, leading them to require more general information on LDs. This more general health information can be useful to form a solid foundation of understanding for parents or teachers looking to understand and potentially help children with LDs (Silver, 1984). Most commonly, pins contained checklists listing symptoms of LDs, thereby allowing users to determine whether they or their child/student might meet the diagnostic criteria for an LD. This finding is consistent with those of previous researchers who have found that an increasing number of websites and social media platforms (e.g, WebMD, Reddit) allow for self-diagnosis (Lewis, 2016; Ryan & Wilson, 2008). From a collaborative care perspective, it is helpful for patients and clients to have ready access to health information; however, this can be problematic if patients do not seek further professional support and guidance after self-diagnosing. Seeking professional support is especially important in the field of LDs, as a clinician's diagnosis is typically required to access educational supports and/or adaptations. It is therefore important that parents and teachers who find LD symptom checklists on Pinterest go a step further to seek

out a clinician's support in making an accurate diagnosis. Although the current study did not examine information on websites linked to included pins, it would be beneficial for these websites to clearly and accurately state how students are assessed, how an LD diagnosis is made, and who is qualified to make the diagnosis.

Infographics were the most used visual communication tool for all sampled pins. Infographics can give users a simple, yet organized and informed overview of information. This can be particularly useful to parents and teachers, as infographics can enhance the comprehension of informational or instructional information among low-literate LD populations. Roberts and colleagues (2008) reported that even when health care providers present all necessary information to patients, patients often experience difficulty understanding the sheer volume and complexity of information and instruction. By presenting LD-related information on Pinterest through infographics, parents and teachers are provided with a general overview or refresher of information that might have been previously presented by a clinician. Furthermore, pictures of children were often used in the background of pins. Since LDs constitute the largest field of special education in North America (Kavale & Forness, 2006), it is most likely that, considering the target audience of Pinterest, users are searching the for LD-information for their child or their students. By having a picture of a child in the pin, parents and teachers may feel more drawn to these particular pins. Although user engagement was not measured in the current study, previous studies have found that Pinterest users searching for medical information often feel more drawn to pins that have pictures of people in them (Neiger at al., 2012).

Despite previous reports documenting the vast amount of inaccurate health information on the internet and social media (e.g., Swire-Thompson & Lazer, 2019), the findings of this study indicated that there was very little misinformation concerning LDs on Pinterest. This finding showcases how using social media, namely Pinterest, can be used as a

health resource. There are many benefits to using Pinterest to collect information on LDs, such as the low literacy skills required to browse Pinterest, the ease of access, the volume of information available, and being able connect with others who may be affected by LDs. Furthermore, since each pin has a website or blog linked to it, Pinterest can be a good place to start gathering health information and gathering more specific information by accessing the linked websites. However, it is wise to approach pinned information cautiously, as not all pins may be scientifically accurate. The ability to distinguish between scientifically valid and invalid information can be of great benefit when using Pinterest as a health resource. In this study, there were eight pins that included scientifically inaccurate information related to interventions that could alleviate LD symptoms (i.e., working memory exercises and physical reflex training); however, there is no research to suggest that either of these interventions are effective in treating symptoms or hypothesized causes of symptoms of an LD. Currently, the only evidence-based intervention for LDs is Direct Instruction in the affected academic area(s) (Wieber et al., 2017). For example, direct systematic instruction in phonics has been shown to be effective for students with LDs in the area of reading (Jeffes, 2016). Despite the lack of evidence for the effectiveness of the interventions listed in some of the included pins, it is important to note that the interventions listed are likely not directly harmful to a child, although they could result in a child not receiving appropriate interventions and falling further behind academically.

Several pins implied inaccurate information regarding the diagnostic process of an LD, namely that only a neuropsychologist can perform the required psychoeducational assessment or that an Occupational Therapist (OT) must complete a gross-motor assessment as part of the diagnostic process. Whereas OTs often complete motor assessments and neuropsychologists can complete psychoeducational assessments, they are not required for an LD assessment; typically, school or clinical child psychologists perform LD assessments

(Maki et al., 2018). This misinformation could cause parents to doubt the professional who conducted their child's LD assessment. Overall, however, results of the current study are encouraging and provide a reason for cautious optimism, as the majority of the information reviewed in the included pins was found to be scientifically valid. Interestingly, Pinterest has recently announced their intention to closely monitor their content for clear conspiracy theories and "fake news" (Pinterest, 2019). This emphasizes that monitoring content and publishing clear guidelines for content can be an effective strategy to combat scientifically invalid information, and as a result allows Pinterest to be used as a reliable health resource.

When examining excluded pins, it was apparent that many pins did not necessarily contain information relevant to LDs. Although many of the excluded pins were related to the field of educational resources and other diagnoses that can affect a child's ability to learn (e.g., ADHD), users could easily feel overwhelmed by the amount of unnecessary information resulting from a search for information about LDs. Furthermore, although the excluded pins may have all been scientifically valid with respect to the information presented, parents and teachers finding such pins might not be able to differentiate between relevant and irrelevant pins. Research has found that internet users with limited health literacy often do not benefit from internet health searches, as they have difficulty filtering important information out of a sea of information (Yom-Tov et al., 2016). Many parents and teachers using Pinterest as a primary resource for information about LDs might have limited health literacy in the field of LDs. This concern is amplified by the presence of pins that did not represent LDs accurately (e.g., use of photos of children with visible disabilities such as Down Syndrome); although many pins with inaccurate visual representation of LDs might contain useful information, parents could become unnecessarily worried or confused by depictions of children with more severe forms of intellectual and/or physical disability.

Limitations

There were two limitations to this exploratory study. First, because only the image of each pin and not the associated text or linked content was considered when analyzing each pin, it was not possible to determine the users' intentions for pinning the content, nor was it possible to determine the accuracy of linked website content. Future research should explore the accuracy and consistency of linked websites on LD-related content displayed via various visual communication tools. For example, reading recommendations for students with a reading disability include direct phonics instruction (Jeffes, 2016; Shapiro & Solity, 2008). However, Pinterest users with LD or children/students with LDs may obtain, share, and act upon inaccurate, ineffective or dangerous recommendations that may lead to no improvements or even detrimental outcomes. Therefore, future research should further explore the accuracy of intervention recommendations represented by embedded visual communication tools and linked websites.

Second, this study did not use a second coder to code and examine qualitative data, meaning that it was not possible to examine reliability of qualitative codes assigned to each pin. Thus, the qualitative data may be biased to a certain extent. This was a result of a feasibility issue; however, the purpose of qualitative description is to aim for transparency and objectivity. Hence, the researcher's confidence in the results is high. Future studies would benefit from having multiple researchers code the qualitative data to obtain interrater reliability, nonetheless.

Future Research

This study did not explore how users interpreted or viewed certain pins. Researching which pins are seen as particularly interesting or tailored to users' searches could help clinicians create pins and more effectively communicate with their target audience of parents and teachers. In this study, engagement metrics were not assessed, as all sampled pins had

zero user interaction (i.e., likes). Hence, there was no way of examining which types of pins drew in larger amounts of users. Future research could sample a group of parents and teachers and interview them about what they look for in health-related pins, how they rate the different type of embedded visual communication tools, and how they evaluate the scientific accuracy of the pins in real-time.

Implications for Clinical Practice

It has been established that many users access social media to gather health information (Basch et al., 2018); therefore, it is of growing importance that clinicians understand the types of health and mental health information being presented on social media platforms such as Pinterest. A greater understanding of the type of information presented on Pinterest could allow clinicians to spread information more effectively through Pinterest as well as aid clinicians' understanding of how their patients access information. Considering that many parents and teachers, who are often tasked with finding and/or implementing interventions for LDs, use Pinterest, it could easily be a platform that clinicians use to spread awareness for LDs and communicate scientifically-valid information effectively. Although Pinterest has started to implement stricter guidelines on the spread of misinformation (e.g., anti-vaccine propaganda), it is still possible that inaccurate information could be spread on this platform, either deliberately or not deliberately. If clinicians can better understand the type of information on social media and the types of visual communication tools preferred by users, they could use this knowledge to communicate with their patients more effectively. Previous research has found that physicians can use social media to counter false information by sharing information on Twitter and Facebook (Stukus & Patrick, 2020; Tutelman et al., 2018). For example, a survey from 2012 found that a majority of physicians surveyed found social media to be a beneficial, engaging, and convenient source for high-quality information and a way to care for their patients more effectively (McGowan et al., 2012). Overall,

Pinterest may be the ideal social media platform to reach out to a large-scale audience to effectively communicate LD information.

In the field of LDs, it is especially important for clinicians to engage in meaningful and frequent conversations about LDs with parents, students, and teachers. Additionally, clinicians should be aware of good online sources of information about LDs and should be able to point clients to these sources should they wish to conduct independent research or find additional resources. There is a great deal of variability with respect to terminology used to define and describe LDs; this was reflected in the pins included in this study and suggests that clinicians must ensure that parents and teachers understand some of the challenges related to LD diagnosis and description. By being provided an informative overview of LDs by a clinician who is aware that parents likely will do their own research at home, many of the concerns raised about online health research could potentially be minimized. For example, parents who know which terms to use when doing online research or parents who are provided with information about how to evaluate the accuracy or reliability of online would be at an advantage when using social media platforms or Internet search engines to find information about LDs. It is important, therefore, that health care providers do their own research online to have a better idea of what parents may be finding on Pinterest.

Conclusion

Very little research exists on the role of social media as a health resource, despite the knowledge that social media platforms such as Pinterest have become popular vehicles for the dissemination of health information over the past decade (Pizzuti et al., 2020). This is the first study (that we know of) to examine how information about LDs is presented on Pinterest. The findings are particularly important, as Pinterest has about 335 million users worldwide (Pinterest, 2020), with many of them using Pinterest as a health resource. The finding that the large majority of LD pins are scientifically valid is promising. This study will

hopefully be the basis of future research which will examine how users take advantage of Pinterest as a health resource and how they evaluate the pins they find, so that clinicians can better communicate and promote scientifically valid information. Overall, results of this study could be used to enhance health care providers' understanding of the type of LD information available on Pinterest, meaning that they can be better prepared to combat false information and, ultimately, ensure that children challenged by LDs are provided with timely and evidence-based assessment, diagnosis, and intervention.

Figure 1

Search Strategy for Included Pins

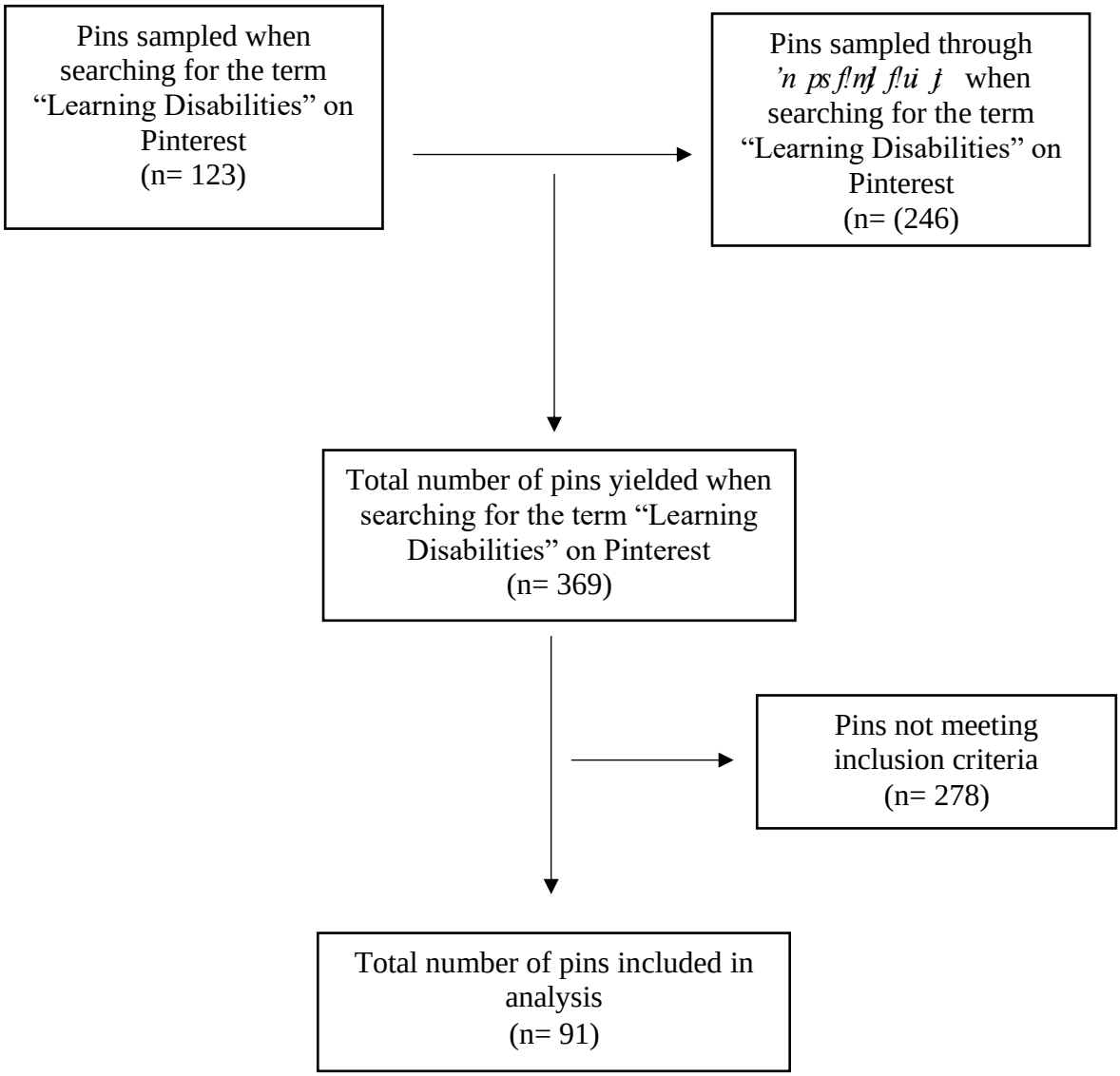

Table 1

Percentage of Pins that Display LD Intervention Information and General Health Information on LDs

Categories of Health Information on LD	N (%)
LD Intervention Information	28 (30.8)
General Health Information on LD	63 (69.2)
Causes	5 (5.5)
Signs/Symptoms	48 (52.7)
Diagnosis	1 (1.1)
Complications	2 (2.2.)
Awareness	23 (25.3)
Other	8 (8.8)

Table 2

Distribution of Embedded Visual Communication Tools among Pins

Embedded Visual Communication Tools	N (%)
Graph	0 (0)
Map	1 (1.1)
Table/Chart	3 (3.3)
Infographic	48 (52.7)
Photograph of real person	16 (17.6)
Photograph of other	8 (8.8)
Checklist	14 (15.4)
Comic/Drawing	3 (3.3)
Diagram	0 (0)
Other	2 (2.2)

Table 3

Distribution of Embedded Visual Communication Tools by Categories of LD Health Information among Pins

Visual Communication Tools Used to Depict Heath Information on LD	Categories of Health Information on LD	
	LD General Health Information	LD Intervention Information
	n (%)	n (%)
Map	1 (1.1)	0 (0)
Table/Chart	2 (2.2)	1 (1.1)
Infographic	37 (40.7)	11 (12.1)
Photograph of real person	6 (6.6) *	10 (10.9)
Photograph of other	4 (4.4)	4 (4.4)
Checklist	13 (14.3)*	1 (1.1)
Comic/Drawing	2 (2.2)	1 (1.1)
Other	1 (1.1)	1 (1.1)

Note. *$p < .05$, two-tailed.

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