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Developmental dyslexia: emotional impact and consequences

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ABSTRACT

Learning disabilities are associated with mental health, behavioural and social difficulties. Developmental dyslexia is a particularly salient example of a learning disability that is associated with social and emotional consequences that are not considered primary features of the disorder. These issues can remain and, in some cases, escalate in adulthood. Practitioners should be made aware of the consequences of the emotional impact of such learning disabilities. The following is a comprehensive review of over 100 journal articles investigating the emotional consequences of developmental dyslexia. Articles published between 1980 and 2018 were found using keywords "dyslexia" and "emotion" or "internalizing behaviour", "externalizing behaviour", "depression" or "anxiety". This review provides an overview of the literature investigating the emotional consequences of developmental dyslexia and suggestions to avoid or at least minimize these consequences on the individual, their family and society are provided.

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Developmental dyslexia is a learning disorder characterized by severe difficulty with the accuracy and/or fluency of word and/or pseudoword reading. The diagnosis is noted in the DSM-5 as a specific learning disorder with impaired reading (American Psychiatric Association, 2013). The definition typically includes inaccurate or slow and effortful reading. The DSM includes behavioural observations such as difficulty sounding out words, reading aloud incorrectly or hesitantly, poor decoding and poor spelling (American Psychiatric Association, 2013). Developmental dyslexia has been associated with genetic, brain structure and function, neurocognitive and environmental factors (Peterson & Pennington, 2015). The diagnosis can be accompanied by secondary difficulties in other aspects of learning such as reading comprehension, or mathematics reasoning (De Clercq-Quaegebeur, Casalis, Vilette, Lemaitre, & Vallée, 2018).

There may be a profound impact of developmental dyslexia on the individual. Developmental dyslexia has been associated with depression, anxiety, lower self-esteem, attention deficits and often, behavioural problems (Arnold et al., 2005; Boyes, Leitao, Claessen, Badcock, & Nayton, 2016; Carroll & Iles, 2006; Daderman, Nilvang, & Levander,

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2014; Kempe, Gustafson, & Samuelsson, 2011; Huc-Chabrolle, Barthez, Tripi, Barthelemy, & Bonnet-Brihault, 2010; Knivsberg & Andreassen, 2008; Mammarella et al., 2014; Mugnaini, Lassi, La Malfa, & Albertini, 2009; Parhiala et al., 2014; Riddick, Sterling, Farmer, & Morgan, 1999). Practitioners should be made aware of the far-reaching emotional, behavioural and social aspects of having dyslexia on the individual, families and society. The impact of learning disabilities is consistently described in the literature as negative (Arnold et al., 2005; Doikou-Avlidou, 2015; Hellendoorn & Ruijssenaars, 2000; Humphrey & Mullins, 2004; Mammarella et al., 2014; McNulty, 2003; Riddick et al., 1999; Siegel, 2013, 2016); however, some individuals are able to attribute resilience (Shessel & Reiff, 1999) or empathy and understanding (Riddick, 2003), suggesting that with support learning disabilities do not have to be interpreted negatively or have negative emotional consequences.

Developmental dyslexia has been associated with negative emotional and social consequences. However, there is little known about the impact of these consequences at the individual, family and societal level. Although the literature on dyslexia is extensive, the role of emotion in the outcomes of developmental dyslexia has not been clarified. Understanding the role of emotion in the relationship between dyslexia and negative life outcomes will provide one avenue for prevention of such outcomes. As such, this review aims to identify the role of emotion in outcomes for individuals with developmental dyslexia according to the current body of literature and to evaluate the cost associated with these outcomes. A broad search was conducted to evaluate the status of the current literature in developmental dyslexia, to identify areas where more work may be needed to clarify this relationship, and to assess and provide suggestions for avenues to minimize the costs of dyslexia for individuals, their families and society. Remediation and intervention are used interchangeably throughout the manuscript, referring generally to methods of minimizing difficulties associated with developmental dyslexia. This review focuses on developmental dyslexia as it is well studied and does not have emotional symptoms as a core feature. We narrowed our focus to this particular learning disability, though the principles may not be specific to developmental dyslexia.

Method

Articles were found with a search using the most reliable research search engine PubMed, but also Google Scholar and PsycINFO, using the keywords “dyslexia”, and “emotion”, or “internalizing behaviour”, “externalizing behaviour”, “depression” or “anxiety”. Bibliographies from selected articles were consulted to identify additional studies. Those that investigated the impact of developmental dyslexia on emotional or social functioning published from the years 1980 to 2018 were selected for review. Additional searches revealed current practices or potential techniques to minimize the reviewed consequences. Peer-reviewed articles were included with the exception of two theses, which provided the first investigation of the relationship between emotion and executive function and into stereotype threat in a dyslexic population. Hand searches were used to follow-up on these theses. Specific journals were not consulted and articles were not excluded to provide a full overview of the current literature available on the emotional consequences of developmental dyslexia. Ninety-seven articles were selected on these criteria and categorized in a comprehensive table (Table 1). Articles were separated into sample age group and emotional or functional outcome measure to

Table 1. Literature search for emotional consequences of developmental dyslexia.

	Article	Age Group	N	Learning Disability	Issue
		Children/Youth			Self/Emotion
		Adolescents/Young adults			Behaviour
		Adults			Social/Relationships
		All			Work/School
					Cognition
					Other
Reviews/Meta-analyses	Elbaum and Vaughn (2001)	ChiLearning disabilitiesren & Adolescents		Learning disabilities	Self
	Wiener (2004)	Children		Learning disabilites	Social
	Gabrieli (2009)	Children		Dyslexia	Other (brain imaging)
	Huc-Chabrolle et al. (2010)	Children		Dyslexia	Psychiatric disorders
	Katsiyannis et al. (2008)	Youth		Learning disabilities	Behaviour
	Mishna (2003)	Youth		Learning disabilities	Bullying
	De Beer et al. (2014)	Adults		Dyslexia	Work
	Kavale and Forness (1996)	Adults		Learning disabilities	Other (progression)
	Klassen et al. (2011)	Adults		Learning disabilities	Internalizing behaviour
	Santuzzi et al. (2014)	Adults		Invisible disabilities (e.g. vision/hearing, chronic illness/pain, sleep/psych disorders, learning disabilities)	Work
	Burden (2008)	All		Dyslexia	Self
	Mugnaini et al. (2009)	All		Dyslexia	Internalizing behaviour
	Ribary (2005)	All		Network dynamics	Other (brain imaging)
No Learning Disabilities	Lesaux and Siegel (2003)	Children	978	None (ESL)	Reading development
	Feldman et al. (2015)	Young adults	83	None (hope, self-efficacy)	School/achievement
	Foley (2001)	Adolescents		None (incarcerated youth)	Academic characteristics
	Johns et al. (2008)	Young adults	81	None (stereotype threat)	Cognition
	Airaksinen et al. (2005)	Adults	399	None (anxiety)	Cognition
	Snyder (2013)	Adults		None (depression)	Cognition
	Wang et al. (2003)	Adults		None (depression)	Other (economic burden)
	Stanovich (1986)	All		None (reading ability)	Cognition
Parents or teachers	Bonifacci et al (2013)	Parents of children	80	Dyslexia	Cognition, Emotion, Family functioning
	Borgelt et al. (2014)	Parents of children	26	ADHD	Other (resources, stigma)
	Earey (2013)	Parents of children	7	Dyslexia	Other (stigma)
	Hornstra et al. (2010)	Teachers and 307 children	30	Dyslexia	Other (teacher attitudes, student achievement)

(*Continued*)

Table 1. (Continued).

	Article	Age Group	N	Learning Disability	Issue
	Rogers et al. (2009)	Parents of children	101	ADHD	Self-efficacy
	Singer (2015)	Parents of children	17	Dyslexia	Other (stereotype threat, stigma)
	Gwernan-Jones and Burden (2010)	Teachers of children and adolescents	87 (183 T1 and 404 T2)	Dyslexia	Other (teacher attitudes)
	Levi et al. (2013)	Teachers of children and adolescents	624	None (learning disabilities)	Self-efficacy
Children and parents	Ackerman et al. (2007)	Children and their mothers	105	Reading problems	Internalizing behaviour
	Arnold et al. (2005)	Adolescents and their parents	188	Poor vs. typical single word reading ability	Behaviour, emotion
	Raviv and Stone (1991)	Adolescents and their parents	98	Learning disabilities	Self-image
First person learning disability	Andreou et al. (2013)	Children	178	Special education programs	Bullying
	Butkowsky and Willows (1980)	Children	123	Reading problems	Self-concept
	Dahle et al. (2010)	Children	70	Dyslexia	Emotion (anxiety, depression, suicide), attention
	Grills et al. (2014)	Children	153	Reading problems	Anxiety
	Habib and Naz (2015)	Children	140	Dyslexia	Relationship anxiety, teacher rejection, cognition
	Haddadian et al. (2012)	Children	32	Dyslexia	Anxiety
	Humphrey and Mullins (2002)	Children	118	Dyslexia	Self
	Katsiyannis et al. (2008)	Children		Learning disabilities	Behaviour
	Kempe et al. (2011)	Children	141	Reading problems	Behaviour
	Knivsberg and Andreassen (2008)	Children	70	Dyslexia	Cognition, behaviour
	Lima (2011)	Children	61	Dyslexia	Depressive symptoms, cognition
	Makan et al. (2013)	Children	60	Dyslexia	Working memory, anxiety
	Mammarella et al. (2014)	Children	45	Nonverbal and reading disabilities	Anxiety, depression
	Margari et al. (2013)	Children	448	Learning disabilities (specific including reading, writing, math and non specified)	Cognition, anxiety/mood disorders
	Mishna (2003)	Children		Learning disabilities	Bullying

(*Continued*)

Table 1. (Continued).

	Article	Age Group	N	Learning Disability	Issue
	Moura et al. (2014)	Children	100	Dyslexia	Executive functioning
	Parhiala et al. (2014)	Children	170	Dyslexia	Social
	Partanen and Siegel (2014)	Children	650	Reading problems	Cognition
	Plakopiti and Bellou (2014)	Children	20	Dyslexia	Anxiety
	Polychroni et al. (2007)	Children	242	Dyslexia	Other (academic self-concept, reading attitudes, learning)
	Reiter et al. (2005)	Children	84	Dyslexia	Executive functioning
	Riddick (2010)	Children		Dyslexia	Other (labelling)
	Trzesniewski et al. (2006)	Children	2232	Reading achievement	Antisocial behaviour
	Wiener and Schneider (2002)	Children	232	Learning disabilities	Social
	Wiener and Tardif (2004)	Children	117	Learning disabilities	Social, behaviour
	Willcutt and Pennington (2000)	Children	867	Reading disability	ADHD, behaviour
	Barwick & Siegel (1996)	Adolescents	123	Learning difficulties	Other (homeless youth)
	Burton (2007)	Adolescents	10	Dyslexia and typical developing	Self-esteem
	Carroll and Iles (2006)	Young adults	32	Dyslexia	Anxiety
	Daniel et al. (2006)	Adolescents	188	Reading problems	Suicide, dropout
	Feldman et al. (2015)	Young adults	83	None	Hope/self-efficacy/optimism
	Gibson and Kendall (2010)	Young adults	5	Disability	School
	Ingesson (2007)	Adolescents	75	Dyslexia	Emotion, self-esteem
	Lockiewicz et al. (2014)	Young adults	180	Dyslexia	Cognition, motivation
	Mcbride and Siegel (1997)	Adolescents	27 suicide notes from 267	adolescent suicides	Reading problems
Suicide					
	Morris and Turnbull (2006)	Young adults	18	Dyslexia	School/work
	Nelson and Gregg (2012)	Adolescents	210	ADHD and Dyslexia	Internalizing behaviour
	Nelson et al. (2013)	Young adults	100	Dyslexia	Anxiety
	Reiff et al. (2001)	Adolescents	128	Learning disabilities	Emotional intelligence
	Stampoltzis and Polychronopoulou (2009)	Young adults	16	Dyslexia	School, social, self-esteem
	Svetaz et al. (2001)	Adolescents	20,780 (1301 with learning	disabilities)	Learning disabilities
Emotion					
	Terras et al. (2009)	Adolescents	68	Dyslexia	Self esteem

(*Continued*)

Table 1. (Continued).

Article	Age Group	N	Learning Disability	Issue
Undheim (2003)	Young adults	34 (530 norm group)	Dyslexia	Psychosocial, educational level
Airaksinen et al. (2005)	Adults	399	None	Anxiety
Brosnan et al. (2002)	Adults and children	18	Dyslexia	Executive functioning
Carawan et al. (2015)	Adults	224	Dyslexia	Emotion, self-esteem, relationships
Daderman et al. (2014)	Young adults	313	Dyslexia	Self-esteem
Dale and Taylor (2001)	Adults	21	Dyslexia	Self, labels
Davis et al. (2009)	Young adults	68	Learning disabilities	Other (Health-related quality of life)
Denhart (2008)	Young adults	11	Learning disabilities	Barriers to higher education; awareness
Doikou-Avlidou (2015)	Young adults	10	Dyslexia	Emotion, social, school
Goldberg et al. (2003)	Adults	41	Learning disabilities	Self-awareness, social support, emotion, success
Heiman and Precel (2003)	Young adults and adults	281	Learning disabilities	School
Hellendoorn and Ruijssenaars (2000)	Adults	27	Dyslexia	Support
Hughes and Dawson (1995)	Adults	47	Dyslexia	Emotion
Jordan et al. (2014)	Adults	99	Dyslexia	Anxiety, emotion
Kavale and Forness (1996)	Adults		Learning disabilities	Emotion, work
Lindgren et al. (2010)	Adults	45	Dyslexia and ADHD	Behaviour
Lisle and Wade (2014)	Adults	200	Learning disabilities	Other (stigma)
McNulty (2003)	Adults	12	Dyslexia	Emotion, school
Nalavany and Carawan (2011)	Adults	224	Dyslexia	Emotion, self-esteem, support
Nalavany et al. (2004)	Adults	224	Dyslexia	Emotion, self-esteem
Nalavany et al. (2011)	Adults	54	Dyslexia	Psychosocial
Newlands et al. (2015)	Young adults	7	Dyslexia	School/work
Riddick et al. (1999)	Young adults and adults	32	Dyslexia	Anxiety
Shessel and Reiff (1999)	Adults	14	Learning disabilities	Emotion, social

evaluate trends or gaps in the literature. Outcomes fell in to six major categories (self and emotion, behaviour, social and relationships, work and school, cognition and other), the consequences of which are discussed from the perspective of the individual with dyslexia, their parents and professionals.

The impact on the individual

Overview

The behavioural and emotional profile associated with developmental dyslexia is heterogeneous. For example, dyslexia presents itself differently between children due to variability in severity of impairment and the way in which the individual responds to their learning disability (Riddick, 2010). Both externalizing or disruptive behaviour (Boyes et al., 2016; Huc-Chabrolle, Barthez, Tripi, Barthelemy, & Bonnet-Brihault, 2010; Knivsberg & Andreassen, 2008; Terras, Thompson, & Minnis, 2009; Trzesniewski, Moffitt, Caspi, Taylor, & Maughan, 2006; Willcutt & Pennington, 2000) and internalizing or depressive and anxious behaviour (Ackerman, Izard, Kobak, Brown, & Smith, 2007; Boyes et al., 2016; Dahle, Knivsberg, & Andreassen, 2010; Huc-Chabrolle et al., 2010; Knivsberg & Andreassen, 2008; Mammarella et al., 2014; Mugnaini et al., 2009; Terras et al., 2009) are associated with dyslexia. Individuals with learning disabilities have reported anger, stress, embarrassment, aggression, guilt, isolation, insecurity, anxiety and emotional and social problems (Lockiewicz, Bogdanowicz, & Bogdanowicz, 2014; Shessel & Reiff, 1999). The memories of these experiences can have lasting damage into adulthood (Ingesson, 2007; Nalavany, Carawan, & Rennick, 2011). Individuals with developmental dyslexia are at increased risk of negative outcomes in emotional, social, educational and occupational domains. Identifying what determines the relationship between dyslexia and life outcomes at the individual level is crucial to promote success. The literature provides us some possible explanations, beginning with the emotional consequences of developmental dyslexia.

Impact on well-being and mental health

Emotional adjustment to learning difficulties may be an important predictor of outcome in individuals with developmental dyslexia. Having this learning disability has a negative impact on overall well-being and quality of life, which may largely be due to associated feelings of anxiety and sadness (Davis, Nida, Zlomke, & Nebel-Schwalm, 2009; Nalavany & Carawan, 2011). Learning disabilities are also associated with socioemotional problems and depression (Kavale & Forness, 1996; Wiener & Schneider, 2002) and such individuals show more psychiatric problems than those without (Undheim, 2003). For example, in individuals with dyslexia, 60% also meet criteria for at least one psychiatric disorder (Margari et al., 2013). Children with dyslexia may be susceptible to becoming withdrawn, anxious and depressed due to their academic underachievement (Willcutt & Pennington, 2000). Adolescents with learning disabilities including dyslexia are also found to be at twice the risk of emotional distress, including risk for violence and suicide attempts (Svetaz, Ireland, & Blum, 2001). Taken together, these findings suggest that learning disabilities such as dyslexia have far-reaching effects on the emotional health of an individual, in turn having a negative impact on chances of success, for example, in

school, jobs or relationships. Most of the feelings reported about developmental dyslexia are negative, which is an obstacle in the way of the individual's success unless they are able to reframe their feelings about their learning disability (De Beer, Engels, Heerkens, & van der Klink, 2014).

The build-up of stigma

Many educators hold negative attitudes towards individuals with learning disabilities, believing that these individuals are less intelligent, more difficult to teach or lazy (Lisle & Wade, 2014). For example, both children and adults with specific learning disabilities, such as dyslexia, have been stereotyped as stupid, cheating, lazy or careless before they are given a formal diagnosis (Denhart, 2008; McNulty, 2003; Siegel, 2013, 2016), which may contribute to the school phobia and fear of being tested seen in these individuals (Lodygowska & Czepita, 2012). These attitudes contribute to the emotional experience with developmental dyslexia and thus play an important role in determining life outcomes. Even implicit attitudes of teachers may have an impact on students with learning disabilities. Teachers that have a negative implicit attitude towards dyslexia are found to give lower ratings of writing achievement to students with dyslexia, which then predict students' actual spelling achievement (Hornstra, Denessen, Bakker, Bergh, & Voeten, 2010). These negative attitudes may affect the actual performance of students by influencing the way educators teach (Gwernan-Jones & Burden, 2010), their efforts to help, the opportunities they offer, the feedback they give, and their nonverbal behaviour (Hornstra et al., 2010). Individuals with developmental dyslexia can also carry assumptions about the way others perceive them that have direct consequences on behaviour and achievement. These individuals underestimate their actual abilities (Butkowsky & Willows, 1980; Lockiewicz et al., 2014; Shifrer, 2013) and can experience less life success due to a potential self-fulfilling prophecy (Lisle & Wade, 2014).

Though personal success can be measured in many ways, educational and occupational attainments are typical metrics of success in Western society, both of which rely on strong literacy skills. The lack of success in these areas is likely to contribute to poor emotional outcomes and discrimination from living with dyslexia (Carawan, Nalavany, & Jenkins, 2015; Denhart, 2008; Nalavany & Carawan, 2011). Both children with developmental dyslexia and their parents indicate that the experience of dyslexia is largely associated with challenges with attitudes of society that celebrate ability and ostracize differences (Leitão et al., 2017). Individuals with developmental dyslexia have reported that the stereotyping, perceptions and assumptions associated with their dyslexia take a greater emotional toll than the specific language difficulties of individuals with this learning disability (Denhart, 2008; McNulty, 2003; Nalavany & Carawan, 2011). This finding illustrates the need to reframe personal attitudes about learning disabilities and success and to focus on areas of strength in education and occupation to minimize negative emotional consequences. In recent thesis work, Singer (2015) found that the majority of parents involved in the study thought their child would confirm stereotypes of specific learning disabilities, such as dyslexia, supporting the idea that stereotype threat may be partly responsible for the outcomes of these individuals. Stereotype threat is the risk of confirming a stereotype about one's group, which has been most extensively studied with respect to assumptions about the intelligence of a particular group or race (Steele & Aronson, 1995). Stereotype threat is shown to reduce

executive function (Johns, Inzlicht, & Schmader, 2008) and as such may exacerbate the difficulties experienced with learning disabilities and negatively impact performance. There is little research investigating the occurrence of stereotyping in relation to learning disabilities and dyslexia in particular, which, according to Lisle and Wade (2014), confirms that this group is often overlooked. Lisle and Wade (2014) found that there are stereotypes associated with a learning disability such that people rate individuals with a learning disability less positively in attractiveness, emotional stability and life success. Both children and adults have reported concern that telling people they have dyslexia will cause others to think less of them (Riddick, 2010). Understandably, hiding difficulties with learning is a major source of stress for individuals with developmental dyslexia from childhood into adulthood (Nalavany & Carawan, 2011; Riddick, 2003, 2010; Siegel, 2013, 2016). This results in avoiding disclosure of learning disability or in quitting university classes (Hellendoorn & Ruijssenaars, 2000; Ingesson, 2007), severely limiting the academic and emotional support they desperately need. Developmental dyslexia has an impact on nearly all aspects of functioning in work and this impact tends to increase over time (De Beer et al., 2014). Students and employees with learning disabilities have been reported to work themselves to exhaustion and even physical ailment to compensate for their difficulties (De Beer et al., 2014; Lisle & Wade, 2014; Siegel, 2013, 2016) and report that others do not see the amount of hard work someone with dyslexia must put in to accomplish the same task as someone without it (Nalavany et al., 2011). School experiences are frequently described by individuals with dyslexia as negative and traumatic, which can be re-experienced in adulthood when they must disclose their learning disability to teachers or employers (Denhart, 2008; Hughes & Dawson, 1995; McNulty, 2003; Stampoltzis & Polychronopoulou, 2009). Disclosure of invisible disabilities like dyslexia in a work setting likely has implications for health, social relationships, work performance and the employer's outcomes (Santuzzi, Waltz, Finkelstein, & Rupp, 2014). Adequate psychosocial functioning and self-esteem also relies on understanding, coping and acceptance of specific learning disabilities (Terras et al., 2009), which likely depends on the level of understanding of the parents, teachers and professionals involved in assessment and support. Adults with developmental dyslexia have reported that poor understanding of their learning disability by parents and teachers was often the cause of problems in their relationships (Terras et al., 2009) and that relationships with employers et al. have a major influence over the impact of dyslexia on work functioning (De Beer et al., 2014). Teachers could be made more aware of what it is like to live with developmental dyslexia, how differently it can present across individuals, and how to positively interact with these students (Shifrer, 2013). Dahle et al. (2010) investigated internalizing and externalizing behaviours of individuals with and without dyslexia (70 children in each group) through questionnaires completed by the children, their parents and their teachers. In their reports, teachers indicated fewer internalizing problems in children with dyslexia than their parents reported (Dahle et al., 2010), suggesting that education about the emotional aspects of learning disabilities is needed for teachers and professionals. Teachers with more special education training have reported higher levels of hope and self-efficacy with respect to their ability to support individuals with learning disabilities (Levi, Einav, Raskind, Ziv, & Margalit, 2013), suggesting that supporting and educating the educators will benefits both them and their students. Legislation and workplace policies could also be made more sensitive to implications of disclosure decisions faced by individuals with invisible disabilities like dyslexia (Santuzzi et al., 2014). Increased openness about challenges and anxieties surrounding

dyslexia with supervisors would likely improve the experiences of students or employees (Newlands, Shrewsbury, & Robson, 2015).

Children identified with developmental dyslexia after early and middle-school years are likely to doubt their intelligence and lose motivation as their learning difficulties remain unexplained (McNulty, 2003). Diagnosis is seen by many with developmental dyslexia to provide a reason for difficulties with learning (Gibson & Kendall, 2010) and to prevent assumptions of laziness or unintelligence (Riddick, 2010). This emphasizes the need for early identification and explanation of developmental dyslexia to prevent traumatic and humiliating misunderstandings about learning difficulties. Stigma may result from the difficulties associated with dyslexia rather than the label itself (Riddick, 2010). For example, being labelled with dyslexia is often interpreted negatively; however, these individuals have reported that educating the public about developmental dyslexia would be better than avoiding using the label (Riddick, 2010). This label was interpreted by individuals as negative if it meant they were separated from peers, suggesting that the difficulty with the label may be the associated consequences (Riddick, 2010). Professionals must take care to be sensitive when explaining the diagnosis of dyslexia, as poor explanations can be interpreted as traumatic and damaging to the individual's ability to compensate (McNulty, 2003), cause them to feel anxious and inferior (Doikou-Avlidou, 2015), or negatively influence student expectations (Shifrer, 2013). Poor academic, emotional and social outcomes from developmental dyslexia and low self-esteem may be attributed to the lack of information given to individuals when they are diagnosed (McNulty, 2003; Stampoltzis & Polychronopoulou, 2009; Terras et al., 2009) or lack of academic and emotional support after diagnosis (Doikou-Avlidou, 2015). To compensate on a psychological level and improve academically and socially, a child with dyslexia requires help to develop coping strategies to reduce the impact of the stigma and personal reactions to difficulties with learning (McNulty, 2003; Shifrer, 2013; Terras et al., 2009).

Impact on self-esteem

Low self-esteem is among the most common psychological problems for individuals with developmental dyslexia and is a risk for children, adolescents and adults (Burden, 2008; McNulty, 2003). Self-esteem is vital to psychosocial functioning in adulthood (Nalavany & Carawan, 2011) and psychological health (Daderman et al., 2014). Issues with self-esteem can begin early. For instance, problems with self-esteem may emerge consistently by school age in individuals with dyslexia (McNulty, 2003). This lack of self-esteem may result from chronic difficulties in reading interfering with the establishment of personality and a sense of self (McNulty, 2003). As individuals with developmental dyslexia experience failures in school and other areas of life they may feel like something is wrong with them and later feel inferior (McNulty, 2003; Siegel, 2013, 2016). To some, these failures are traumatic (McNulty, 2003). This often involves difficulties being misattributed to personal characteristics including work ethic, emotional state or intelligence (McNulty, 2003). Children with dyslexia also perceive a stronger relationship between intelligence and reading ability than children without dyslexia and therefore are more likely to feel unintelligent (Humphrey & Mullins, 2002). This finding suggests that children with developmental dyslexia may internalize their difficulties as reflecting their level of intelligence. Low self-esteem in such

individuals is also correlated with rates of social, emotional and behavioural difficulties that are much higher than in the general population (Terras et al., 2009). Poor self-concept in children with developmental dyslexia has also been associated with poor relationships with peers (Humphrey & Mullins, 2004), suggesting that self-esteem is an important target in minimizing the negative consequences in multiple domains. Self-esteem group work, for example, is associated with increases in self-esteem in secondary students (Burton, 2007).

Many individuals with developmental dyslexia frequently have their work ethic and intellect called into question by parents and teachers, resulting in learned helplessness (Butkowsky & Willows, 1980; Undheim, 2003). For example, individuals with developmental dyslexia have lower academic self-esteem (Ingesson, 2007; Polychroni, Koukoura, & Anagnostou, 2007) and higher academic anxiety (Carroll & Iles, 2006) than their peers, which may worsen as they go through the school system (Burden, 2008). This anxiety is not necessarily specific to reading, as levels of mathematics anxiety are also increased in such populations (Jordan, McGladdery, & Dyer, 2014). Over time poor academic self-esteem appears to lead to emotional insecurity and self-doubt (McNulty, 2003), which likely results in decreased motivation and success. Academic self-esteem, which is lacking in individuals with developmental dyslexia, is also associated with internalizing difficulties (Burden, 2008; Elbaum & Vaughn, 2001; Polychroni et al., 2007; Terras et al., 2009). Poor academic self-concept likely limits an individual's confidence to succeed, further limiting their ability and motivation to learn (Burden, 2008). However, the negative effect of developmental dyslexia on self-esteem depends on support levels at home and school (Daderman et al., 2014).

Increasing behavioural problems

Developmental dyslexia has also been associated with externalizing and behaviour problems (Mugnaini et al., 2009; Terras et al., 2009), which is likely also be due to the emotional experience with these difficulties. In individuals with developmental dyslexia, for example, there are three times more behavioural disorders reported than those without, as well as an increased incidence of ADHD (Huc-Chabrolle et al., 2010; Margari et al., 2013). Terras et al. (2009) found significant differences in individuals with developmental dyslexia on measures of emotional symptoms, hyperactivity, and conduct and peer problems compared to the general population, which is likely the case with other learning disabilities as well. These difficulties likely influence the ability and willingness of parents and teachers to help, while also affecting school and relationships. One group found that, at least in early grades, reading difficulties and problem behaviours occur independently of one another, suggesting that each should be targeted independently during this period (Kempe, Gustafson, & Samuelsson, 2011).

Escalating social problems

Deficient social skills and peer rejection are found to accompany learning disabilities across age groups (Lisle & Wade, 2014; Parhiala et al., 2014; Wiener & Schneider, 2002). Developmental dyslexia could be a cause or correlate of social problems, including self-regulation and social interaction (De Beer et al., 2014; Kempe et al., 2011) and social anxiety in adults (Carroll & Iles, 2006) and children (Mammarella et al., 2014; Terras et al., 2009). In

some children with developmental dyslexia, there may be difficulty in processing social information due to difficulty in facial affect recognition (Whiting & Robinson, 2009). Although some learning disabilities may have inherent social problems that lead to internalizing behaviours, these along with externalizing behaviours can arise in individuals with other types of learning disabilities and other risk factors, like education or parenting mismatch and comorbidities (Wiener, 2004). Bullying has been reported in research in children with developmental dyslexia (Humphrey & Mullins, 2002; Mishna, 2003) as well as discrimination and ridicule in nursing students with developmental dyslexia (Morris & Turnbull, 2006). Students participating in special education programs were found to have higher rates of victimization, though these students were found to be involved in both bullying and victimization and both were associated with poor self-efficacy for social skills with peers and loneliness (Andreou, Didaskalou, & Vlachou, 2013). Individuals with developmental dyslexia can experience problems finding friends or relationships, which could be due in part to negative attitudes towards individuals with cognitive impairments (Lisle & Wade, 2014). This problem also may be due to the fear of having their learning disability exposed or being interpreted by others as unintelligent (Denhart, 2008; McNulty, 2003). These social problems have been reported to increase upon reaching adulthood (Carroll & Iles, 2006), emphasizing the need for social support throughout the lifespan.

Consequences for cognition and executive function

The internalizing behaviours associated with learning disabilities may be a result of underlying deficits in sensory, cognitive, language and executive functioning, in addition to academic difficulties (Klassen, Tze, & Hannok, 2011; Ribary, 2005). Developmental dyslexia is an example that illustrates this. Internalizing behaviours themselves likely exacerbate problems with executive function and inattention, both of which are associated with developmental dyslexia in both childhood and adulthood (Brosnan et al., 2002; Kempe et al., 2011; Lima, 2011; Makan, Daramadi, & Bagheri, 2013; Moura, Simões, & Pereira, 2014; Reiter, Tucha, & Lange, 2005; Smith-Spark, Henry, Messer, Edvardsdottir, & Ziecik, 2016). Lima (2011) suggests in thesis work that dyslexic children are vulnerable to depressive symptoms, which appear to be negatively associated with executive functioning. Emotional complications predict cognitive difficulties in children with dyslexia, as measured by everyday errors and minor mistakes (Habib & Naz, 2015). Furthermore, these difficulties relate to interpersonal relationship anxiety and teacher rejection (Habib & Naz, 2015). Taken together, these consequences serve to intensify existing learning difficulties (Habib & Naz, 2015). Anxiety and reading ability seem to bidirectionally related, such that certain types of anxiety predict future reduced reading ability and vice versa (Grills-Taquechel, Fletcher, Vaughn, & Stuebing, 2011). However, Meer, Breznitz, and Katzir (2016) found that there are no differences in anxiety during reading between individuals with poor versus skilled reading abilities. Physiological arousal has also been found to be lower during reading in individuals with developmental dyslexia than those without (Meer et al., 2016; Tobia, Bonifacci, Ottaviani, Borsato, & Marzocchi, 2016), which may be due to this type of anxiety being primarily cognitive rather than physically based (Nelson, Lindstrom, & Foels, 2013).

Developmental dyslexia has also been associated with broader difficulties in language and verbal skills (Loveland, Fletcher, & Bailey, 1990), which are influenced by emotional

symptomology (Egidi & Nusbaum, 2012). Taken together, this may suggest a positive feedback loop between emotional and cognitive associates of developmental dyslexia.

Elements of executive function including working memory and nonverbal ability also predict test anxiety in college students with developmental dyslexia (Nelson et al., 2013). Depression and anxiety are also known to exert a negative impact on executive functioning (Airaksinen, Larsson, & Forsell, 2005; Snyder, 2013). Individuals with learning disabilities in post-secondary school were found to have poor stress management compared to peers without learning disabilities (Reiff, Hatzes, Bramel, & Gibbon, 2001). This combined with increased feelings of nervousness, frustration and uncertainty during testing (Heiman & Precel, 2003) supports the idea that the emotional experiences associated with learning disabilities are a key contributor to decreased success that could be avoided.

Possible influence on interventional outcomes

Early identification and remediation increase both academic and emotional well-being of individuals with developmental dyslexia (Merzenich et al., 1996; Tallal, 2004), but there are some individuals who show little improvement in academic performance with remedial education (Partanen & Siegel, 2014). Understanding what prevents response to intervention will allow for greater prediction of outcome and improvement in supporting remedial programs. Difficulty reading discourages reading outside of the classroom (Gabrieli, 2009; Siegel, 2013, 2016; Stanovich, 1986), which further hinders reading development and likelihood of engaging in extra reading help. Therefore, careful attention to emotional and self-esteem difficulties that may be discouraging children from reading are crucial targets. Individuals identified with behavioural difficulties appear to respond inadequately to reading intervention (Grills et al., 2014), which could indicate emotional or self-esteem difficulties. Global anxiety may not predict response to reading intervention at a young age, but anxiety could be characteristic of some individuals with inadequate response (Grills et al., 2014). Instructional quality and efficacy of intervention are required to maximize benefits from remedial education (Vaughn & Fuchs, 2003). Delivery method and text configuration are also likely important factors in targeting anxiety around reading comprehension education in individuals with developmental dyslexia. In such students, low-luminance electronic text is associated with improved comprehension and reduced state anxiety (Plakopiti & Bellou, 2014) and these students tend to feel more secure in a classroom with people who share their difficulties (Burton, 2007; Dale & Taylor, 2001). Furthermore, the use of audiobooks has been shown to be associated with reduced unease and emotional-behaviour disorders and increased motivation for school activities (Milani, Lorusso, & Molteni, 2010). Individuals with learning disabilities who attend schools with extra support for dyslexia (e.g. dyslexia-friendly schools in the UK) report less emotional distress, which facilitates higher self-esteem, than those from mainstream schools (Nalavany, Carawan, & Brown, 2004). However, for children in mainstream schools, individuals in more inclusive programs report more positive social and emotional outcomes including better relationships, higher self-esteem and fewer problem behaviours compared to those in programs taught separately from regular classes (Wiener & Tardif, 2004). The quality and regularity of therapy also has an impact on the emotional consequences of developmental dyslexia, such that irregular therapy has been associated

with greater school phobia in such children (Lodygowska & Czepita, 2012). Stress management programs can enhance ability to learn (Grills et al., 2014), thereby reducing the impact of the emotional consequences of developmental dyslexia on further reading acquisition and other areas of academic studies. More work is needed to clarify whether the impact of dyslexia on emotional well-being or self-esteem influences response to intervention and whether this influence may be reduced through specific support for emotional and self-esteem needs.

Early experiences and consequences in adulthood

Developmental dyslexia and the associated emotional experiences occur across the lifespan (Carroll & Iles, 2006; Undheim, 2003; Undheim, 2009). Memories of school and childhood experiences with developmental dyslexia are reported by adults to have long-lasting negative consequences (Hughes & Dawson, 1995; Kavale & Forness, 1996; Nalavany et al., 2011). Internalizing problems including anxiety and depression are suggested to continue from childhood into adulthood in part because academic and language skills remain important (Klassen et al., 2011). It also seems that internalizing behaviour continues into adulthood regardless of whether the individual chooses to attend postsecondary education (Klassen et al., 2011), suggesting that the emotional problems associated with learning disabilities may be maintained by non-academic stressors. The increased stress of adult life and ongoing cognitive problems associated with these difficulties likely also maintain internalizing behaviours (Klassen et al., 2011). Young adulthood is a particularly difficult time in which emotional support is beneficial to thwart the negative consequences of the increasing workload and losing accommodations and supports received in post-secondary school (Nalavany & Carawan, 2011). For example, Nelson and Gregg (2012) report that college undergraduates with developmental dyslexia report more symptoms of anxiety and depression than those transitioning from high school, further emphasizing the emotional needs at this stage of life. In late adulthood, the emotional consequences of dyslexia can have an increased impact on well-being as many of these difficulties may be mistaken as mild cognitive impairment or dementia (Carawan et al., 2015). Furthermore, the literary, cognitive and emotional difficulties associated with developmental dyslexia are likely compounded by cognitive decline associated with aging (Harada, Natelson Love, & Triebel, 2013). To minimize the negative impact of developmental dyslexia on quality of life, it appears that assessing and supporting the emotional needs of these individuals is crucial throughout the lifespan. Assessment, treatment and prevention of emotional problems should be included for individuals with learning disabilities throughout the school years, and in university services (Davis et al., 2009), in the workplace, and be available for adults looking for support. Health-related quality of life may be improved by targeting social skills, stress and anxiety, which may include cognitive behavioural therapy or programs in time management and relaxation (Davis et al., 2009).

Importance of early diagnosis

Klassen et al. (2011) suggest that successful functioning in adulthood for individuals with learning disabilities depends on understanding of how difficulties might affect

emotional well-being. Adults can continue to have negative emotional experiences with developmental dyslexia if they do not learn adaptive strategies to compensate for their learning difficulties (Carawan et al., 2015), highlighting the importance of early intervention for both cognitive and emotional functioning. Dyslexia, for example, is associated with a host of difficulties beyond specific reading difficulties including internalizing and externalizing mental health problems and even motor impairment (Huc-Chabrolle et al., 2010; Margari et al., 2013) that could be identified by people around them long before receiving a diagnosis. Late diagnosis and support has a negative impact on understanding, adjustment, self-perception, confidence, and the reaction of friends and family to dyslexia (Gibson & Kendall, 2010). Adaptation, academic success and occupational opportunity are more likely to be possible when there is early diagnosis (Stampoltzis & Polychronopoulou, 2009), personal understanding of dyslexia (McNulty, 2003) and a sense of control over work (De Beer et al., 2014). Developmental dyslexia has not received sufficient support and early intervention for both reading and psychosocial adjustment is an important step (Terras et al., 2009). Positive outcomes in academic, social, emotional and economic domains rely on early identification and intervention for developmental dyslexia (Partanen & Siegel, 2014). Adults with learning disabilities identified as being successful according to a broad range of life domains (academic attainment, life satisfaction, independent living status, health, employment status, etc.) are found to use strategies including being self-aware, seeking help, planning ahead, using social support and compartmentalizing emotional reactions to overcome the emotional challenges associated with their disability (Goldberg, Higgins, Raskind, & Herman, 2003). Recognizing differences, accepting difficulties with learning, understanding strengths and developing helpful strategies may prevent developmental dyslexia from defining the individual (Doikou-Avlidou, 2015) and have been endorsed by adults with this learning disability (Nalavany et al., 2011). This may be best achieved through support from parents, teachers and peers. A balance must be struck between knowledge and preoccupation with dyslexia to ensure positive outcomes, both with reading and anxiety (Shany, Wiener, & Feingold, 2011). Gabrieli (2009) and Lesaux and Siegel (2003) suggest that treatment that is intensive, in small groups, and that includes phonological and decoding education is the most effective. Elbaum and Vaughn (2001) found that overall, middle school students benefited from interventions more than elementary and high school students. Counselling was more effective for students past the elementary years, who responded better to interventions focused on academic skills (Elbaum & Vaughn, 2001). This finding highlights the fact that support needs may change across years and supports the idea that reading difficulties precede emotional problems. As there is inevitable variability between individuals and research has shown that emotional problems and reading difficulties often occur co-morbidly, employing a program that focuses on both counselling and improvement of academic skills will likely be beneficial to the greatest number of individuals.

Though different types of interventions may be more effective at different developmental stages, reading improvements are more likely with early intervention (Gabrieli, 2009). Furthermore, explanations of diagnosis, parental support, a suitable teaching and help seem to be of utmost importance in developing positive cognitive and emotional compensation for dyslexia (McNulty, 2003; Stampoltzis & Polychronopoulou, 2009). The most successful method to achieve positive coping with developmental dyslexia is

psychological intervention that focuses on both academic remediation and self-esteem (McNulty, 2003). Roer-Strier (2002) also found that lobbying for rights and services for learning disabilities reduced dropout rates, stress, anxiety and improved academic achievement, self-esteem, and socioemotional well-being of students with learning disorders. This suggests that empowerment and advocacy programs may be particularly beneficial in conjunction with or substitution of individual therapy targeting emotional and academic difficulties.

The impact on the family

Consequences for caregivers and teachers

Perceived family support throughout life promotes positive self-esteem, life satisfaction, psychosocial adjustment, and positive coping and acceptance in adults with developmental dyslexia (Doikou-Avlidou, 2015; Hellendoorn & Ruijssenaars, 2000; Ingesson, 2007; McNulty, 2003; Stampoltzis & Polychronopoulou, 2009; Terras et al., 2009). The relationship between family support and self-esteem is largely explained by the effect of family support on the emotional experience with dyslexia, which is likely achieved through support for both learning and emotional needs (Carawan et al., 2015; Nalavany & Carawan, 2011), as well as parental understanding and social support (Terras et al., 2009). McNulty (2003) suggests that caregivers play an important role in protecting children from misunderstandings and trauma associated with their dyslexia. For example, adults with developmental dyslexia can have difficulty accessing services due to troubles with written material and forms (Carawan et al., 2015). Family support is especially important to maintain self-esteem in the young adult years, before individuals are able to select school, work and social contexts that rely on their strengths (Carawan et al., 2015; Nalavany & Carawan, 2011). A determinant of the impact of academic achievement on self-esteem is the importance of competence in a particular domain to an individual, suggesting that reorganizing investment in various areas likely minimizes the threat of dyslexia to self-esteem (Humphrey & Mullins, 2004). Support continues to be important into adulthood for individuals with developmental dyslexia to buffer emotional reactions to having a learning disability as they live in a world with little support for them (Hellendoorn & Ruijssenaars, 2000). Parents of children with developmental dyslexia, for example, appear to be so focused on the reading difficulties and academic success of their children that they sometimes miss their need for emotional support (Raviv & Stone, 1991). The importance of support with academic and emotional concerns for such individuals places immense pressure on their family members. Young adults with developmental dyslexia are also found to need family support longer than their peers to manage their emotions and achieve independence (Nalavany & Carawan, 2011), emphasizing the fact that this support role is needed throughout life. The emotional and academic risks associated with developmental dyslexia also likely put added pressure on families to take on advocacy roles. Parents are likely to be unsure until they are able to connect with agencies, highlighting the need for support and education for parents in taking on this role. Nalavany and Carawan (2011) suggest that support services may be helpful to both individuals with developmental dyslexia as well as their parents and family members. The parents and family members of these

individuals play a crucial role in their self-esteem and subsequently their mental health and well-being. As such, it is clear that educating families on how to support someone with developmental dyslexia and about its impact on socio-emotional well-being would be an important step in preventing the negative consequences throughout the life course. Among adolescents with learning disabilities, connectedness to parents and school is reported to be most strongly associated with reduced emotional distress, suicide attempts and involvement in violence (Svetaz, Ireland, & Blum, 2001). Mental health and educational professionals are key stakeholders in helping families understand and provide support for individuals with developmental dyslexia around school difficulties, pursuing opportunities that take advantage of strengths, social relationships, disclosure of their difficulties and emotional experiences related to misunderstandings about their learning disability throughout life (Nalavany & Carawan, 2011). In the context of ADHD, parents are also reported to be receptive to neuroimaging and/or genetic testing in support of their child to provide insight, acceptance, reduce blame and access help access resources (Borgelt, Buchman, Weiss, & Illes, 2014), which is likely the case in parents of children with developmental dyslexia. However, more research is required to establish whether neuroimaging and genetic methods have clinical utility and cost-effectiveness (Eden & Moats, 2002).

Parental reactions and difficulties

Developmental dyslexia has a persistent impact on family relationships (Goldberg et al., 2003; Terras et al., 2009). This learning disorder is associated with increased parental distress, particularly due to the perception of having a child with specific needs and difficult parent-child interactions (Bonifacci, Montuschi, Lami, & Snowling, 2013; Carotenuto et al., 2017). Parents of children with developmental dyslexia have also reported feeling guilty for their influence in genetically passing on dyslexia or for having wrongly assumed their child was not trying (Earey, 2013). Many feelings from parents of children with developmental dyslexia were a result of fear for the future of their child (Riddick, 2010) and parents might react by feeling helpless or disheartened (Earey, 2013). Other concerns include their child not having access to programs, or not getting enough support, in addition to personal stress and frustration (Serry, Liamputtong, Rose, & Bretherton, 2016). Parents and professionals have reported that some children with dyslexia are hypersensitive to perceived criticism, which may be due to early difficulties in childhood that make them feel different before being formerly diagnosed (McNulty, 2003). Furthermore, parents of individuals with learning disabilities may likely have similar difficulties of their own. For example, Bonifacci et al. (2013) found that parents of children with developmental dyslexia sometimes present with reading impairment and poor phonological awareness, which likely results in difficulty supporting their child with schoolwork. Individuals with developmental dyslexia have an increased chance of having a child with a reading disorder or difficulty with spelling and reading skills, which may be exacerbated by their personal reading difficulties (Bonifacci et al., 2013). These difficulties could be minimized by early diagnosis and support, as well as education of families and professionals. Furthermore, Carotenuto et al. (2017) suggest that assessment of parents may be important to improve management of dyslexia and family involvement.

Financial burden

Besides the emotional, academic and advocacy roles that some parents of children with developmental dyslexia assume, there is likely to be financial strain on these families. Learning accommodations (e.g. learning assistants, special programming) often rely on a diagnosis and families can be forced to pay large amounts of money for private testing to receive support for their child. Intervention programs should take parental needs and resources into account (Bonifacci et al., 2013). In some cases specialized school is the better option for their child's academic and emotional well-being, which can be associated with greater costs. In these cases, lack of financial resources may be a major barrier, further adding to feelings of guilt previously reported by parents of children with developmental dyslexia (Earey, 2013). Economic disadvantage is also a predictor of academic difficulties (Ackerman et al., 2007), suggesting that dyslexia may further compound the academic problems already faced by individuals and families who struggle financially.

The impact on society

Consequences for criminality

Learning disabilities and academic difficulty are over-represented in homeless, delinquent and prison populations (Barwick & Siegel, 1996; Daniel et al., 2006; Foley, 2001; Katsiyannis, Ryan, Zhang, & Spann, 2008; Lindgren et al., 2010; McBride & Siegel, 1997). Barwick and Siegel (1996) found that 82% of their sample showed some type of learning disability. Fifty-two per cent of their sample of adolescents from a shelter for runaway and homeless youth had a reading disability, established through achievement testing and reading evaluation (Barwick & Siegel, 1996). These learning difficulties were not found to relate to history of substance abuse, maltreatment, or education experiences, which were the same across those with and without learning difficulties (Barwick & Siegel, 1996). Svetas et al. (2001) also reported that female adolescents with learning disabilities are at twice the risk for violence involvement. Learning problems are suggested to precede problems with aggression (Terras et al., 2009), highlighting the importance of properly targeting learning difficulties early.

Conduct disordered, delinquent or incarcerated children in multiple countries show significantly increased rates of reading difficulties (Lindgren et al., 2010). Poor language skills can actually identify boys at risk of later offending (Lindgren et al., 2010), suggesting that these learning difficulties precede criminality. A proportion of individuals with specific reading difficulties went on to display criminality in late adolescence, which may be influenced by hyperactivity, commonly seen with developmental dyslexia and other learning disabilities (Lindgren et al., 2010). Prisoners with developmental dyslexia, for example, are also suggested to be more likely to have been diagnosed with antisocial personality disorder (Lindgren et al., 2010). Similarly, reading competence has been found to relate to both cognitive and emotional expressions of empathy, suggesting that lower reading abilities are associated with lower levels of empathy (Gabay, Shamay-Tsoory, & Goldfarb, 2016). Trzesniewski et al. (2006) suggest that in boys, poor reading leads to antisocial behaviour through academic failure and frustration, and that these externalizing behaviours reciprocally lead to difficulty with learning. This finding again highlights the potential involvement of reading difficulties on prosocial behaviour. As

noted above, these relationships do not occur alone, but rather in the context of an individual with a complex history and combination of emotional, cognitive and behavioural responses, and in a larger context of families and communities.

The school-to-prison pipeline has received increased attention in past years and suggests that school suspension and expulsion may be moving youth and adolescents into juvenile and adult detention centres. Harsh policies in school discipline may result in students with unnoticed and unattended learning difficulties ending up in the justice system. In this way academic failure may be a risk for delinquency, which may be influenced positively or negatively by school policies (Christle, Jolivette, & Nelson, 2005). Some suggest yearly assessments beginning in early school years to predict and properly identify reading difficulties after primary school (Partanen & Siegel, 2014). Direct instructions and tutoring have been shown to be effective correctional education approaches in incarcerated youth populations (Foley, 2001), demonstrating that these techniques extend to the criminal justice setting. However, as mentioned with respect to the impact on the individual, an approach that focuses on both academic and emotional needs is likely more beneficial. Varying degrees of remedial education may play a role in the presence of different rates of learning disabilities in prison populations across countries (Lindgren et al., 2010), suggesting that the way support is delivered may be important in reducing the number of individuals with learning disabilities that make up prison and homeless populations, thereby reducing the associated costs of running facilities and support programs. As suggested by Katsiyannis et al. (2008), high-quality academic and reading interventions can reduce rates of delinquency and recidivism.

Increased risk for suicide

The findings from the National Longitudinal Study of Adolescent Health in the United States revealed that adolescents with learning disabilities had twice the risk of emotional distress and that females in this group were at twice the risk of attempting suicide (Svetaz et al., 2001). Suicidal ideation (Dahle et al., 2010) has also been reported specifically in children with developmental dyslexia. Daniel et al. (2006) found that youth with poor reading skills were more likely to experience suicidal ideation and attempts, dropping out of school, substance use and depression. Adolescents that have attempted suicide have been shown to display patterns of dysfunction similar to those of children with learning disabilities and adolescents that have committed suicide are found to be more likely to have been diagnosed with learning disabilities (McBride & Siegel, 1997). The suicide notes of adolescents who had committed suicide showed similar language deficits to written language of adolescents with learning disabilities (McBride & Siegel, 1997). These suicide notes also indicated worse deficits than suicide notes of a group of older adults who died by suicide around the same time. These findings suggest that aspects inherent to writing a suicide note, such as emotional state, is likely not responsible for the deficits reflected in their language (McBride & Siegel, 1997). More research is needed to clarify the reason for the disproportionate number of learning disabilities associated with adolescent suicides compared with the general adolescent population; however, regular screening for learning disabilities such as developmental dyslexia in school, psychiatric and young offender populations may

help reduce the incidence of suicide in this population (McBride & Siegel, 1997). Failing to achieve reading proficiency by the end of grade one is associated with an increased risk of drop out and of developing psychiatric disorders (Partanen & Siegel, 2014). Beyond the devastation experienced by families and communities, depression and suicide are associated with large economic costs. Depression imposes considerable costs on society, largely due lost work productivity, that amounts to tens of billions of dollars each year in just the United States (Wang, Simon, & Kessler, 2003). Suicide and suicide attempts also impose considerable costs through lost earnings and healthcare expenses (Palmer, Evicki, Halpern, & Hatziandreu, 1995).

Consequences for employment

Difficulties with reading and general academic challenges have consequences for success in education and the workplace. The feelings of sadness, anxiety and the stress of academic studies likely contribute to the increased dropout rate for individuals with learning disabilities (Davis et al., 2009). Negative emotions stemming from living with developmental dyslexia, a learning difficulty that is often stereotyped and misunderstood, have also been shown to result in lower self-efficacy and competency relating to work, and increased work anxiety (Nalavany, Logan, & Carawan, 2018). There are also fewer individuals with learning disabilities that are employed, and those that are have less job satisfaction (Kavale & Forness, 1996). This creates an increased burden at individual, family and societal levels due to lost wages, increased support and health costs, and suicide prevention efforts. Early intervention, education and support with academic and emotional needs appear to be crucial in minimizing these costs.

Intervention recommendations

As discussed, early reading interventions are recommended to help minimize the consequences of developmental dyslexia. A combination of targets and approaches is likely the most effective as the secondary outcomes of developmental dyslexia are all highly interrelated. One such method is to target the core features of dyslexia. Reading interventions have shown long-term success in reducing literacy deficits (Partanen & Siegel, 2014), which could greatly minimize the emotional consequences that occur with reading and academic difficulties. Katsiyannis et al. (2008) suggest that implementing academic interventions, particularly in reading, can reduce delinquency and recidivism. As reading difficulties and problem behaviour likely have a reciprocal negative impact on one another, targeting both throughout the school years will likely be most beneficial, even when one may be causing the other.

By targeting the features of dyslexia directly, the hope is that reading abilities and academic achievement would also improve. Developing a dyslexic individual's reading abilities can increase academic self-concept (Burden, 2008), which will likely in turn decrease internalizing behaviours and increase psychosocial adjustment (Terras et al., 2009). Childhood learning history, academic difficulties and problems with executive functioning may be important avenues contributing to adulthood internalizing emotional issues (Klassen et al., 2011). Interventions to improve executive function could also help improve life skills and reduce internalizing behaviours for adults with learning disabilities, such as organizational strategies to bypass deficits and reduce stress (Klassen et al., 2011).

Several targets of support within the secondary consequences of developmental dyslexia have been discussed throughout this review. For instance, programs targeting test-anxiety, which is higher in such individuals (Nelson et al., 2013), are found to exert a positive effect on academic achievement (Grills et al., 2014). Stress management is likely another important target for intervention to avoid the internalizing and externalizing behaviours often associated with learning disabilities which may further compound difficulties with executive function.

Self-esteem appeared frequently in the literature and is relevant at a young age, making it a particularly important target of intervention (Burton, 2007; Carawan et al., 2015; Daderman et al., 2014; Nalavany & Carawan, 2011; Nalavany et al., 2004; Riddick et al., 1999; Terras et al., 2009). Children and parents are less likely to have negative attitudes towards reading difficulties and their impact on relationships if the child has higher global self-worth (Terras et al., 2009), suggesting that self-worth and self-esteem could be potential targets to mitigate the negative psychosocial impacts of learning disabilities. The key to success in academic endeavours for individuals with developmental dyslexia appears to depend more so on motivational than cognitive factors (Lockiewicz et al., 2014), making these secondary consequences important targets for preventing difficulties associated with the reading difficulties that characterize dyslexia.

Similarly, hope and self-efficacy is key to promote positive adjustment and outcomes for individuals with developmental dyslexia. Self-instruction for improving reading performance is found to both improve reading and reduce anxiety in primary school students with developmental dyslexia (Haddadian, Alipourb, Majidi, & Maleki, 2012). Helping students build personal resources including hope, self-efficacy and optimism are also found to relate to academic success (Feldman, Davidson, & Margalit, 2015). Hope interventions could also be an avenue for individuals with developmental dyslexia for classroom and remedial education. Together, this suggests that targeting academic, self-esteem, and emotional needs will likely be the most effective in minimizing the negative consequences of dyslexia.

Conclusion

Developmental dyslexia is associated with poor outcomes in academic, social, emotional, occupational and economic domains. This review evaluated the literature about the role emotion in the association between dyslexia and these outcomes. We also aimed to identify key targets of intervention in preventing these outcomes. Developmental dyslexia is associated with problems with reading and learning, and results in various primary and secondary consequences. These consequences are summarized in Figure 1 as a visual depiction of the important role of emotion in the impact of developmental dyslexia and the target areas of intervention. Primary consequences are poor academic and work performance and differences being noticed by family, peers and teachers. These differences come with real or perceived stigma. It is possible that the characteristics of developmental dyslexia could be prevented or minimized by early identification and remediation, reducing these primary and secondary consequences. However, these individuals may still find their differences noticed by others or reflected in their performance in school or activities in which these skills are tested. Individuals with developmental dyslexia often form negative self-evaluations, which could be prevented by early explanation and assistance with their difficulties. Educating people about developmental dyslexia may also improve these self-evaluations by reducing stigma. When individuals with developmental dyslexia have

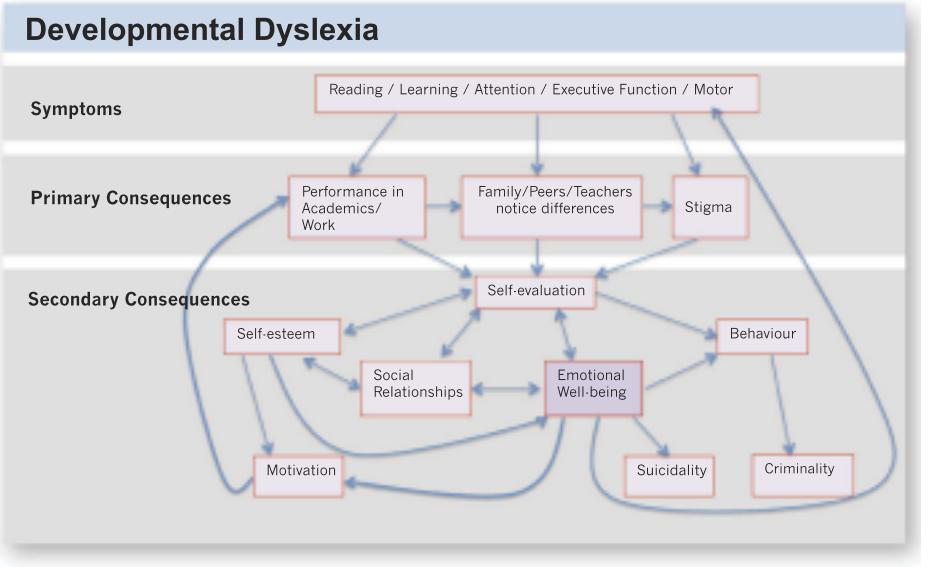

Figure 1. Schematic diagram of primary and secondary consequences and potential targets for support mechanisms.

negative self-evaluations and feelings of inadequacy, there are a host of negative consequences, including issues of self-esteem, social relationships, behaviour, motivation and emotional well-being. Emotional well-being was found in our examination of the literature to be discussed as a secondary consequence of developmental dyslexia, often in relation to others including self-esteem, social relationships and behaviour. As such, emotional functioning is a particularly important target as it influences nearly all other aspects of the individual that are affected by dyslexia. Difficulties with emotion likely further exacerbate the key aspects of dyslexia, creating a loop that may maintain the other difficulties experienced by the individual with dyslexia (Figure 1). Self-esteem is also a key factor in the relationship between emotional response to developmental dyslexia and outcomes in multiple domains. As such, emotional and self-esteem support for such individuals is pivotal in reducing the negative impact at the level of the individual, the family and society. The primary and secondary consequences of developmental dyslexia are highly integrated and therefore require multiple avenues of support, especially including interventions (e.g. cognitive brain-based reading programs), academic support, early diagnosis and education (family support, social support and emotional support) (Figure 1).

Limitations

The limitations of this study include the narrow search criteria to focus the review. Although dyslexia was a specified search term and the focus of this review, the principles found in our literature search likely applies broadly to all learning disabilities. Future work could explore the constellation of emotional consequences associated with other learning disabilities.

Summary of recommendations and next steps

This report highlights the need for early, high-quality assessment and diagnosis of developmental dyslexia with support for academic, emotional and self-esteem needs including remedial education. Routine screening of developmental dyslexia is recommended to begin at an early age, along with education and emotional support during diagnosis for both families and individuals. Research using a variety of perspectives and methodologies with multiple stakeholders is recommended to expand our understanding of developmental dyslexia and the best approaches to remediation, including a fuller understanding of risk and resilience-promoting factors (Boyes et al., 2016). More education is recommended for practitioners, individuals, parents, teachers and employers regarding the impact of developmental dyslexia beyond the specific learning difficulties. Finally, greater support systems and intervention for individuals and their families are needed to address and reduce the emotional consequences of dyslexia. Given these recommendations, research is needed to assure individuals and their families the highest quality assessment and support for developmental dyslexia. Research is needed to determine the impact of the emotional experience with developmental dyslexia on reading acquisition and response to intervention, as well as the role of stereotype threat on academic success.

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