TEACHER HELP FOR ASD: THE DEVELOPMENT OF AN ACCESSIBLE, EVIDENCE-BASED, ONLINE INTERVENTION FOR CLASSROOM TEACHERS AND STUDENTS WITH AUTISM SPECTRUM DISORDER

by

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Dedication

Grandma Cara: You were always so proud of my academic accomplishments and I wish you were here to see me achieve the biggest one yet. I dedicate this to you because even though you are gone you are with me at every step on this journey. As an elementary school teacher, I know you believed in this project and I hope you would be proud.

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Abstract

With a move toward inclusive education, children with autism spectrum disorder (ASD) spend at least a portion of their school day in the inclusive classroom. These students often present with behavioural, academic, and social challenges for which teachers may not have adequate training. The aim of *Teacher Help for ASD* program is to provide an accessible (online), evidence-based resource for classroom teachers to optimize the educational experience for students with ASD. To develop and evaluate this program, a stepped approach was taken, including a literature review, usability testing, effectiveness testing, and study of implementation barriers and facilitators. The systematic literature search revealed 13 classroom-based, teacher-implemented ASD intervention studies, all with some demonstrated effectiveness. These results, along with knowledge about best clinical practice, was used to develop the *Teacher Help for ASD* program. The usability of the new program was then assessed, with the User Experience Honeycomb (Morville & Sullenger, 2010), by classroom teachers, ASD support professionals, and ASD advocates with lived experience. The program was positively received and believed to be useful for classroom teachers, with participants strongly endorsing the program and providing mostly minor constructive feedback. Next, an effectiveness study was conducted in schools across Canada. However, due to recruitment challenges, insufficient quantitative evidence was collected to power the analyses adequately. Qualitative data reflected positive views in terms of the utility and effectiveness of this program. Finally, interviews were conducted with teachers and support staff to better understand the barriers and facilitators to using *Teacher Help for ASD*. Using the Theoretical Domains Framework (Atkins et al., 2017), the *environmental context and resources*, *knowledge*, and *beliefs about consequences* domains emerged as being most relevant for both impeding and facilitating factors. Additionally, *intentions* and *social influences* were important facilitators while *professional role and identity* and *reinforcement* were barriers. Generally, the usability and accessibility of the program were identified as facilitators. In summary, various stakeholders believed that *Teacher Help for ASD* is a valuable resource for classroom teachers. However, there is a need to consider how to assess effectiveness in schools, and how to implement this program in schools across Canada.

List of Abbreviations and Symbols Used

ABAS = Adaptive Behavior Assessment Scale

ABC = antecedent-behaviour-consequence

ABC+F = function-based antecedent-behaviour-consequence

ADHD = attention deficit / hyperactivity disorder

AF = adaptive functioning

APA = American Psychiatric Association

ASD = autism spectrum disorder

BEd = Bachelor of Education

BIF = background information form

CDC = Centers for Disease Control and Prevention

C-RCT = clustered randomized controlled trial

CW-FIT = Class-Wide Function-related Intervention Teams

DSM = Diagnostic and Statistical Manual of Mental Disorders

EA = educational assistant

EMQ = end of module questionnaire

ERIC = Education Resources Information Centre

ESQ = end of session questionnaire

FASD = Fetal Alcohol Spectrum Disorder

GAS = Goal Attainment Scale

ICD = International Classification of Diseases

ID = intellectual disability

IQ = intelligence quotient

KBHN = Kids Brain health Network

LEAP = Learning Experiences: An Alternative Program for Preschoolers and Parents

LD = learning disabilities

M = mean

N/n = sample size / sub-sample size

N/A = not applicable / not asked

NASS = National Autism Spectrum Disorder Surveillance System

NCES = National Center for Education Statistics

NDD = neurodevelopmental disorder

NP = non-participant

NR = no response

ODD = Oppositional Defiant Disorder

OT = occupational therapist

P = participant

PAND = percent of all non-overlapping data

PEM = percentage of data points exceeding the baseline median

PD = professional development

PhD = Doctor of Philosophy

PHAC = Public Health Agency of Canada

PICOS = participants, intervention, comparison, outcomes, study design

PRISMA = Preferred Reporting Items for Systematic Review and Meta-analyses

r = correlation coefficient

RCT = randomized controlled trial

SBMHSA = School-Based Mental Health and Substance Abuse Consortium

SD = standard deviation

SE = special education

SLP = speech-language pathologist

SS = support staff

T = teacher

TA = teaching assistant

TD = typically developing

TDF = Theoretical Domains Framework

UN = United Nations

UNESCO = United Nations Educational, Scientific and Cultural Organization

USA = United States of America

WHO = World Health Organization

WISC = Wechsler Intelligence Scale for Children

% = percentage

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CHAPTER 1: INTRODUCTION

This chapter provides an overall context for the research I present within this dissertation. First, I review the features of autism spectrum disorder (ASD) and the subsequent impacts on the child, their family, and their education. I also discuss the potential for schools to provide intervention to meet the needs of students with disabilities[1], particularly ASD, and the consequences of inadequate intervention. Next, I comment on the rise in ASD diagnoses, including a brief history of ASD and the concurrent movement toward inclusive education. I also present recent research about the current context of education for individuals with ASD, particularly the existing challenges faced by educators. I highlight the Canadian perspective, wherever possible. Later, I put forward online professional development as a potential tool to mitigate some of these challenges, and describe a recently developed online, professional development program, *Teacher Help*. I then outline the *Teacher Help* program which was designed to support classroom teachers in implementing evidence-based behavioural intervention for students with disabilities. Finally, I describe the dissertation objectives and research questions, setting the course for the remainder of this dissertation.

Current Conceptualization of ASD

Autism is characterized by persistent social interaction and communication challenges and restricted, repetitive behaviour patterns and interests that present in early development (American Psychiatric Association [APA], 2013; World Health

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[1] For the purpose of this dissertation, "students with disabilities" and "individuals with disabilities" refers to students and individuals requiring supports due to physical, behavioural, and / or cognitive challenges. Literature focused on specific types of disabilities such as neurodevelopmental disorders (NDDs) and various types of NDDs (i.e., autism spectrum disorder [ASD], attention deficit / hyperactivity disorder [ADHD], and learning disabilities [LDs]) will be identified as such.

Organization [WHO], 2019). Both the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013) and the recently accepted 11th edition of the International Classification of Disease (ICD-11; WHO, 2019), which will go into use in January 2022, define ASD as a neurodevelopmental disorder (NDD) with deficits in the aforementioned areas. Individuals diagnosed with ASD may or may not have language-based disorders and/or intellectual disabilities (APA, 2013; WHO, 2019). Additionally, the level of impairment varies greatly as both groupings of symptoms exist on a spectrum ranging from mild impairment (i.e., needing minimal supports) to severe impairment (i.e., needing a high level of support). Autism is a pervasive, life-long disorder, and though individuals with less severe symptom presentations may function quite well in certain settings or during different developmental periods, they still experience clinically significant impairment in functioning when environmental demands surpass individual capacities (APA, 2013; WHO, 2019).

The Impacts of ASD in Childhood

By the time a child receives a diagnosis of ASD, the family is typically already experiencing distress related to the child's development, which is often further compounded by learning that their child is likely to experience life-long challenges (Karst & Vaughn van Hecke, 2012). Having a child with ASD is associated with a number of negative outcomes for families, including decreased parental self-efficacy, increased parental stress, and high risk of parental mental health difficulties – this is true even when comparing to parents of children with other disorders such as attention deficit / hyperactivity disorder (ADHD) or intellectual disability (Karst & Vaughn van Hecke, 2012). For the child, in addition to the symptoms directly associated with ASD, there is

an increased risk for a variety of mental health disorders including anxiety, phobias, depression, ADHD, oppositional defiant disorder, sleep-related disorders, and feeding disorders (Kelly et al., 2008; Mannion & Leader, 2013; Salazar et al., 2015). Moreover, there appears to be a co-exacerbating effect between ASD symptomatology and anxiety/depression (Kelly et al., 2008). That is, there is a reciprocal negative interaction between the symptoms of these disorders. Moreover, family conflict is associated with more severe symptoms of anxiety and depression which, in turn, are associated with more severe ASD symptom (Kelly et al., 2008). Research has found that trying to navigate the treatment options for ASD is a challenge for families and that the treatment options parents choose tend to include a mixture of interventions with and without empirical support (Hess et al., 2008; Karst & Vaughn van Hecke, 2012). Furthermore, contextual family factors (e.g., higher parental stress, lower parenting efficacy, parental mental and physical health problems) can negatively impact attendance, implementation effort, and ultimately, the effectiveness of intervention (Karst & Vaughn van Hecke, 2012).

Outside the home, children with ASD are more likely than their typically developing (TD) peers to display severe and frequent behaviours that disrupt the classroom environment and interfere with academic and social skills acquisition (Koegel et al., 2012). Based on teacher assessment, students with ASD have significantly more oppositional behaviours, challenges with inattention, aggression, and social problems compared to their TD peers (Ashburner et al., 2010). They are also more likely than their TD peers to be perceived as hyperactive, anxious, depressed, and perfectionistic (Ashburner et al., 2010). Unsurprisingly, given the significantly greater behavioural, social, and learning challenges, students with ASD are more likely to be under-achieving

academically, both compared to their TD peers and as compared to their own capability (Ashburner et al., 2010). It would be extremely difficult to intervene in a different context (e.g., at home, at a clinic) in a meaningful way to target these problematic behaviours at school and more appropriate to use the natural setting in which the context-bound concerns are observed (Karst & Vaughn van Hecke, 2012).

Canadian studies have found that parents of children with ASD frequently identify a lack of continuous service provision as an unmet need (Brown et al., 2012). While most children with ASD in Canada receive intensive early intervention services through provincial or territorial funding, many children with ASD do not have ongoing services beyond the preschool-age period (Brown et al., 2012) and Canadian parents express a challenging transition from preschool to grade school during which they experience a loss of services, often with no concrete replacement (Lynch & Irvine, 2009). Providing services in public grade schools is one way to ensure continuity of services, particularly to address the above-mentioned academic, behavioural, social, and emotional concerns experienced by many students with ASD.

The Role of Schools and Educators

There has been a shift over the past several decades toward treating learning, behavioural and emotional concerns of childhood in community settings as opposed to clinical settings (Ringeisen et al., 2003). Nearly all school-aged children access community schools and they spend about 30 hours a week there making them an optimal setting for such intervention (Kasari & Smith, 2013; Koegel et al., 2012; Ringeisen et al., 2003). In fact, research suggested that the majority of mental health services received by school-aged children are accessed in their school (Ringeisen et al., 2003). Moreover,

within Canada schools are explicitly identified as an important source of mental health promotion (School-Based Mental Health and Substance Abuse Consortium [SBMHSA], 2013). Koegel et al. (2012) presented a set of guidelines, gleaned from past research, for implementing interventions in schools for students with ASD. Some of the key points include implementing intervention in the inclusive classroom, using comprehensive interventions, collaborating between home and school, and working with a team to support the student in a consistent way (Koegel et al., 2012).

It can be challenging for schools to intervene effectively, particularly when the recommended interventions do not fit well into the school system (Kasari & Smith, 2013; Koegel et al., 2012; Lindsay et al., 2013; Ringeisen et al., 2003). A 2013 report on school-based mental health in Canada identified the need for more research on ASD due to concerns that programming used in Canadian schools may not be evidence-based or rigorously evaluated (SBMHSA, 2013). Similarly, research from the United States of America (USA) has suggested that school-based programming for students with ASD is insufficient to continue the trajectories that are put into motion in early intervention programs (Kasari & Smith, 2013). Worryingly, a study based in Georgia found that less than 10% of the strategies public schools were using to support students with ASD were evidence-based (Hess et al., 2008) and a study with teachers found that whether or not an intervention is research-based does not tend to factor into their decisions about implementation (Koegel et al., 2012).

Classroom teachers may have access to a variety of interventions for students with ASD. However, many of these interventions have no scientific foundation (Hess et al., 2008). Even if teachers are provided with effective interventions, they may experience

numerous challenges. In a Canadian study, teachers identified challenges providing classroom-based intervention for students with ASD to be their lack of knowledge and understanding, environmental obstacles (e.g., lack of resources), acceptance from peers, parents and other teachers, and lack of collaboration with parents of the students with ASD (Lindsay et al., 2013). These challenges are compounded by the fact that, although policies have shifted towards holding schools more accountable for student outcomes (Koegel et al., 2012; SBMHSA, 2013; Ringeisen et al., 2003), there have been concurrent increases in the number of students requiring special education and mental health services (Chu et al., 2020; Ringeisen et al., 2003), as further discussed below.

The Rise in ASD Diagnoses

At the same time as the movement supporting education for children with disabilities was stimulated in the 1960s, and 1970s, so was the study of autism (Holaday, 2012). As research in ASD expanded to examine larger populations of children, it became clear that ASD was genetically based, existed on a spectrum, and that these children responded well to behavioural intervention methods (Holaday, 2012). Most prevalence studies from this period reported prevalence rates of about 1 in 2000-2500 (Centers for Disease Control and Prevention [CDC], 2020; Elsabbagh et al., 2012).

Since then, global rates of ASD have continued to increase steadily with rates tripling from the prevalence studies published between 1966 and 1991 to those published between 1992 and 2001 (Fombonne, 2003; Fombonne, 2005). The WHO takes the stance that a combination of improved awareness, increased reporting, and broadening of the diagnostic criteria (despite above-mentioned refinement of diagnostic criteria), can explain the observed increase in prevalence rates of ASD (WHO, 2017). Based on current

data from the CDC, the prevalence of ASD is 1 in 54 children in the USA (Maenner et al., 2020). In the USA, approximately half of children diagnosed with ASD have at least average intellectual ability, while about one third have an intellectual disability (Maenner et al., 2020). These statistics have remained relatively stable over the past decade (Maenner et al., 2020), after the rate of diagnosis of ASD in children with average intelligence increased from 2002 to 2010 (McCarthy, 2014). Males are currently four times as likely to be diagnosed with ASD (Maenner et al., 2020), representing a change from the previous decade during which males were five times as likely to be diagnosed with ASD (McCarthy, 2014). Research has demonstrated that females with ASD without cognitive impairment are less likely to receive an early diagnosis and may not have a documented diagnosis at all (Giarelli et al., 2010). This is likely related females with ASD being less likely to demonstrate significant impairments, particularly in the social domain, on certain ASD assessment tools (Ratto et al., 2018). Increased understanding of the sex differences in ASD and changes in diagnostic criteria have likely contributed to decreasing difference in rates of diagnosis.

In Canada, the National Autism Spectrum Disorder Surveillance System (NASS) has been put in place by the Public Health Agency of Canada (PHAC) and has tracked 5- to 17-year-old children and youth with ASD throughout the nation as information is made available (PHAC, 2018). Based on their data, estimated national prevalence of ASD in Canada was 1 in 66 (PHAC, 2018). The PHAC reported that, in 2015, males made up about 80% of the population of children and youth with ASD (PHAC, 2018), similar to the USA. Population-based data about intellectual ability in children with ASD in Canada are not currently available.

1The Inclusive Education Movement

Toward Integration

The global movement towards inclusive education began over half a century ago with the Convention Against Discrimination in Education (United Nations Educational, Scientific and Cultural Organization [UNESCO], 1960). While the 1960 policy did not refer directly to individuals with disabilities, it stated that no individual should be discriminated against based on "social origin", which Peters (2007) argued can be taken to include disability. However, Peters (2007) also noted that this policy referred to rights to education aligned with an individual's "capacity", as opposed to "potential", which is inherently problematic given an individual's capacity could be limited without adaptations (i.e., changes to the educational environment to compensate for a learner's challenges). Nevertheless, this marked the beginning of period of significant change for individuals with disabilities. Whereas in the 1940s and 1950s human rights policies focused on prevention and rehabilitation for individuals with disabilities, the 1960s and 1970s saw a global shift towards affording individuals with disabilities equal rights, including the right to education (Peters, 2007; Vislie, 2003). Consequently, the period from the 1970s through 1990, consisted of several additional United Nations (UN) policies promoting the rights of individuals with disabilities (i.e., UN, 1971; 1975; 1982; 1990a; 1990b and UNESCO, 1981). In terms of education, these policies recommended providing education and rehabilitation to enable individuals with disabilities to reach their full potential and to integrate into society and, over time, increasingly recognized and underscored the importance of appropriate intervention and the necessity of educators trained in special education (Peters, 2007).

Although these new policies were promising, it is important to understand how "integration" differs from "inclusion". Integration, or desegregation, initially implied a movement toward including individuals with disabilities in regular schools and classrooms, as opposed to denying them education or having them educated in specialized institutions (Vislie, 2003). Essentially, the individual with a disability was viewed as requiring adaptations or supports to help them "integrate" into society; that is, to assimilate into the "mainstream" (Peters, 2007; Sebba & Ainscow, 1996). Inclusion, conversely, is conceptualized as a movement in which schools focus on educating *all* students based on their *individual* needs, regardless of disability status, and creating a community within the classroom that is supportive of diversity (Sebba & Ainscow, 1996; Uditsky, 1993). Inclusive environments should foster a sense of belonging and community in which there is a group of integrated individuals as opposed to an individual with disabilities being integrated into the group (Cologon, 2014; Emanuelsson, 1998; Uditsky, 1993).

Toward Inclusion

The 1990s brought the international shift from integration to inclusion starting with the World Declaration on Education for All: Meeting Basic Learning Needs (UNESCO, 1990). The Standard Rules on the Equalization of Opportunities for Persons with Disabilities (UN, 1993) soon followed and furthered the social model of inclusion by expanding the breadth of the rights of access for individuals with disabilities. In terms of education, this included asking for improvements at the school level in terms of policy, adapted curriculum, materials, and teacher training (Peters, 2007). Arguably, one of the most significant policies in the inclusion movement was the Salamanca Statement and

Framework for Action (UNESCO, 1994). Not only was this policy unique in that it focused solely on education for individuals with disabilities, it also was the first to specifically note that education systems must adapt to fit the student's needs and not the reverse, representing a clear shift towards inclusion over integration (Peters, 2007; Vislie, 2003). At the turn of the century, the Dakar Framework (UNESCO, 2000) reiterated much of the policy set out by the Salamanca Statement. Relevant goals from this policy included the enrichment of education for students with special needs and a focus on ensuring that individuals with disabilities receive *quality* education (Peters, 2007). Additionally, from this meeting, an Education for All (EFA) Flagship was formed. The EFA flagship is a program with a mission statement to address challenges related to education for individuals with disabilities.

The Canadian Context

In Canada, parents of children with disabilities have historically advocated for changes even before the changes were formally addressed by the global policies outlined above (Uditsky, 1993). For instance, even when institutionalization was the recommended solution for individuals with disabilities, many Canadian parents were choosing to keep their children in their homes and expressing their belief that their children were capable of learning and deserving of formal education (Uditsky, 1993). Although the policies accepted in the 1970s (e.g., UN, 1971; UN, 1975) moved beyond rights to education being based on capacity, these policies allowed the degree of integration to be based on "economic capacity" (Peters, 2007). As a result, throughout much of Canada, where education is the jurisdiction of individual provinces and

territories, students continued to receive their education in ill-equipped, segregated schools or classrooms (Uditsky, 1993).

According to Uditsky (1993), Canadian parents in the 1970s continued to advocate for the rights of their children with disabilities and by the 1980s, public schools in Canada were expected to provide education by certified teachers for children with disabilities within their districts. However, well into the 1980s, despite specific legislation to protect the rights to education for children with disabilities in most provinces and territories, these policies were being implemented to varying degrees. By the end of the 1980s, many students with disabilities were at least partially integrated into the regular classroom and it was becoming evident that this had minimal negative impact on their TD peers and a positive impact on the students with disabilities (Uditsky, 1993).

As was the case globally, inclusion was still not a reality for most individuals with disabilities in the early 1990s in Canada (Uditsky, 1993). When in the classroom, students with disabilities were frequently following their own curriculum, often spending a portion of their day outside the regular classroom and being physically separated from their classmates (e.g., at a desk by the teacher's desk, or a desk with barriers around it). In 1990 and 1991, UNESCO implemented a project entitled Special Needs in the Classroom to aid in developing policy related to compulsory education for *all* children within regular schools and to upgrade relevant teacher training (Ainscow, 1993). Canada was one of eight countries involved in the workshops designed to provide teachers with training aimed at furthering the inclusion of students with disabilities. One Canadian site was based within a large community school in a remote northern community and was implemented as a school-wide staff development project. The other Canadian site was a

summer program for experienced teachers at a renowned university (Ainscow, 1993). For Canada and all participating countries, the project was well-received, improved teachers' ideas about inclusion for students with disabilities; and furthermore, anecdotal reports from many participants included details about intended and actual changes to teaching practices (Ainscow, 1993).

Despite the positive outcomes of the Special Needs in the Classroom project, recent research shows that teacher training in inclusive education remains inadequate (i.e., while teacher education programs typically offer a general course about inclusive education or diverse learners, most lack specified instruction about various disabilities and supervised experiences in implementing evidence-based interventions; Chu, Craig, Yeworiew, & Xu, 2020; McCrimmon, 2015). As a result, Canadian teachers struggle to foster inclusive classroom settings (McCrimmon, 2015). Additionally, although all provinces and territories have policies calling for inclusive education, jurisdictional differences and challenges with implementation remain (McCrimmon, 2015; Sokal & Katz, 2015). Given that the path to inclusion has been 60 years in the making, there is a critical need to understand how Canadian teachers can be educated and supported so that they can confidently and effectively foster inclusion in their classrooms.

Is Inclusive Education Worth the Effort?

Given that inclusive education has proven effortful and time-consuming, it is worth asking whether the outcomes are worthwhile. Research suggests that inclusive education is valuable not only for students with disabilities, but for all involved (Cologon, 2014; Florian 1998). Research has found no academic benefits to segregated schools or classrooms compared to integrated education *and* that inclusive education has additional

benefits to those gained from integration alone (Cologon, 2014; Florian 1998). In terms of academic performance, a large body of research has supported inclusive education as improving performance in reading, writing, and mathematics for students with disabilities as well as for some of their TD peers (Cologon, 2014; Lynch & Irvine, 2009). Inclusion has demonstrated several other potential benefits for the classroom community including enriching communication and language development, stimulating physical and social development, increasing attendance, and supporting a sense of belonging (Cologon, 2014; Lindsay, 2007; Lynch & Irvine, 2009). Furthermore, where inclusion is implemented fully, families of children with disabilities are generally satisfied with the services and report social benefits for their children (Lynch & Irvine, 2009).

Despite research finding positives associated with inclusion, some research has found that inclusion does not have a significant effect and others have reported negative effects of inclusion, typically related to children's self-concept (Lindsay, 2007). Predictably, given the challenges and jurisdictional differences in inclusive education around the globe, these studies have employed different definitions and methods of inclusion and examined inclusion of students with different types of disabilities, making it difficult to compare across studies and to draw generalizable conclusions about inclusion. What can be concluded is that negative effects appear rare and that, at least under certain conditions and for some students with disabilities, inclusion has a positive impact.

ASD in the Inclusive Classroom

As with earlier generations of parents of children with disabilities, parents of children with ASD have worked for policy change in the education system to support their children (Shepherd & Waddell, 2015). In the wake of the push towards more

inclusive education in the early 1990s, parents of children with ASD made concentrated efforts to ensure their children received timely and appropriate services and support in terms of health and education (Shepherd & Waddell, 2015). As health and education services are provincially funded, this has often meant separate efforts by parents across the country have been necessary (Shepherd & Waddell, 2015). While most children with ASD now have access to early behavioural intervention, a lack of continuity between health services and education services remains a concern as these children transition into grade school (Shepherd & Waddell, 2015). In Canada, children with ASD typically attend public schools participating either in an integrative or inclusive classroom (Fontil & Petrakos, 2015).

The current conceptualization of inclusive education in Canada is very much in line with previously outlined definitions. The expectation is that students attend and are *welcomed* into their community schools, attend classes with same-age TD peers, and are supported in all aspects of their learning and development in their regular classroom (Sokal & Katz, 2015). With the aforementioned push towards inclusion over integration in education, educators are faced with the task of creating an inclusive classroom within a system that is in many ways still integrated (Lynch & Irvine, 2009; Sokal & Katz, 2015). That is, in many Canadian schools, it is still common for individuals with disabilities to receive specialized services outside the regular classroom throughout the day and much of the programming, funding, and education that teachers receive continues to support an integrated system (Sokal & Katz, 2015). A Canada-wide, teacher self-report study showed that many teachers desired more knowledge about diverse learners (Froese-Germain & Riel, 2012). Although teachers in Canada reported feeling ill-prepared to

teach individuals with disabilities, research has demonstrated that there is a desire to learn more about inclusive teaching and to receive training in this area (Sokal & Katz, 2015). Teacher education is an effective way to improve teachers' attitudes towards individuals with disabilities (Sokal & Katz, 2015). Parents of children with ASD in Canada often recognize that their child's teacher is making their best efforts but is ill-equipped in terms of knowledge and resources to support their child in an inclusive environment (Fontil & Petrakos, 2015).

Putting Inclusion into Practice

Canadian researchers, Lynch and Irvine (2009) presented a large degree of overlap in recommendations and when comparing best practice for students with ASD to the inclusion model. Specifically, Lynch and Irvine (2009) note that best practice recommendations for ASD and inclusive education concepts highlight collaboration (e.g., to ease transition from preschool to grade school; between school personnel and community-based professionals), family involvement, supports for students and staff, and adapted instructional practices. A Canadian study examining the impact of teacher training on inclusive classroom practices for students with ASD had promising results (Leblanc et al., 2009). In Leblanc et al.'s (2009) study, the focus was to improve teachers' knowledge about characteristics of ASD and behaviourally based strategies for supporting students with ASD in schools. Teachers received approximately 3 hours of training from ASD consultants. Following this professional development, teachers demonstrated enhanced knowledge about ASD and evidence-based practices and how to implement these practices, as well as more positive attitudes about students with ASD and more knowledge about how to access professional support for working with students with ASD

(Leblanc et al., 2009). While Leblanc et al. (2009) reported that participants felt they had a good understanding of how to access the supports needed to teach students with ASD in the future, the researchers did not assess how this knowledge impacted behaviour of classroom teachers. However, there is some evidence that when teachers have professional development training in inclusive education, their students tend to outperform students of teachers without training (Chu et al., 2020).

Challenges in Implementing Inclusive Education

Whereas global (Peters, 2007; Vislie, 2003), national (Uditsky, 1993; Sokal & Katz, 2015), and provincial (McCrimmon, 2015; Sokal & Katz, 2015) policies promote inclusive education as the ultimate goal for students with disabilities, there remains a well-documented gap in classroom teachers' knowledge about diverse needs (Chu et al., 2020; Froese-Germain & Riel, 2012; Sokal & Katz, 2015) and a tendency towards more integrative, as opposed to genuinely inclusive, practices in many Canadian schools (Lynch & Irvine, 2009; Sokal & Katz, 2015). This is exacerbated by the rise in diagnoses of ASD globally (Elsabbagh et al., 2012; WHO, 2017) and nationally (Ouellette-Kuntz et al., 2014; PHAC, 2018). Canadian teachers typically support inclusive education but often lack the knowledge and resources to make this a reality in their classrooms (Fontil & Petrakos, 2015; Leblanc et al., 2009). A lack of inclusion focused professional development is associated with decreased likelihood of prioritizing this type of training; that is, a tendency to minimize the important of inclusive education by teachers who have not received adequate inclusive education training (Chu et al., 2020).

As demonstrated by Leblanc et al. (2009), professional development focused on understanding ASD and providing evidence-based, behavioural interventions can improve

teachers' knowledge and perceived abilities to support students with ASD. However, providing professional development in an effective and efficient manner to the large numbers of geographically dispersed Canadian teachers is challenging. In-person professional development would require significant travel for teachers and/or facilitators, particularly for remote communities, incurring more expenses (e.g., for travel, for trainers) and requiring more time (i.e., time to travel in addition to the professional development and not having flexibility in the *timing* of the training). Additionally, as provinces are responsible for their own education policy and finances (McCrimmon, 2015; Sokal & Katz, 2015), costly training and resources may not be accessible in all provinces and all schools, and teachers nationally and internationally report challenges accessing inclusion-focused professional development (Chu et al., 2020).

A Potential Solution

An online intervention offers an efficient and potentially effective tool for professional development. A meta-analysis of 201 studies of online learning for health professionals demonstrated large positive effects compared to no intervention and small, heterogenous effects compared to traditional learning (Cook et al., 2008). Online behavioural interventions for mental health have also demonstrated effectiveness (e.g., Berge et al., 2009; Calear et al., 2009; Proudfoot et al., 2013), including those implemented by an adult caring for a child or youth (e.g., Corkum et al., 2016; Morgan et al., 2016; Moss et al., 2014; Palermo et al., 2009).

As such, online learning outcomes are potentially comparable to traditional learning outcomes within health domains. Furthermore, online interventions fit well with the vision of inclusive education as many of the goals of "e-Health" (i.e., health services

delivered through, or facilitated by, the internet and other technologies) are similar to those of inclusive education (e.g., providing quality care, using evidence-based treatments/strategies, encouraging collaboration, educating, and fostering equity; Eysenbach, 2001). However, research examining online professional development has demonstrated that about a quarter of teachers do not complete online courses for which they register, a rare concern in face-to-face professional development (Reeves & Pedulla, 2011). Reeves and Pedulla (2011) suggest that, based on feedback from educators, online professional development programs should be well-organized, user-friendly, and include content that can easily be transferred to the classroom. Furthermore, fostering interactions between the participants, featuring beneficial discussion topics, being provided helpful feedback, and receiving compensation were also believed to make programs more satisfying.

The Teacher Help *Program*

The *Teacher Help* program was developed to address the challenges in providing Canadian teachers with professional development that can improve their knowledge about common NDDs (i.e., ASD, ADHD, and learning disabilities [LDs]) and evidence-based behavioural interventions to be used in the inclusive classroom. *Teacher Help* was conceptualized in 2006 and is the product of 14 years of research and development. Based on a collaboration with a team of educators, the *Teacher Help* research team learned that teachers were seeking professional development about students with ASD that they could access when and where they needed it (as opposed to waiting for relevant professional development opportunities) and that would guide them through evidence-based interventions with a step-by-step plan (Corkum et al., 2014). As such, the idea for a

platform combining e-Health with e-Learning (i.e., training and education provided using technology) was formed.

Each module of the *Teacher Help* program focuses on providing psychoeducation about the disorder (i.e., ASD, ADHD, or LD) and characteristics of students with the specific disorder before moving into evidence-based strategies based on behavioural principles to use in the classroom (see Table 1.1. for general breakdown of *Teacher Help* sessions and Table 1.2 for detailed outline of the *Teacher Help for ASD* module). The *Teacher Help* program has been designed for use in inclusive classrooms; the program is not meant to be an individual program plan but is designed to assist classroom teachers in supporting their students with disabilities in an inclusive setting.

The research team first developed *Teacher Help for ADHD* and from 2010-2013 the program underwent a pilot study (Barnett et al., 2012), followed by a randomized controlled trial (RCT; Corkum et al., 2019). The RCT included 58 classroom teachers and their students with ADHD and demonstrated clinically and statistically significant improvements in ADHD symptoms. Additionally, teachers reported a high level of satisfaction with the program. Next, in 2013, *Teacher Help for Learning Disabilities (LD)* was developed and evaluated by school psychologists, resource and learning centre teachers, and school administrators who reported high satisfaction with the program and provided constructive feedback to improve the module (Parker et al., 2019).

I joined the research team in 2015 when embarking on my doctoral degree program in clinical psychology. Upon joining the team, I assisted with the development of content for the ASD module including information about the disorder, its impact in the classroom, and evidence-based interventions appropriate for the classroom. As a former

teacher, I was able to draw on my own experiences in the classroom when considering how various recommendations might factor into the school environment. While the ASD module was being developed, the ADHD prototype program was undergoing usability testing to gather feedback about the look, feel, and general user experience of the platform. Again, constructive feedback was used to modify the program's online presence to ensure it was accessible and usable. In 2017, the ASD module was moved to the online platform and I conducted usability testing with teachers, ASD advocates, and ASD support professionals, described in Chapter 3.

Once necessary modifications had been made to all three modules, an effectiveness trial was conducted in the 2018-2019 school year. Recruitment of school boards and school psychologists, who were to act as the contacts with the *Teacher Help* research team and to support implementation with the classroom teachers, was successful. However, there were significant challenges in recruiting teachers with only 81 participating across the three different modules meaning there was insufficient power to conduct the planned quantitative analyses. Qualitative feedback from teachers suggested that they perceived the program as meaningful, accessible, and a good source of information. Ninety percent of teachers reported learning new information and approximately 75% observed improvements in their students' behaviour and academic performance. As a result of the recruitment and implementation challenges, immediately after the effectiveness study was completed, I conducted a follow-up study examining barriers and facilitators to participation across all three modules (i.e., ASD, ADHD, and LD). Findings for this barriers and facilitators study are described in Chapter 4.

Overall Goal of Dissertation

The overall goal of this dissertation is to examine the potential for an online, behaviourally based intervention for classroom teachers to use with students with ASD in the inclusive classroom. Both globally and within Canada, diagnoses of ASD risen over the past 60 years (Maenner et al., 2020; Ouellette-Kuntz et al., 2014; PHAC, 2018; WHO, 2017). During this same time period, rights for individuals with disabilities have gradually improved (Peters, 2007; Uditsky, 1993; Vislie, 2003) and, currently, the consensus is that students with ASD should be part of *inclusive* classrooms (Cologon, 2014; Lynch & Irvine, 2009; Sokal & Katz, 2015). However, this can be challenging for Canadian teachers who often lack the knowledge, skills, and time to appropriately support students with disabilities, including ASD, in their classrooms (Fontil & Petrakos, 2015; Froese-Germain & Riel, 2012; Leblanc et al., 2009). It is critical to fill this knowledge gap. Online programs may offer an efficient, cost-effective, and equitable manner to provide teachers with this professional development opportunity. However, there is a need to understand if and how this might work in Canadian classrooms, which is the purpose of this dissertation. This was addressed using three specific research questions which are described below.

Research Question 1: Are there Effective Interventions for ASD that can be Implemented by Classroom Teachers in the Inclusive Classroom?

First, it is necessary to examine carefully the extant literature regarding school-based interventions for students with ASD. The majority of studies of interventions for students in school are implemented outside the inclusive classroom setting (i.e., in a setting aside from the regular classroom and implemented by someone other than their

classroom teacher such as special education teachers or researchers). Although this is valuable in providing us with a sense of which interventions may work in an integrative setting, I posit that it fails to meet the goals of inclusive education wherein each student should receive the support they need within the classroom community. As such, I conducted a comprehensive and systematic review of the literature to determine the number, type, and effectiveness of interventions delivered directly in inclusive classrooms by classroom teachers to assess whether these types of intervention can be effective. I present this systematic review in Chapter 2.

Research Question 2: Is an Online Behavioural Intervention Implemented in the Inclusive Classroom Appropriate for Students with ASD and their Classroom Teachers?

Once establishing whether classroom-based, teacher-delivered interventions for student with ASD in the inclusive classroom can be effective, I address the question of whether key stakeholders view *Teacher Help for ASD* as a usable and feasible program. Using Morville and Sullenger's (2010) *User Experience Honeycomb*, I answer this question with the help of classroom teachers and ASD support specialists. Additionally, given the importance of collaboration and community in inclusive education, individuals with lived experience, such as parents of children with ASD and adults with ASD were invited to participate in the study. I present this usability study in Chapter 3.

Research Question 3: What are the Challenges to Implementing an Online

Behavioural Intervention in the Inclusive Classroom for Classroom Teachers?

Finally, I sought to understand the challenges that may have prevented classroom teachers from successfully implementing the *Teacher Help* program in the classroom. Given the evidence that teachers are generally supportive of inclusive education and the need for knowledge and resources to support students with disabilities in the inclusive classroom, it would be expected that a user-friendly, evidence-based program would be of great interest. However, the limited uptake for the pan-Canadian randomized trial of the *Teacher Help* program suggested that there may be barriers to participation for teachers. There is a need to understand how *Teacher Help* could be improved or changed to make this intervention more feasible in Canadian classrooms. Using the Theoretical Domains Framework (Atkins et al., 2017), I conducted a qualitative interview study with the RCT study's participants and potential participants (i.e., individuals who intended to participate in *Teacher Help* but ultimately did not). I present the qualitative study examining barriers and facilitators to *Teacher Help* in Chapter 4.

Table 1.1. *Breakdown of Teacher Help Program*

Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
• Evidence-based overview of the disorder • Self-care for teachers • The team approach	• Framework for the intervention • Developing a Teacher Help support plan • Learning about your student • Home-school communication • Special topics	• Understanding your student • Intervention strategies for core symptoms • Developing and implementing an intervention plan • Special topics	• Further developing the intervention plan with a focus on core symptoms	• Associated characteristics • Adding interventions focused on associated characteristics • Special topics	• Adapting and modifying the Teacher Help support plan • Transition planning • Changing presentation of the disorder • Further needs

Table 1.2. *Overview of the Teacher Help for ASD module*

Session	Session Goal	Outline	Worksheets	Supplemental Materials
All About ASD	To further build your knowledge about autism spectrum disorder and the treatments known to work for these children, and to highlight the importance of a team approach and self-care.	• All about ASD • Impact of ASD • Interventions for ASD • Self-care for teachers & the team approach • Summary	• Worksheet 1.1 Your Student's Profile • Worksheet 1.2 Building Your Support Team	• Supplemental 1.1 Communication Challenges and Supports • Supplemental 1.2 Information on Restricted, Repetitive Patterns • Supplemental 1.3 Sensory Differences • Supplemental 1.4 Strategies to Reduce Stress
Taking the First Steps	To set up a framework for thinking about behaviour, to complete the first steps in building a *Teacher Help* support plan for your student, and to address a special issue for students with ASD.	• Toolbox analogy • Behavioural change • ABCs+F framework • Developing a *Teacher Help* support plan • Identifying behaviours to change • Collecting data/Recording behaviours • School-home communication • Special issue : Bullying • Summary	• Worksheet 2.1 Selecting and Recording Behaviour • Worksheet 2.2 *Teacher Help* Communication Logs (Daily, Period, Weekly)	• Supplemental 2.1 Example ABC+F Chart for Younger Students • Supplemental 2.2 Example ABC+F Chart for Older Students • Supplemental 2.3 Bullying and ASD

Session	Session Goal	Outline	Worksheets	Supplemental Materials
The Support Plan	To develop and implement the first part of the *Teacher Help* Support Plan for your student that focuses on the target behaviours you selected.	• Developing the first part of a *Teacher Help* support plan • Reviewing Step 1 • Completing Step 2 • Teaching new skills • Teaching replacement behaviours • Special topics: Special interests in students with ASD • Summary	• Worksheet 3.1 Your Student's *Teacher Help* Support Plan	• Supplemental 3.1 Strategies for Teaching New Skills
Adding to The Support Plan	To continue building the *Teacher Help* support plan by adding antecedent strategies to the plan.	• Further developing the *Teacher Help* support plan • Antecedent strategies • The physical setting • Instructional strategies • Rules, routines, and transitions • Your student's *Teacher Help* support plan • Special topics: Social scripts/Social narratives • Summary	• Worksheet 4.1 Adding Antecedent Strategies to the *Teacher Help* Support Plan	• Supplemental 4.1 Example Oops Card 1 • Supplemental 4.2 Example Oops Card 2 • Supplemental 4.3 Common Antecedents and Strategies

Session	Session Goal	Outline	Worksheets	Supplemental Materials
Additional Needs	To continue building the *Teacher Help* Support Plan by including Consequence strategies, and to outline the associated characteristics of ASD and provide strategies to help support them	• Adding consequence strategies to the *Teacher Help* support plan • Strategies to address associated characteristics • Special topics: Academic challenges • Summary	• Worksheet 5.1 Considering Consequences • Worksheet 5.2 Your Student's Associated Characteristics of ASD	• Supplemental 5.1 Reward Programs • Supplemental 5.2 Supporting Classroom Participation • Supplemental 5.3 Reading Comprehension Challenges
Keep Moving Forward	To plan for the future.	• What's next? How to continue with the support plan • Transition planning • Changing symptom presentations • When further specialized assessment needed? • Helpful resources • Celebrating successes • Points to remember • Summary	• Worksheet 6.1 Planning for the Future	• Supplemental 6.1 Transition Planning • Supplemental 6.2 Helpful Resource for ASD

Note. ASD = Autism Spectrum Disorder; ABC+F = function-based ante

Chapter 2: A Systematic Review Examining Classroom-Based Interventions for Students with Autism Spectrum Disorder in the Mainstream Classroom

The manuscript based on this systematic review is presented here. Readers are advised that Nicole Ali, under the supervision of Dr. Penny Corkum and in consultation with her dissertation committee members (Dr. Isabel Smith and Dr. Sean Mackinnon), was responsible for the research question, the review methodology, critical analysis of the included papers, and all aspects of the writing process. She also received critical editorial feedback from her dissertation committee members and her colleague Matthew Orr. She would like to acknowledge Rimsha Arif and Derek van Voorst for their help as second raters during the review process. The following manuscript is being prepared for submission for publication as:

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Abstract

Children with autism spectrum disorder (ASD) often spend at least a portion of their school day in the mainstream inclusive classroom, which may present challenges for classroom teachers whose training may not have included evidence-based interventions for students with ASD. The aim of this systematic review was to identify studies of interventions implemented in the mainstream inclusive classroom by classroom teachers to support students with ASD, and to evaluate the methodological quality of these studies. Three databases were searched, and 13 studies met inclusion criteria. Studies targeted a variety of challenging classroom behaviours which impacted students academically, socially, and/or behaviourally. In addition to classroom teachers, various other individuals were involved in implementing these interventions including other school staff, peers, and students with ASD themselves. A variety of intervention types were used, most with a behavioural basis. All studies had some success in improving targeted behaviours. Results suggest that classroom teachers have the potential to implement strategies in the mainstream classroom to improve the experiences of students with ASD.

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder (NDD) characterized by deficits in communication and reciprocal social interaction and repetitive behaviour patterns (e.g., stereotyped movements, restricted and intense interests; American Psychiatry Association [APA], 2013). The prevalence of ASD is 1 in 59 children in the United States of America (USA) and 1 in 66 in Canada, as reported by Centers for Disease Control and Prevention (CDC; Baio et al., 2018) and the Public Health Agency of Canada (PHAC; 2018), respectively. Due to improved awareness, increased reporting, and broadening of the diagnostic criteria (World Health Organization [WHO], 2017), there has been a steady global increase in ASD diagnoses with rates tripling from the prevalence studies published between 1966 and 1991 to those published between 1992 to 2001 (Fombonne, 2003; Fombonne, 2005). Around the world, alongside rising rates of ASD diagnoses, schools have moved towards inclusive classroom settings, that is, the integration of students with disabilities in mainstream classrooms with a general education teacher. During the World Education Forum in 2000, led by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Dakar, the *Flagship on the Right to Education for Persons with Disabilities: Towards Inclusion,* was introduced. Inclusive education includes general education classroom teachers providing education to children with a variety of disabilities and learning challenges in their classrooms. In the past, children with disabilities, including those with ASD, were most often taught in specialized classes by special education teachers (UNESCO, 2000). According to the National Center for Education Statistics (NCES), in 2013, 91% of students with ASD in the United States attended a general education public school, with approximately 40% of these students spending 80% or more of their time in the

mainstream classroom (NCES, 2016). Similar statistics are not currently available for

Canadian schools, but similar statistics are expected.

Teachers may face challenges in the inclusive classroom, as the teaching methods

used for typically developing (TD) students may not be as effective for students with

ASD due to difficulties associated with ASD and/or common co-morbid disorders. For

instance, students with ASD have difficulty interpreting social cues in the same way as

their peers, which may necessitate different teaching strategies (Frazier Norbury et al.,

2010). Furthermore, students with ASD themselves are negatively impacted

academically, often due to conflictual relationships with their teachers and to

inappropriate classroom environments (Bolourian et al., 2019). Fortunately, evidence-

based interventions may improve the experience of students with ASD at school (see

previously published reviews: Kossyvaki & Papoudi, 2016; Machalicek et al., 2007;

Machalicek et al., 2008; Martinez et al., 2016; Sutton et al., 2018). Past reviews have

primarily included interventions targeting challenging behaviours (Machalicek et al.,

2007; Martinez et al., 2016) and social and communication challenges (Sutton et al.,

2018). Moreover, previous reviews have included studies conducted in specialized

schools or classrooms (i.e., schools or classes specific to children with disabilities) as

opposed to in the mainstream classroom where most students with ASD spend at least

part of their day. Additionally, many studies have examined interventions implemented

primarily by researchers or specialist educators (Kossyvaki & Papoudi, 2016; Machalicek

et al., 2007; Machalicek et al., 2008; Martinez et al., 2016; Sutton et al., 2018) bringing

into question feasibility for mainstream classroom teachers to implement these

interventions effectively with their students with ASD. Although there is empirical

evidence that interventions may ameliorate the negative classroom experience of students

with ASD, more research is needed to determine whether interventions can be effectively implemented in the classroom and by the classroom teacher given the goal of providing inclusive education.

To our knowledge, no prior reviews have focused exclusively on interventions being implemented in the mainstream classroom by classroom teachers. Our aim was to conduct a systematic review of the literature on mainstream classroom-based interventions targeting students with ASD. We were interested in understanding: (1) how many studies have examined the implementation of a classroom based intervention where teachers were involved in implementation; (2) who was involved in the implementation (i.e., anyone other than the classroom teacher); (3) what types of interventions were implemented; (4) how effective these interventions were; and (5) the quality of the studies. We also wanted to gather information about the students (i.e., sex, age, diagnostic information) and targeted outcomes (i.e., academic, behavioural, or social).

Based on our criteria described above, for inclusion in our review, the core of the intervention must be implemented in the classroom. The initial training session may occur elsewhere, but the core intervention and data collection must occur during regular classroom time. Additionally, implementation of the intervention must involve the classroom teacher but may include additional implementers such as other school staff, peers, or the students with ASD themselves. In addition to the requirement that the participating students with ASD must spend at least part of their day in the mainstream classroom, participants must have been between grades 1 and 12 and not have a diagnosis of intellectual disability (ID). We excluded students below the first grade given that there is variability in expectations in kindergarten or equivalents and that this is a major

adjustment period for young children. Our decision not to include studies of students with a diagnosis of ID was made because these students spend less time in the mainstream classroom than students with ASD alone and are unlikely to follow an unmodified core curriculum (NCES, 2016). This review, along with two upcoming reviews focused on attention-deficit/hyperactivity disorder (ADHD) and learning disability (LD), were used to inform the development of an eHealth program designed to assist classroom teachers to provide evidence-based treatments to students with neurodevelopmental disorders in grades 1 – 12. ASD, ADHD, and LD constitute the first three modules of this program which was recently tested in Canadian public schools (ClinicalTrials.gov NCT02919215).

Method

The Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) statement (Liberati et al., 2009) was used as the pre-specified protocol for this review.

Search Strategy

The initial search was conducted simultaneously for all three aforementioned disorders followed by separate updated searches as it was apparent each disorder had enough prior research to constitute an independent systematic review. Three databases, PsychInfo, PubMed, and Education Resources Information Centre (ERIC), were used as the information sources for the review. No limits (e.g., language, population, publication type) were applied to the searches due to the risk of introducing bias as described by Cooper et al. (2018). The initial systematic search related to all three NDDs included studies from January 2000 to September 2016 and the search has since been updated with

the most recent search and review taking place in February 2020. The year 2000 was selected as the beginning date for inclusion of articles, as this is the year of release of the aforementioned Flagship program (UNESCO, 2000). See Appendix 2.1 for the original (i.e., including ADHD and LD search terms) search strategy and search terms for PubMed.

Study Selection Criteria

A PRISMA diagram outline the article selection process (see Figure 2.1). For all searches (i.e., the initial search conducted in September 2016 and subsequent updates including up to the most recent search in February 2020), duplicate articles were removed first, followed by title and abstract reviews in which any articles that clearly did not meet the inclusion criteria were removed. Finally, full-text reviews were done to determine the eligible studies for the review. Inclusion criteria included: (a) the study reported on at least one aspect of student classroom-based outcomes (i.e., not solely reporting on teachers' attitudes or knowledge), (b) all participating students had a diagnosis of ASD *or* separate results for participants with ASD were provided, (c) no participants reported to have a diagnoses of intellectual disability (ID) *or* separate results for participants with/without ID, (d) all participating students were between the 1st and 12th grade *or* separate results for participants in different grades were provided, (e) participating students spent some portion of their day in the mainstream classroom, (f) the study reported on an intervention which was implemented in mainstream classroom during class time, (g) the intervention was implemented by the classroom teacher (i.e., given the focus on examining interventions that can be implemented by classroom teachers in the inclusive setting), (h) study was peer-reviewed (i.e., not an unpublished dissertation), and

(i) study was available in English or French. In cases for which critical information was needed to determine if the article met inclusion criteria, an attempt was made to contact the authors ($n = 8$); if no response was received, the article was excluded ($n = 1$).

Data Extraction

Data extraction for each article included in the review was completed independently by the first author (N.A.) and compared to independently completed extraction by one of the other authors (either R.A. or M.O.) using an author-created form. Any noted inconsistencies were discussed and reconciled between the two authors and, if necessary, a third author (P.C.). The categories used for data extraction were: (1) country in which the intervention was implemented, (2) study design, (3) type of intervention, (4) number of participants who met inclusion criteria (e.g., had a diagnosis of ASD, were in grades 1-12), (5) ages of participants, (6) sex of participants, (7) comorbid disorders of participants (if reported), (8) IQ of participants (e.g., as measured by a standardized test such as Wechsler's Intelligence Scale for Children [WISC]; if reported), (9) adaptive functioning of participants (e.g., as measured by a standardized test such as Adaptive Behaviour Assessment Scale [ABAS]; if reported), (10) who implemented the intervention (in addition to the classroom teacher), (11) description of the training provided to implementer (if applicable), (12) length of intervention, (13) length of follow-up (if applicable), (14) targeted behaviours for the student with ASD only (i.e., measures of behaviour change for teacher or peers not reported), (15) how targeted behaviour change was assessed/measured, and (16) fidelity, and (17) evidence of success (i.e., for, mixed, none, or against based on whether improvement was seen across all participants and target behaviours, some participants or target behaviours, no participants or target

behaviours, or negative changes were seen across participants or targeted behaviours, respectively).

Quality Assessment

A quality assessment for the articles selected for full review was conducted using the *Checklist for Measuring Study Quality* (Downs & Black, 1998) by a pair of authors (N.A. & R.A. or N.A. & M.O.). Any inconsistencies between authors were discussed and reconciled, if necessary, a third author (P.C.) was consulted. The checklist allows for an assessment of the methodological quality of both randomized and non-randomized studies. The checklist consists of five sub-scales: (1) reporting of the information in the study and clarity of description, (2) external validity of the findings, (3) possible bias evident when analyzing the method of measurement and study outcome, (4) and confounding bias evident in the selection of study subjects, and (5) statistical power. Calculation of power was not considered as it was not suitable for the primarily single-subject design studies included in this review. As such, items were scored out of a possible total of 27 points as in previous reviews (Blunden et al., 2011; Rigney et al., 2018). Previous assessments of psychometric properties of the *Checklist for Measuring Study Quality* include high internal consistency (*KR-20* = 0.89; Downs & Black, 1998) and good inter-rater reliability (*ICC* = 0.73; Hootman et al., 2011).

Results

In the initial search, which included studies focused on ASD, ADHD and LD, 11,947 articles were found. An additional 1,064 articles were found during updated searches using only the ASD search terms. Of the 13,011 total articles, 9,084 were unique (i.e., 8,222 of which were from the original search containing ADHD and LD articles).

Following title screening, 2,208 articles remained (i.e., 1,690 from original search), and following abstract review, 650 remained (i.e., 511 from original search). At this stage during the original search, 326 of the 511 articles were excluded as they did not include participants with ASD (i.e., were focused on ADHD or LD; focused on some other NDD or did not focus on NDD). Combining the remaining 185 from the original search and the 139 from the updated ASD only searches, 324 articles were reviewed in full. Thirteen articles met inclusion criteria and were retained. The primary reason for exclusion during full text review ($N = 311$) was that the intervention was not implemented by the classroom teacher in the mainstream classroom. For example, the mainstream classroom teacher was not involved in implementation and/or intervention implemented outside of the mainstream classroom [e.g., in specialized school or class, during recess or lunch]; n =203). Additional reasons for non-inclusion are described in Figure 2.1. General information about the included articles is summarized in Table 2.1 and elaborated below.

All 13 included articles were classified as single-subject research designs including between one and four participants. The modal number of participants was three. Within each study, individual participants were counted only if they met the inclusion criteria. Specifically, two studies included one participant in kindergarten (Mancil et al., 2009; Strain et al., 2011) who was excluded from our data extraction. This left 33 participants included in our analyses across the 13 studies.

Participants

As expected, given the sex ratio for diagnosed ASD, most study participants were male. Within the selected studies, 9% of the participants were females (95% CI [1.9%, 24.3%]), representing the lower end of the expected range of 20-30% of individuals with

ASD being female (Zwaigenbaum et al., 2012). However, cognitive ability has been

shown to have a moderating effect on this ratio such that females diagnosed with ASD

tend to have lower cognitive functioning. As such, it is possible that the exclusion of

participants with ID may have led to the exclusion of a higher number of female

participants. The participants ranged from 6-14 years old ($M = 9.25$), representing the full

scope of expected ages of children in elementary school, but not the later years of high

school. Several studies reported co-morbid disorders (i.e., other than ID, which was

excluded) in participants including: learning disorders (McCurdy & Cole, 2014; Strain et

al., 2011), ADHD or characteristics of ADHD (MacDonald et al., 2018; Stasolla et al.,

2014b), fetal-alcohol spectrum disorder (MacDonald et al., 2018), and oppositional

defiant disorder (MacDonald et al., 2018). Of note, individual participants may have had

multiple co-morbid diagnoses. Only one article explicitly reported that the participant did

not have any other diagnoses (Bock, 2007). It is possible that other participants had co-

morbid diagnoses that were not reported in the study, particularly given that upwards of

70% of individuals with ASD have significant difficulties with hyperactivity, conduct,

and/or emotional problems (Simonoff et al., 2008; Simonoff et al., 2013). However, given

the risk of some comorbidities (e.g., hyperactivity) increases with lower intelligence, the

exclusion of individuals with ID may have led to fewer comorbidities among the

participants in the included studies. Only five studies (Bock, 2007; Cihak et al., 2012;

Macdonald et al., 2018; Strain et al., 2011; Wu et al., 2019) reported a standardized

measure of intelligence; across these studies IQs ranged from "extremely low" to "above

average". Only one included study (Cihak et al., 2012) reported a measure of adaptive

functioning with participants' scores ranging from extremely low to low average within

the study. As with intelligence, participants with lower adaptive functioning are at higher risk of comorbidity (Simonoff et al., 2013).

While classroom teachers played a role in implementation in all included studies, and all studies were implemented in the mainstream classroom, they worked with at least one other implementer in nine studies and as the sole implementer in four. Other implementers included special education teachers ($n = 2$); educational assistances ($n = 2$), other school staff ($n = 1$), peers ($n = 1$), and the student with ASD themselves ($n = 1$). Additionally, researchers played a significant role beyond simply training others or collecting data and assisted with the implementation of the intervention in four studies.

Study Findings

Each reported target behaviour was assigned to one of three categories: social, academic, or challenging behaviour. It is worth noting that many interventions focused on improving social behavior are implemented outside the regular classroom in more social settings and, as such, studies in this category are under-represented in this review. Details including country where the study was conducted, type of intervention, age and sex of participants, intervention implementers, quality ratings, and evidence of effectiveness are discussed below within the context of the types of behaviour being targeted. Information about how outcomes were measured, training for implementers (where applicable), length of intervention, length of follow-up and number of maintenance sessions can be found in Table 2.1. Six of the 13 studies addressed outcomes from two of the three categories and, as such, are discussed more than once below.

Social Behaviour

Social Engagement. A single study focusing on social engagement, specifically, working cooperatively with others, was identified (Bock, 2007). As noted above, studies focusing on social behaviour appear unlikely to be conducted in the classroom setting. The participant in the study was a 12-year-old boy and the intervention was implemented by the classroom teacher and a special education teacher and involved a social-behavioural learning strategy called Stop-Observe-Deliberate-Act (SODA; Bock, 2007). This intervention involves providing an adolescent with ASD with a set of questions, based on the SODA acronym, which they are expected to ask themselves. It encourages them to stop, observe, and deliberate about environmental cues, the actions and words of others, and their own feelings and thoughts before acting (Bock, 2007). The quality rating for this study were 18/27. At baseline, the student engaged in cooperative learning approximately 10% of the time which increased immediately once the intervention was implemented and averaged 72% throughout intervention and maintenance periods representing an increase of 62% (Bock, 2007).

Academic Behaviour

Academic Engagement. Ten studies were of interventions aimed to improve academic engagement. Academic engagement was defined by increased on-task behaviour, decreased off-task behaviours, or both.

Visually Based Interventions. Visually based interventions were common including video self-modelling, video Social Stories^{TM}, a visual schedule and work system, and a stimulation program.

Video self-monitoring involves using recordings of the student exhibiting the desired behavior and having the child view this video as a reminder of what is expected. Schatz et al. (2016) examined the use of video self-modelling implemented by a classroom teacher with three male students aged 8-10 years old. Two of the three students in Schatz et al.'s (2016) study exhibited significant improvements from baseline over the course of the intervention and maintenance phases (i.e., 42% and 32% on-task engagement at baseline to 67% and 63%, respectively, during the intervention phase, and 72% and 83%, respectively, during the maintenance phase). The percentage of data points exceeding the baseline median (PEM) were 76% and 100% in intervention and 100% for both students in maintenance. The third student exhibited only a minimal increase from baseline during the intervention (i.e., 83% to 88%) and displayed less frequent on-task engagement during maintenance (i.e., 75%). During the intervention and maintenance phases, his PEM was 55% and 43%, respectively, which Schatz et al. (2016) interpreted to mean the intervention was minimally effective. The quality rating for this study was 18/27.

Cihak et al. (2012) examined the use of video based Social Stories[TM] implemented by the classroom teacher and a special education teacher with four male students aged 11-14 years old. Social Stories[TM] are stories that are written to explain social events and activities to students with social challenges in a way that guides them towards appropriate behaviour and responses. Two stories were created for each student and were assessed to see which was more effective. Following the initial examination of each story, the remaining analyses were conduced with the more effective story. Using each students' more effective story, they were on task for an average of 83%, 95%, 97%, 100% of

intervals when the story was used compared to 58%, 64%, 82%, and 60%, respectively, when the story was withdrawn. Thus, across participants, the video-based Social Stories[TM] increased on-task engagement 18-67%. Cihak et al.'s (2012) study was rated 17/27 for quality.

In Macdonald et al.'s study (2018), a visual schedule and work system was implemented by the classroom teacher with four male students aged 8-11 years. Visual schedules are pictures, symbols, and/or written language used to orient the student to the sequence of events for the day and work systems focus on supporting students through sequencing by breaking tasks down into what to do when as well as being explicit about what to do, how much to do, and how to know when goals have been met. The students demonstrated on-task engagement 9%, 20%, 40%, and 61% of the intervals during baseline and increased to 65%, 53%, 60%, and 86%, respectively, during the intervention. Increases were considered to be large and statistically significant for the first three, and moderate but not statistically significant for the latter. Maintenance was only assessed for one student (i.e., the student who had increased from 20% to 53%) and his on-task engagement fell to 8%. As such, the evidence for this study is considered to be mixed given the extreme decrease in on-task behaviour for this student during maintenance and the fact maintenance was not reported for the other students. Moreover, while on-task behavior increased during the intervention phase, there was not a significant decrease in off-task behaviours and only some students were successful in completing significant more work. MacDonald et al.'s (2018) study was assigned a quality rating of 18/27.

Stimulation programs, such as that delivered in the study by Stasolla et al. (2014a), are designed to elicit engagement and reduce stereotyped behaviours through

stimulation input and may include activities such as colouring and using a computer. This study was implemented with two male students aged 7 and 8 years by the classroom teacher and a research. Both participants demonstrated no constructive engagement during their baseline, increased their engagement when the colouring intervention was implemented (i.e., 76% and 88% engagement), and further increased with the computer intervention (i.e., 96% and 94%, respectively). Both participants chose the computer stimulation for the remainder of the study and continued to demonstrate increased on-task behaviours (i.e., 97% and 93-94%, respectively) as compared to return to baseline intervals where both students' on-task behaviour returned to zero. This study by Stasolla et al. was rated as 14/27.

   Traditional Behavioural Reinforcement Interventions. Four interventions targeting academic engagement used more traditional behavioural reinforcement techniques.

   Garbacz and McIntyre (2016) examined the implementation of a behavior support plan following a conjoint behavioural consultation (i.e., a behavioural consultation between the students' families and the school) for each student. They examined the impact on three (two males; one female) students between the ages of 6 and 8 years old and were implemented by a classroom teacher alongside a researcher. Students were engaged an average of 79%, 88%, and 92% of the time during baseline and 100%, 98%, and 98% of the time during treatment. The percent of all non-overlapping data (PAND) was calculated and demonstrated that 70-100% of the data points for the intervention phase were different from the baseline. The quality rating for this study was 18/27.

Reeves et al. (2013) studied the implementation of a function-based antecedent-behaviour-consequence (ABC+F) approach by classroom teachers and educational assistants with three 7-year-old males. ABC+F interventions are behaviour support plans that can include a variety of behaviour modification strategies including adjusting antecedent conditions, reinforcing replacement behaviours, and withholding reinforcement of undesired behaviours. These interventions may also include skills training. They are developed following a functional analysis of an individual's behaviour to understand the function the behaviour serves. During baseline and return to baseline phases, the students demonstrated 21-48%, 37-50%, and 42-47% on-task behaviour. When the intervention was implemented, the students demonstrated 87-94%, 77-96%, and 85-96% on-task behaviour, respectively. During the follow-up phase, participants were on-task 98%, 100%, and 93% of the time. Reeves et al.'s (2013) study was rated as 17/27 for quality.

Strain et al. (2011) examined the implementation of a Prevent-Teach-Reinforce model with an 8-year-old male and a 9-year-old female. This intervention, which involves preventing in the antecedent stage, teaching replacement behaviours, and reinforcing desired behaviours, was implemented by classroom teachers, educational assistants, and other school staff. Although exact values were not reported by Strain et al. (2011), visual inspection of figures would suggest that at baseline the students were both engaged about 20% of the time which increased to 60-70% and 80-90% during intervention. Moreover, the first student's engagement increased to 70-80% during follow-up while the latter's remained consistent. Strain et al.'s (2011) study received a quality rating of 15/27.

Finally, Wu et al. (2019) examined the effects of Class-Wide Function-related Intervention Teams (CW-FIT), a positive behaviour support program that emphasizes reinforcement strategies. They examined the effects of Tier 1 (i.e., defining, modelling, role-playing) and Tier 1 + Tier 2 (i.e., addition of prompting student to use self-management skills using a chart of strategies) with a 10-year-old boy. All students in the class worked in "teams" and received points for behaving as expected during timed intervals. For the student with ASD, on-task behaviours were 21% during baseline and increased to 41% with Tier 1 with a 20% overlap in data points. Wu et al. (2019) noted that while there was an observed improvement, it was insufficient. Once Tier 2 was added, the student's on-task behaviours increased to 70% and there was no data overlap with the Tier 1 only phase. Further, removing Tier 2 led to a decrease back down to 37% on-task behaviour and re-introduction of Tier 2 increased the on-task behaviour back to 72%. Thus, Wu et al. (2019) determined that Tier 1 + Tier 2 was more effective than Tier 1 alone. The quality rating for this study was 17/27.

Self-Monitoring Intervention. One study targeting academic engagement used a self-monitoring intervention and, thus, was implemented by the student themselves alongside the classroom teacher and a researcher (Stasolla et al., 2014b). This intervention, which was implemented with two male students aged 7 and 8-years old, involved having the students take note of their own behavior (i.e., whether or not they were on task) when a reminder tone was played over a headset. Prior to the intervention, the students were engaging in 6% and 12% on-task behaviours. During the intervention phase, on-task behaviour increased to 95% and 87%, respectively, and was maintained at 96% and 86%, respectively. This study was rated 14/27 for quality.

Peer Support Intervention. Finally, one intervention targeting academic

engagement used peer support, implemented with the support of a classroom teacher with

three male students aged 7 to 11-years-old (McCurdy & Cole, 2014). This intervention

involved a peer prompting appropriate behaviour by staying in close proximity to the

student with ASD during class, reminding the student what is expected, giving them

verbal and nonverbal encouragement, and when off-task behaviour is displayed,

prompting them toward the expected behaviour. Across the three participants, baseline

data indicated 69%, 73%, and 75% of time was spent on off-task behaviours. During the

intervention phase, this decreased to 12%, 15%, and 43%, respectively. The former two

students were on task more frequently than their peer support (i.e., peer supports were

both off task 19% of the time) while the latter continued to display more off-task

behaviours than his peer support (i.e., 43% versus 14%). Similarly, PAND for the first

two students was 100% compared to 50% for the third; however, this was believed to be

due to the peer support not remembering to prompt the student and when she was

provided with a MotivAider (i.e., a tool that vibrated at intervals to reminder her to check

on her partner) the PAND increased to 100%. McCurdy and Cole (2014) was assigned

15/27 for quality.

Acquisition and Accuracy. One intervention in the academic category focused

instead on improving the acquisition of academic material (Tekin-Iftar et al., 2017). This

study included three male students aged 12 to 13 years and was implemented by the

classroom teacher. This study used a simultaneous prompting procedure to improve

acquisition of knowledge on a Health topic (i.e., sleep or injury/emergency) which

involves a teacher presenting a stimulus and then giving an individualized prompt to elicit

a correct response. At future sessions, they probed for whether that information was learned, training again as needed. All three students were unable to correctly respond to any questions on the generalization pretest and made 100% on the post-test. Likewise, while they performed with 0-9% accuracy during baseline measures, two students reached 100% accuracy within two sessions and the other within three. Evidence supported this intervention and it received a quality rating of 17/27.

Challenging Behaviour

Stereotyped Behaviour. Two interventions, including four male participants between the ages of 7 and 8 years of age, targeted the reduction of stereotyped behaviour. They included Stasolla et al.'s (2014b) self-monitoring study and Stasolla et al.'s (2014a) stimulation program study, both described above. In the self-monitoring study, the students engaged in stereotyped behaviour 94% and 99% of intervals. This decreased to 28% and 11%, respectively, during the intervention, and further decreased to 20% and 10% during maintenance (Stasolla et al., 2014b). In the stimulation program study, both students engaged in stereotyped behaviours in 100% of the intervals. Similar to the engagement data in this study, the colouring condition led to improvement (i.e., reduced to 14% and 25% of intervals with stereotyped behaviours) and the computer condition led to more (i.e., 9% and 4%, respectively). As noted previously, both students chose to continue with the computer stimulation and they engaged in stereotyped behaviours 11-13% and 2-3% of intervals, respectively in the following phases. When the intervention was withdrawn, both students demonstrated significant increases in stereotyped behaviours (i.e., 89% and 100%, respectively; Stasolla et al., 2014a). Both studies had quality ratings of 14/27.

Disruptive Behaviour. Three studies employed interventions to target disruptive behaviours such as emotional outbursts and disrupting the class (Garbacz & McIntyre, 2016; Strain et al., 2011; Wu et al., 2019). Disruptive behaviour was a target for four (three males; one female) of the participants included in these studies. The relevant participants were between the ages of 8 and 10 and included a behaviour support plan implemented by a classroom teacher and a researcher (described previously; Garbacz & McIntyre, 2016), the Prevent-Teach-Reinforce intervention implemented by a classroom teacher, an educational assistant, and other school staff (described previously; Strain et al., 2011), and CW-FIT (described previously; Wu et al., 2019).

Disruptive behaviour was a target for one of the three students in the Garbacz and McIntyre (2016) study. This 8-year-old male engaged in disruptive behaviour during 10% of the intervals at baseline and 1% during the treatment phase. Moreover, the PAND was 86%. The two students (i.e., a 9-year-old female and an 8-year-old male) in the Strain et al. (2011) study engaged in disruptive behaviours 30-50% and 40-70% of intervals during baseline. With the implementation of the intervention, this was reduced to 10-20% and 10-40%, respectively. At follow-up, both students were only engaging in disruptive behaviours in about 10% of intervals. Finally, the 10-year-old male in Wu et al.'s (2019) study engaged in disruptive behaviours 78% of the time during baseline and decreased to 67%, with 35% overlap, during Tier 1 of the intervention. As with engagement, a true improvement was not observed until Tier 2 was added at which point disruptive behaviours decreased to 35% with no overlapping data with Tier 1 only condition. As with the engagement behaviours, removal of Tier 2 resulted in regression and an increase in disruptive behaviours which remediated when Tier 2 was re-introduced. This group of

studies has quality ratings of 18/27 (Garbacz & McIntyre, 2016) ,15/27 (Strain et al., 2011), and 17/27 (Wu et al., 2019)

Non-Compliance. One study (Garbacz & McIntyre, 2016) targeted non-compliance with a single student (i.e., a 6-year-old female). As such, a behaviour support plan intervention was implemented by the classroom teacher and a researcher (described previously; Garbacz & McIntyre, 2016) with the goal of reducing the time it took for the student to respond to commands. This student complied promptly 39% of the time during baseline and 72% of the time in the treatment phase with a PAND of 95%. As noted previously, this study was rated 18/27 (Garbacz & McIntyre, 2016).

Aggressive Behaviour. Two studies involving three males and two females between the ages of 6 and 8 years targeted aggressive behaviour such as pushing and hitting (Garbacz & McIntyre, 2016; Mancil et al., 2009). One intervention used a behavioural support plan implemented by a classroom teacher and a researcher (described previously; Garbacz & McIntyre, 2016), and the other used Social Stories[TM] implemented by the classroom teacher (Mancil et al., 2009). The Social Stories[TM] (see previous definition) presented in the Mancil et al.'s study (2009) included both paper and Powerpoint[TM] formats.

Although assessed for all three, two of the three students in the Garbacz and McIntyre (2016) study did not engage in any (i.e., less than 1%) aggressive behaviours during baseline or treatment phases. The student, a 6-year-old girl, engaged in aggressive behaviours in 2% of baseline intervals which was reduced to less than 1% during treatment. PAND value was not calculated due to the low incident level. In the Mancil et al. (2009) study, a 7-year-old boy and an 8-year-old girl were presented with Social

Stories™ with the goal of reducing pushing behaviours. During baseline, they pushed their peers an average of 16-19 and 13-20 times during a 5-minute transition period, respectively. In conditions using the traditional paper stories, pushing was reduced to 5-10 and 4-7 times on average. Similarly, using the Powerpoint™ format, they pushed their peers an average of 5-10 and 4-7 times. During maintenance, the students were allowed to choose whether they wished to use a story and which format they preferred. Both chose the Powerpoint™ format and pushing behaviour continued to decrease to an average of 2 times and 0 times, respectively. The studies were assigned quality ratings of 16/27 (Mancil et al., 2009) and 18/20 (Garbacz & McIntyre, 2016).

Summary of Other Study Details

The interventions varied greatly in terms of the training provided to implementers, intervention length, and whether follow-up and fidelity were measured. Full details are described in Table 2.1. Where reported (8/13 studies), training ranged from as little as a 30-minute training session (McCurdy & Cole, 2014) to having ongoing feedback with a consultant who helped to plan and problem solve (Garbacz & McIntyre, 2016). Intervention length ranged from as few as two sessions (i.e., for the paper delivery method in the Mancil et al.'s study [2009]) to as many as five weeks (Reeves et al., 2013). Due to the nature of the studies included (i.e., single subject designs), there was often a great deal of variability in number of sessions across participants within in studies. Eight studies included some type of follow-up or maintenance measure, taking place anywhere from immediately after the intervention ended (Strain et al., 2011) to having a final session two months after the intervention ended (Bock, 2007). Twelve studies measured outcomes through observations (e.g., tally of the frequency of observed

behaviour, percentage of intervals with observed behaviour, percentage of time spent engaged in the observed behaviour) and the remaining study used percent correct on a test of academic acquisition. Finally, ten studies included some type of fidelity measure. Of those studies, one only reported fidelity during training (Bock, 2007), another only reported on intervals that achieved 100% fidelity and did not report how many intervals were excluded for not reaching this threshold (Schatz et al., 2016), and one reported that fidelity assessment was done during training but did not report on rate of fidelity (Wu et al., 2019). The lowest reported fidelity was a range of 50% to 83% across intervals and this was the one study that reported mixed findings (Macdonald et al., 2018). Both Mancil et al. (2009) and Tekin-Iftar et al. (2017) reported 100% fidelity across the entire intervention.

Discussion

The purpose of this systematic review was to examine the scope (i.e., number of published studies), type, effectiveness, and quality of intervention studies for students with ASD implemented in mainstream inclusive classrooms. There was also an interest in noting which interventions were implemented by classroom teachers alone and who else was involved in implementation. We also considered student information and targeted outcomes. This review adds to the literature as the first to focus solely on interventions implemented in the mainstream classroom by classroom teachers, which is relevant for moving forward interventions being used in inclusive classroom settings.

Scope and Type Interventions

One of the most notable findings in this review was the paucity of classroom-based, teacher-implemented intervention studies. Despite an extensive review of the

literature over nearly 20 years, only 13 studies met the inclusion criteria with more than 200 studies being eliminated because the intervention was implemented outside the inclusive classroom setting or because the classroom teacher was not involved in implementation – usually both. Moreover, all the included studies were classified as single-subject research design, which suggests large-scale studies meeting our criteria have yet to be conducted.

Not surprisingly, the majority of the studies included in this review (11/13; 85%) targeted an academic behaviour; namely academic engagement (n = 10) and acquisition and accuracy of academic material (n = 1). The interventions targeting academic behaviours included visually based interventions (e.g., video self-modelling, video Social Stories[TM]) and standard behavioural interventions (e.g., ABC+F, behavioural support plan). Interventions using self-monitoring and peer support were also employed.

A variety of challenging classroom behaviours were also addressed through interventions included in this review. These included ASD-specific challenges (i.e., stereotyped behaviour) and other behavioural challenges (e.g., disruptive behaviour, lack of compliance, aggressive behaviour). These interventions, most of which were also targeting academic engagement, used the same strategies described above (i.e., visually based strategies, traditional behavioural strategies).

Finally, one of the interventions addressed social behaviour, specifically social engagement, and used a social-behavioural learning strategy. It is worth noting that there are many interventions focused on improving social behaviour in students with ASD that were excluded due to being implemented outside the classroom (e.g., during recreational time, during lunch hour). It is logical that the majority of interventions targeting social

skills would be implemented in more social settings; however, social engagement is also an important skill in the classroom (e.g., group work; appropriate peer interactions).

Effectiveness and Quality of Interventions

Overall, the studies included in this review demonstrate the potential for effective mainstream classroom-based interventions for students with ASD with 12/13 (92%) reporting positive findings and the remaining study (i.e., MacDonald et al., 2018) reporting mixed findings. The ecological validity of the findings in this review is relatively strong given that the interventions occurred in the classroom. While the studies had small sample sizes, this review provides an argument for moving forward with larger-scale classroom-based intervention studies given the demonstrated evidence for change with individual students shown in these studies.

Using a modified version of Downs and Black's (1998) quality rating scale, which is designed for use with a range of methodologies including small scale research, the relative quality was not very strong, ranging from 14 to 18 out of a possible 27. These scores tended to reflect risk of bias related to external validity (e.g., unable to ascertain representativeness of sample) and internal validity (e.g., lack of blinding for those assessing outcomes). While most of the studies in the current sample demonstrated rigor appropriate for single subject designs, it is impossible to know how well the interventions would work with a more diverse sample of students. Furthermore, due to publication bias it is possible that some of the interventions presented have previously been implemented unsuccessfully with similar or different student samples.

Implementers and Students

In four of the studies included in this review, the intervention was implemented by the classroom teacher alone, with the student with ASD being considered an implementer due to self-monitoring intervention in another study. Similarly, one study used peer support which suggests that that these six interventions could potentially be implemented effectively without any support from outside the classroom community. Of the remaining studies, other school staff such as educational assistants and special education teachers were also involved which is likely representative of available supports in most schools. In four of the studies, researchers appeared to play a fairly large role in supporting implementation (e.g., training, feedback) and it is unclear whether these interventions would be effective if teachers and school staff were to implement them on their own.

The students included in the studies ranged from 6 to 14 years of age representing children in elementary and junior high schools. However, no studies focused on students in high school, and most were focused on elementary aged students. One reason for the lack of studies with older students may be due the increased likelihood of students having multiple teachers throughout the day, making classroom-based interventions more difficult to organize as they would require several teachers to collaborate in order to achieve consistency. Where explicitly reported, co-morbid disorders included ADHD, LD, fetal alcohol spectrum disorder, and oppositional defiant disorder. As noted previously, students with ASD and comorbid ID were intentionally excluded as they often spend a reduced portion of the day in the mainstream classroom compared to students with ASD without ID. Similarly, students with IDs are less likely to follow the regular, unmodified programming. For instance, recent statistics from the United States show that

68% of those with ASD only graduate with a regular diploma (i.e., complete unmodified curriculum outcomes) while only 42% of those with ID only graduate with a regular diploma (NCES, 2016). Although statistics for students with co-morbid ASD and ID were not available, one can infer that the probability of exclusion from mainstream classroom is higher with ID than ASD. Conversely, other common co-morbid disorders (e.g., ADHD or anxiety) would be unlikely to require any adjustment to educational outcomes and could be addressed with accommodations and, thus, were not excluded from this review. It is also worth noting that the participants in the included studies ranged from "extremely low" to "above average" intelligence were measured with a standardized intelligence measure and reported.

Challenges to Generalizability

As noted above, few studies reported explicitly on co-morbidity. Given that an estimated 70% of children with ASD have a co-morbid psychiatric disorder (e.g., ADHD, anxiety, oppositional defiant disorder; Simonoff et al., 2008; Simonoff et al., 2013) more research on students with ASD and common co-morbid disorders is needed in order to understand how well interventions would work across various symptom presentations. Similarly, as few studies reported on intelligence it is challenging to determine whether these interventions are appropriate for students of varying intellectual ability (i.e., aside from those with ID who were intentionally excluded). It would be beneficial for future studies to include information about intelligence and adaptive abilities, which was only reported once, to better understand which interventions can serve individual students best.

Another issue in generalizability is that with 9 of the 13 studies (69%) being conducted in the United States, it is difficult to know whether the findings would

generalize well to school systems in other countries. As previously mentioned, a Flagship program introduced at the World Education Forum in 2000 focused on moving towards inclusion. Thus, while the inclusion of studies from three different countries (i.e., two from Italy and one each from Taiwan and Australia) is a good start, there is a need for more classroom-based intervention research of students with ASD in other parts of the world. It is also possible that, due to differences in public school systems, interventions that are effective in one country may not be feasible in another. More global research into the inclusion of students with ASD is needed. Of note, due to the requirement of studies being published in English or French for inclusion in this review, four potential studies were excluded without full-text review because they were published in other languages.

Future Directions

As larger scale studies are conducted, the potential to collect more data on female students with ASD is broadened. In the currently reported studies, 91% of the participants were male. Some studies have suggested differences in rates of ASD between males and females may be much smaller than previously believed, with as few as 62% of individuals with ASD being male (Zwaigenbaum et al., 2012). There is a great need to include female students with ASD in intervention research, particularly given evidence that symptoms and presentation in females may differ from males (Zwaigenbaum et al., 2012), which may indicate a difference in the most effective means of intervention.

Similarly, there is a need for research with older students as no studies meeting our criteria included students beyond the age of 14. As mentioned previously, this may be due in part to the difficulty of coordinating a classroom-based intervention at the higher grades due to students typically seeing several teachers throughout the day. Furthermore,

it is possible that students with ASD may be less likely to be included in the mainstream classes in the upper years if they are continuing to experience academic or behavioural challenges.

Summary

In conclusion, this systematic review is the first to examine specifically interventions for students with ASD that are implemented in the mainstream classroom with classroom teachers playing a role in implementation. Although the studies included are limited by small participant pools, these studies include participants who are fairly varied in age and, where reported, co-morbid diagnoses and intelligence. Furthermore, a variety of different interventions have been effectively used across academic and behavioural challenges. These findings suggest that it may be possible to effectively provide intervention in the inclusive classroom for students with ASD. There is a need to test classroom-based, teacher implemented interventions with larger research pools of students in mainstream classrooms to better generalize findings. Interventions that can be implemented by the classroom teacher and can keep the students in the classroom are in line with global guidelines around the rights and inclusion of students with disabilities set out by UNESCO in 2000. There is a need for more research focusing on interventions that can be implemented by classroom teachers in the mainstream classroom so that students with ASD can receive education in an inclusive classroom while having their learning and behaviour needs supported.

...a Extracted from Studies Included in Systematic Review

Reference & country	Participant information	Implementers & intervention type	Targeted behaviours & measures used	Training & fidelity	Intervention length and follow-up	Support & quality
Bock (2007) USA	1 male; age 12; no comorbid conditions "typical" non-verbal IQ	Classroom teacher, SE teacher; Social-behavioural learning strategy	Social engagement; % of time spent on desired behaviours	Unknown; 90% before study (not assessed during)	4-13 sessions (across target behaviours); 4 follow-up sessions over 2 months	For; 18.00
Cihak et al., (2012) USA	4 males; ages 11-14; "low average" to "average" IQ; "extremely low" to "low average" AF	Classroom teacher, SE teacher; Video social stories	Academic engagement; % of intervals on task	Unknown; 94% to 98%	8 sessions; No follow-up	For; 17.00
Garbacz & McIntyre (2016) USA	2 males, 1 female; ages 6-8	Classroom teacher, researcher; Behaviour support plan	Academic engagement, compliance, aggression, disruptive behaviour; % of time engaged in behaviours and GAS	Consultant helped develop plans and problem solve and gave feedback to teachers; 88% to 100%	5-13 days (at school); No follow-up	For; 18.00

Reference & country	Participant information	Implementers & intervention type	Targeted behaviours & measures used	Training & fidelity	Intervention length and follow-up	Support & quality
Macdonald et al., (2018) Australia	4 males; ages 8-11; ADHD, FASD, ODD; "average" to "above average" IQ	Classroom teacher / Visual schedules and work systems	Academic engagement / % of intervals with behaviour, # of words written	Teacher consulted researcher; followed training manual / 50% to 83%	7-21 sessions (across participants) / 11 follow-up sessions with one participant immediately	Mixed / 18.00
Mancil et al., (2009) USA	1 male, 1 female; ages 7-8	Classroom teacher / Social stories	Aggression / Tally of incidents of target behaviour in 5-minute periods	1 training session / 100%	2-3 sessions (across intervention delivery methods) / 7 follow-up sessions after 2 weeks	For / 16.00
McCurdy & Cole (2014) USA	3 males; ages 7-11; LD	Classroom teacher, peers / Peer support	Academic engagement / % of off task intervals	30 minutes of training / Fidelity not assessed	7-12 days (across participants) / No follow-up	For / 15.00

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Reference & country	Participant information	Implementers & intervention type	Targeted behaviours & measures used	Training & fidelity	Intervention length and follow-up	Support & quality
Reeves et al., (2013) USA	3 males; age 7	Classroom teachers, EAs Function-based ABC	Academic engagement % of on task behaviour intervals per session	3 days training through modelling; feedback 88% to 100%	5 weeks 3 weekly follow-up sessions	For 17.00
Schatz et al., (2016) USA	3 males; ages 9-11	Classroom teacher Video self-modeling	Academic engagement % of time on-task	No training information Data only collected in incidents with 100% fidelity	11-19 sessions 7 follow-up sessions over 2 weeks	For 18.00
Stasolla, Damiani, & Caffò (2014) Italy	2 males; ages 7-8	Classroom teacher, researcher Stimulation program	Academic engagement; stereotyped behaviour Mean % of intervals with behaviour	No training information Fidelity not reported	90 sessions (in blocks of 15) No follow-up	For 14.00

Reference & country	Participant information	Implementers & intervention type	Targeted behaviours & measures used	Training & fidelity	Intervention length and follow-up	Support & quality
Stasolla, Perilli, & Damiani (2014) Italy	2 males; ages 7-8; symptoms of ADHD	Classroom teacher, researcher, self Self-monitoring	Academic engagement; stereotyped behaviour Mean % of intervals with behaviour	No training information Fidelity not reported	90 sessions (in blocks of 15) 60 follow-up sessions (in blocks of 15)	For 14.00
Strain et al., (2011) USA	1 male, 1 female; ages 8-9; LD; " extremely far below average" to " average" IQ	Classroom teacher, EAs, other staff Prevent-Teach-Reinforce	Academic engagement, disruptive behaviours % of intervals with behaviour	Support for 3-4 sessions; team meetings; additional coaching as needed 80% to 100%	3-4 sessions (across participants) 3 follow-up sessions immediately following intervention	For 15.00

Reference & country	Participant information	Implementers & intervention type	Targeted behaviours & measures used	Training & fidelity	Intervention length and follow-up	Support & quality
Tekin-Iftar et al., (2017) USA	3 males; ages 12-13	Classroom teacher; Simultaneous prompting procedure	Academic acquisition and accuracy; % of correct responses	PD training and videos; 100%	4-6 sessions (across participants); Follow-up proves at 1, 2, and 4 weeks	For; 17.00
Wu et al., (2019) Taiwan	1 male; age 10; " below average" IQ	Classroom teacher, researcher; Class-wide function-related intervention teams	Academic engagement, disruptive behaviour; % of interval with behaviour	Training using CW-FIT website; practice sessions; Fidelity not reported	24 sessions (15 sessions Tier 1; 9 sessions Tier 1 + Tier 2); No follow-up	For; 17.00

Note. Under "participant information", details about sex and age for the participants from the st[...] listed. Where included in the study, co-morbid diagnoses and descriptions of intellectual and ad[...] each case where co-morbid disorders are listed, all listed disorders presented in a single particip[...] America; IQ = intelligence; SE = special education; AF = adaptive functioning; GAS = Goal At[...] defi[...] Hyperactivity disorder; FASD = Fetal Alcohol Spectrum Disorder; ODD = Oppositional [...] disability; EA = educational assistant; ABC = Antecedent-Behaviour-Consequence; PD = profe[...] Class-Wide Function-related Intervention Teams.

Figure 2.1. *PRISMA Diagram Combining Original Search for All Three NDDs and Updated ASD Search.*

Articles retrieved from original database search (*N* = 11,947)

Articles retrieved from updated ASD database searches (*N* = 1,064)

Articles from all searches combined (*N* = 13,011)

Article titles screened (*n* = 9,084)

Duplicates excluded (*n* = 3,927)

Article abstracts screened (*n* = 2,208)

Excluded (*n* = 6,876)

Excluded (*n* = 1,558)

Articles reviewed in full (*n* = 650)

Excluded because no NDD (*n* = 11) or for ADHD / LD study (*n* = 315)

Total ASD-focused articles reviewed in full (*n* = 324)

Excluded for not meeting inclusion criteria (*n* = 311)
- Classroom teacher not involved in implementation and/or not implemented in the mainstream classroom/school (*n* = 203)
- Not peer-reviewed (*n* = 28)
- No intervention implemented or results not reported (*n* = 17)
- Not all participants between 1st and 12th grades and no individual results reported (*n* = 15)
- Not focused on student outcomes or not focused on school-based outcomes (*n* = 15)
- Not novel research (e.g., review; *n* = 15)
- Not all participants had ASD and individual results not reported (*n* = 10)
- Not available in English or French (*n* = 4)
- All participants have diagnosis of intellectual disorder (n = 3)
- Failed to make contact to obtain further information (n = 1)

Articles included in review (*n* = 13)

Due to intentional overlap in dates (to ensure no articles were missed) when conducting updated searches, totals may be inflated (i.e., a small number of articles may have been reviewed and counted multiple times)

Appendix 2.1: *Teacher Help* **Systematic Reviews PICOS (Participants, Intervention,**

Comparison, Outcomes, Study design) Search Strategy for PubMed in 2016.

Search Rules	
- Mapping:	"<term>" [MH]
- Explode term:	(*automatic with "MH"*)
- Truncation:	*
- 1 wildcard:	*not supported*
- 0-1 wildcard:	*not supported*
- Title/abstract/keyword:	*automatic*

Parameter 1 - School-age

Terms	Search Entry (modified to fit database rules)
- adolescen*	1. "adolescent" [MH] OR adolescen*
- boy	2. boy OR boys
- child	3. "child" [MH] OR child*
- children	4. *redundant with "child*"*
- girl	5. girl OR girls
- juvenile	6. juvenile OR juveniles
- kid	7. kid OR kids
- "latency age"	8. "latency age"
- p*ediatric	9. "pediatrics" [MH] OR pediatric OR paediatric OR pediatrics OR paediatrics
- pre-pubescen*	10. pre-pubescen*
- pubescen*	11. pubescen*
- schoolage	12. school-age
- "School age"	13. "school age"
- schoolchild*	14. schoolchild* *(NB: "school children" redundant with "child/children")*
- student	15. "students" [MH] OR "student" OR "students"
- teen	16. teen*
- teenager	17. *redundant with "teen*"*
- youth	18. youth

Parameter 1 (compressed search entry)

"adolescent" [MH] OR adolescen* OR boy OR boys OR "child" [MH] OR child* OR girl OR girls OR juvenile OR juveniles OR kid OR kids OR "latency age" OR "pediatrics" [MH] OR pediatric OR paediatric OR pediatrics OR paediatrics OR pre-pubescen* OR pubescen* OR school-age OR "school age" OR schoolchild* OR "students" [MH] OR "student" OR "students" OR teen* OR youth

Parameter 2 - School-based

Terms	Search Entry (modified to fit database rules)
- Class-based - "Class based" - Classroom - "classroom based" - "educational setting" - "educator delivered" - "Elementary school" - "high school" - "junior high school" - "middle school" - school-based - "school based" - "school delivered" - "teacher delivered"	20. class-based 21. "class based" 22. classroom 23. "classroom based" 24. "educational setting" 25. "educator delivered" 26. "elementary school" 27. "high school" 28. "junior high school" 29. "middle school" 30. "school-based" [MH] OR school-based 31. "school based" 32. "school delivered" 33. "teacher delivered"

Parameter 2 (compressed seVariarch entry)

class-based OR "class based" OR classroom OR "classroom based" OR "educational setting" OR "educator delivered" OR "elementary school" OR "high school" OR "junior high school" OR "middle school" OR "school-based" [MH] OR school-based OR "school based" OR "school delivered" OR "teacher delivered"

Parameter 3 - Intervention

Terms	Search Entry (modified to fit database rules)
- accommodation - adaptation - "behaviour plan" - coaching - "in-service training" - intervention - PD - "professional development" - program/programme - supports - therapy - training - treatment	35. accommodation* 36. adaptation* 37. "behavior plan" OR "behaviour plan" 38. coaching 39. "inservice training" [MH] OR "inservice training" OR "in-service training" 40. intervention* 41. PD 42. "professional development" 43. program* 44. support* 45. "therapy" [MH] OR therapy 46. training 47. treatment

Parameter 3 (condensed search entry)

accommodation* OR adaptation* OR "behavior plan" OR "behaviour plan" OR coaching OR "inservice training" [MH] OR "inservice training" OR "in-service training" OR intervention* OR PD OR "professional development" OR program* OR support* OR "therapy" [MH] OR therapy OR training OR treatment

Parameter 4a - LD

Terms	Search Entry (modified to fit database rules)
- Dyscalculia - Dysgraphia - Dyslexia - LD - "learning disability" - "learning disorder" - "math disability" - "math disorder" - "reading disability" - "reading disorder" - SLD - "specific learning disorder" - "writing disability" - "writing disorder"	49. "dyscalculia" [MH] OR dyscalculia 50. dysgraphia 51. "dyslexia" [MH] OR dyslexia 52. LD 53. "learning disabilit*" 54. "learning disorders" [MH] OR "learning disorder*" 55. "math disabilit*" 56. "math disorder*" 57. "reading disabilit*" 58. "reading disorder*" 59. SLD 60. "specific learning disorder" [MH] OR "specific learning disorder" 61. "writing disabilit*" 62. "writing disorder*"

Parameter 4a (condensed search entry)

"dyscalculia" [MH] OR dyscalculia OR dysgraphia OR "dyslexia" [MH] OR dyslexia OR LD OR "learning disabilit*" OR "learning disorder*" OR "learning disorders" [MH] OR "math disabilit*" OR "math disorder*" OR "reading disabilit*" OR "reading disorder" OR SLD OR "specific learning disorder" [MH] OR "specific learning disorder" OR "writing disabilit*" OR "writing disorder*"

Parameter 4b - ADHD

Terms	Search Entry (modified to fit database rules)
- ADHD - "attention deficit hyperactivity disorder" - "attention deficit disorder" - hyperactivity - inattention	64. ADHD 65. "attention deficit disorder with hyperactivity" [MH] OR "attention deficit hyperactivity disorder" 66. "attention deficit disorder" 67. hyperactivity 68. inattention

Parameter 4b (condensed search entry)

> ADHD OR "attention deficit disorder with hyperactivity" [MH] OR "attention deficit hyperactivity disorder" OR "attention deficit disorder" OR hyperactivity OR inattention

Parameter 4c - ASD

Terms	Search Entry (modified to fit database rules)
- ASD - Asperger - "Asperger's syndrome" - Autism - "Autism spectrum disorder" - Autistic - PDD - PDD-NOS - "Pervasive Developmental disorder"	70. ASD 71. Asperger* 72. "asperger syndrome" [MH] 73. autism 74. *redundant with "autism"* 75. "autistic disorder" [MH] OR autistic 76. PDD 77. PDD-NOS 78. "child developmental disorders, pervasive" [MH] OR "pervasive development* dis*" OR "child development* dis*"

Parameter 4c (condensed search entry)

> ASD OR asperger* OR "asperger syndrome" [MH] OR autism OR "autistic disorder" [MH] OR autistic OR PDD OR PDD-NOS OR "child developmental disorders, pervasive" [MH] OR "pervasive development* dis*" OR "child development* dis*"

Parameter 4 (LD, ADHD, and ASD search terms combined)

> ("dyscalculia" [MH] OR dyscalculia OR dysgraphia OR "dyslexia" [MH] OR dyslexia OR LD OR "learning disabilit*" OR "learning disorder*" OR "learning disorders" [MH] OR "math disabilit*" OR "math disorder*" OR "reading disabilit*" OR "reading disorder" OR SLD OR "specific learning disorder" [MH] OR "specific learning disorder" OR "writing disabilit*" OR "writing disorder*") OR (ADHD OR "attention deficit disorder with hyperactivity" [MH] OR "attention deficit hyperactivity disorder" OR "attention deficit disorder" OR hyperactivity OR inattention) OR (ASD OR asperger* OR "asperger syndrome" [MH] OR autism OR "autistic disorder" [MH] OR autistic OR PDD OR PDD-NOS OR "child developmental disorders, pervasive" [MH] OR "pervasive development* dis*" OR "child development* dis*")

Complete Search Entry (all parameters)

("adolescent" [MH] OR adolescen* OR boy OR boys OR "child" [MH] OR child* OR girl OR girls OR juvenile OR juveniles OR kid OR kids OR "latency age" OR "pediatrics" [MH] OR pediatric OR paediatric OR pediatrics OR paediatrics OR pre-pubescen* OR pubescen* OR school-age OR "school age" OR schoolchild* OR "students" [MH] OR "student" OR "students" OR teen* OR youth) AND (class-based OR "class based" OR classroom OR "classroom based" OR "educational setting" OR "educator delivered" OR "elementary school" OR "high school" OR "junior high school" OR "middle school" OR "school-based" [MH] OR school-based OR "school based" OR "school delivered" OR "teacher delivered") AND (accommodation* OR adaptation* OR "behavior plan" OR "behaviour plan" OR coaching OR "inservice training" [MH] OR "inservice training" OR "in-service training" OR intervention* OR PD OR "professional development" OR program* OR support* OR "therapy" [MH] OR therapy OR training OR treatment) AND (("dyscalculia" [MH] OR dyscalculia OR dysgraphia OR "dyslexia" [MH] OR dyslexia OR LD OR "learning disabilit*" OR "learning disorder*" OR "learning disorders" [MH] OR "math disabilit*" OR "math disorder*" OR "reading disabilit*" OR "reading disorder" OR SLD OR "specific learning disorder" [MH] OR "specific learning disorder" OR "writing disabilit*" OR "writing disorder*") OR (ADHD OR "attention deficit disorder with hyperactivity" [MH] OR "attention deficit hyperactivity disorder" OR "attention deficit disorder" OR hyperactivity OR inattention) OR (ASD OR asperger* OR "asperger syndrome" [MH] OR autism OR "autistic disorder" [MH] OR autistic OR PDD OR PDD-NOS OR "child developmental disorders, pervasive" [MH] OR "pervasive development* dis*" OR "child development* dis*"))

CHAPTER 3: USABILITY OF AN ONLINE INTERVENTION PROGRAM FOR TEACHERS OF STUDENTS WITH AUTISM SPECTRUM DISORDER

The manuscript based on this usability study is presented here. Readers are advised that Nicole Ali, under the supervision of Dr. Penny Corkum and in consultation with her dissertation committee members (Dr. Isabel Smith and Dr. Sean Mackinnon), was responsible for the research question, the study methodology, critical analysis of the data, and all aspects of the writing process. She received critical editorial feedback from her dissertation committee members and would like to acknowledge Sarah Brine for her support in organizing study materials and data collection. A version of the following manuscript is currently under review.

Ali, N. Smith, I. M., Brine, S., & Corkum, P. (2020). *Usability of an online intervention program for teachers of students with autism spectrum disorder.* [Manuscript under review].

Abstract

Students with autism spectrum disorder (ASD) often present with behavioural, academic, and social challenges for which teachers may not have adequate training. The purpose of this study was to assess the usability of an online intervention designed for use by classroom teachers of students with ASD. *Teacher Help for ASD* was developed as a module within our larger *Teacher Help* program. Classroom teachers, ASD support professionals, and ASD advocates with lived experience were given access to the *Teacher Help for ASD* module and asked to review and assess each session. This included completing a modified version of a questionnaire based on Morville's User Experience Honeycomb (Morville & Sullenger, 2010) and answering questions about readiness for use, completeness of information, and willingness to recommend the module to classroom teachers. Descriptive statistics showed that participants believed the module was useful, usable, desirable, valuable, accessible, and credible. Additionally, participants rated the module's features and appearance positively and believed it was ready for use, had all the information they expected, and reported they would recommend the program to classroom teachers. As such, we believe that this module has the potential to be used by classroom teachers to support the behavioural, academic, and social challenges of students with ASD.

Introduction

The World Health Organization (WHO) reports a steady global increase in diagnosed autism spectrum disorder (ASD), possibly explained by changes to the diagnostic criteria and increased awareness (WHO, 2017). Estimated prevalence is now 1 in 59 in the United States (Baio et al., 2018) and 1 in 66 in Canada (Public Health Agency of Canada [PHAC], 2019). Nearly all North American students with ASD attend a general education public school (National Center for Education Statistics [NCES], 2016). However, inclusion is not without its challenges. According to a national survey conducted by the Canadian Teachers' Federation in 2011, ASD was one of the most pressing concerns in terms of specialised resources to support students' needs (Froese-Germain & Riel, 2012). The category of learning disabilities (LDs), which included ASD, was endorsed as a pressing concern by 90% of participating teachers.

Based on our systematic review, very little published research has focused on school-based teacher-implemented interventions for students with ASD attending mainstream education programs. We found that there were very few studies ($N = 13$) meeting our inclusion criteria of being implemented by a classroom teacher in the inclusive classroom setting and that all of the relevant published research used single subject designs. This review held promise that, when trained, classroom teachers may be able to implement classroom-based interventions for students with ASD, specifically those targeting behaviours and academic performance. As such, the question remains of how to reach a larger number of schools, classroom teachers, and students with ASD while keeping costs low.

The internet offers a cost-effective way to increase access to knowledge and training. As noted in an extensive meta-analysis by Cook et al. (2008), internet-based learning is as effective as traditional forms of learning. Furthermore, several randomised controlled trials (RCTs) have demonstrated the effectiveness of online interventions for addressing mental health disorders in adolescents and adults (e.g., Berger et al., 2009; Calear et al., 2009; Proudfoot et al., 2013). Of interest for the current study, however, are interventions in which an individual learns about a treatment online and implements the intervention with the goal of treating another individual. A growing number of studies have demonstrated the potential effectiveness of interventions delivered in this way, including parent-delivered treatment for children and adolescents with chronic pain (Palermo et al., 2009), insomnia (Corkum et al., 2016), and for young children with anxiety (Morgan et al., 2016). Online interventions have also been delivered as school-based programs targeting adolescents' depression and anxiety (Wong et al., 2014) and eating disorders and obesity (Bell et al., 2019). However, in both interventions, students worked through the intervention themselves. A less-examined potential means for intervention is through online professional development programs for teachers that support them in developing interventions they can deliver in the classroom.

We have developed an online program called *Teacher Help* that aims to increase classroom teachers' knowledge of evidence-based interventions, help teachers create an classroom environment that is a positive fit for students with mental health and neuro-developmental disorders, and to support teachers in developing and implementing evidence-based strategies to support students' academic, behavioural, social, and emotional needs in the classroom. Specifically, teachers are provided with intervention

strategies with a focus on understanding the roots or functions of behaviour and using

positive behaviour intervention and support to yield behaviour change. Three *Teacher*

Help modules have been developed, each targeting a specific NDD (described below),

with plans to develop modules addressing other mental health disorders (e.g., anxiety).

Teacher Help for Attention-Deficit/Hyperactivity Disorder (ADHD) has previously

undergone usability testing and found to be well-received and effective in a small RCT

(Corkum et al., 2019). Based on feedback, the ADHD module was modified and two new

modules, *Teacher Help for Autism Spectrum Disorder* and *Teacher Help for Learning*

disabilities (LD), were developed. The *Teacher Help for LD* module underwent usability

testing (Parker et al., 2019) and was also positively received.

The purpose of the current study was to assess the usability of *Teacher Help for*

ASD before assessing the effectiveness of the intervention with students with ASD. This

is a six-session program that provides psychoeducation about ASD, strategies to address

the core symptoms of ASD (i.e., difficulties with social communication and interaction,

and restricted, repetitive patterns of behaviour, interests or activities) and associated

features (e.g., emotional dysregulation), as well as planning for the future (e.g.,

transitions, addressing comorbid disorders; see Table 3.1 for overview of session

content). Over the course of six weeks, teachers participating in the program are expected

to develop and implement a behavioural plan targeting challenging behaviour with which

the student with ASD presents in their classroom. As such, the purpose of the current

study was to address the question of whether the *Teacher Help for ASD* module is

perceived as usable and valuable by end-users and stakeholder. Further, this research

addressed the questions of how to best modify the module in order to prepare it for

effectiveness testing along with the other two *Teacher Help* modules.

Methods

Participants

Ethical approval for this project was acquired from the IWK Health Centre Ethics

Board (#1022152). All participants were recruited directly through the investigators'

professional contacts by word-of-mouth or e-mail. Participants were required to be able to

complete the study in English and to have regular access to the internet through at least

one device (e.g., computer, smartphone, tablet). All participants who provided consent

were given a voucher (i.e., a code to enter the online program) allowing them access for

approximately two months, regardless of whether they completed the study. Three types

of participants were recruited (i.e., classroom teachers, ASD school support professionals,

and ASD advocates) and eligibility for each group was assessed during initial contact.

Participants were also screened online before being entered into the study. Participants

who completed the study were given a gift card valued at 20 Canadian dollars.

A flow chart (Figure 3.1) reports the number of potential participants who were

invited, who consented to participate, and who completed part or all of the study. In total,

20 participants reviewed at least one session, of whom 17 completed and reviewed the

entire module. Participants completing at least one session were 13 ASD support

professionals, five classroom teachers, and two ASD advocates (details about participant

progress by group are provided below). As noted by Macefield (2009), there is much

debate in the field regarding the ideal number of participants for problem discovery

studies such as the current usability study. Macefield recommends between 3 and 20

participants, depending on the study complexity. According to Faulkner (2003), 15 participants would be expected to find an average of 97%, and a minimum of 90%, of problems, and 20 participants would find an average of 98% with a minimum of 95% of problems. Thus, it could be expected that our group of 17 would likely uncover the vast majority of issues. Moreover, across our participants, responses were fairly homogenous with little variability (i.e., similar ratings on quantitative items). Additionally, given their expertise with presented evidence, having an adequately sized group of ASD support professionals was our primary goal. Ideally, the teacher group would have been slightly larger in order to adequately represent the teachers' views on the usability of the program in the classroom; however, given the lack of variability in teachers' responses we can be fairly confident that their views have been represented. Finally, while there were only two ASD advocates, the purpose of including these participants was to include the voices of those with lived experience who could also speak to the experiences of others with lived experience that they support through their advocacy work. We recognize that two participants may not accurately represent the views of this group, but their inclusion is unique and adds breadth to the findings. Demographic details about participants are described in Table 3.2.

Classroom Teachers

Eligible teachers had experience teaching at least two students with ASD in the inclusive mainstream classroom within the past five years. That is, teachers were required to have taught students with ASD alongside their typically developing peers, as opposed to teaching in a learning centre, resource room, or similar setting. Participants were

eligible if their current work was in other positions (e.g., administration, special education) or they had retired, but had met criteria in their past teaching roles.

ASD Support Professionals

Eligible support professionals were individuals who worked in a professional role in which they supported students with ASD at school or in the community (e.g., speech-language pathologist, psychologist). Members of the *Teacher Help* research team (e.g., co-investigators, collaborators) who are also ASD support professionals, and who were not involved with development of the *Teacher Help for ASD* content, were also invited to participate. Support professionals were each required to have worked with at least 10 youth with ASD.

ASD Advocates

ASD advocates were required to have lived experience either as a parent of an individual with ASD or as a youth with ASD between the ages of 18 and 25, and to be members of at least one organization directly supporting the ASD community. It was required that the ASD advocate had worked with at least five individuals with ASD and/or their families and/or their teachers in the last five years.

Procedure

Participants were provided with a voucher and log-in information to access the *Teacher Help for ASD* module. Participants were asked to review each of the six sessions and respond to a questionnaire at the end of each session, as well as to respond to a questionnaire after completing the entire module. All sessions were available immediately, so participants were able to complete the reviews at their own rates. They

were initially given four weeks during which to complete the study, and reminders to participate were sent out weekly. However, the study was extended by approximately one month to allow participants who had begun the study to complete all surveys.

Measures

Background Information Forms (BIFs)

Once online consent was provided, participants were taken to a survey designed to collect background information. The BIFs were designed to gather pertinent information from each group and therefore differed slightly for different participant types (i.e., ASD support professionals, classroom teachers, ASD advocate – youth with lived experience, and ASD advocate – parent of child with ASD; see Appendices 3.1-3.4, respectively). Demographic information such as age, sex, education, and experience working with individuals with ASD were collected from all participants. Classroom teachers were also asked about their experiences in the school system (e.g., positions held, grades taught, years worked, supports for working with students with ASD) and relevant courses or professional development opportunities. Support professionals were asked similar questions focused on their own positions and training. Finally, advocates were asked questions specific to how they/their children experienced the school system, about their own work as advocates, and about any relevant training they may have undertaken.

End of Session Questionnaires (ESQs)

Feedback about the *Teacher Help for ASD* program was collected using ESQs at the end of each of the six sessions (see Appendix 3.5). The ESQ was adapted from a Usability Questionnaire developed based on Morville's User Experience Honeycomb

(Morville & Sullenger, 2010) for a previous study (Speth et al., 2015). Morville's User

Experience Honeycomb is a recommended tool for testing the usability of online context

(Martin, 2014) and has been used with previous usability studies (e.g., Giguere et al.,

2011; Rosenbaum et al., 2008). Morville's User Experience Honeycomb considers

measures of usefulness, usability, desirability, value, accessibility, and credibility. For

each session, scores for usefulness, usability, and accessibility were based on responses to

two questions each, and one question each about desirability, value, and credibility.

Participants identified how much they agreed with each statement on a 5-point Likert

scale and were provided the opportunity to elaborate on what worked well and what

needed to be changed. Participants were asked to rate three to five feature-based questions

per session about the videos (if present in that session), worksheets, and supplemental

sheets (i.e., documents containing additional topic-specific information that may be useful

but not necessary for completing the module). They were also asked, on a 5-point Likert

scale, specific questions about whether they: (1) believed the information provided was

useful for inclusive classroom teachers, (2) believed the session was ready for use, (3)

believed everything that should be included in the sessions was, and (4) were satisfied

with the session. Finally, they were asked if they would recommend the session to

teachers (i.e., yes / no / maybe). Furthermore, participants were asked to provide general

feedback. The ESQ consisted of 29 questions, required approximately 15 minutes to

complete, and was completed online via Opinio (an online survey platform) after

reviewing each of the six sessions.

End of Module Questionnaire (EMQ)

The EMQ (see Appendix 3.6) was collected after the participants had reviewed the entire module and completed the six ESQs. Like the ESQ, it asked participants to indicate their agreement with statements about usefulness, usability, desirability, value, accessibility, and credibility, as well as to answer questions about the module's appearance and readiness, their satisfaction with the program, and whether they believed that the program provided useful information for teachers. Participants were asked to rate the features of the program and whether they would recommend it. Again, they were provided opportunities to elaborate on their responses. The EMQ had additional questions about participants' opinions about the functionality of technology, the appearance of the module (e.g., font, colour, graphics), as well as general feedback. Participants were asked to provide details of how they accessed the program (e.g., device, browser) and how well it worked (e.g., time for pages to load, how well links worked). The EMQ consisted of 41 questions and required approximately 25 minutes to complete online via Opinio.

Results

Quantitative Data

Within each ESQ and the EMQ, a Total Satisfaction score was calculated based on the individual's mean score across dimensions of usability (i.e., usefulness, usability, desirability, value, accessibility, and credibility ratings) and ratings of the various features (i.e., videos, worksheets, supplemental materials). These scores were compared to ratings on the 'overall satisfaction' question for each session and the module and, in each case, a high and statistically significant correlation was found (ranging from $r = 0.60$ to $r = 0.85$, $p \leq .001$ to $p = .012$). As such, the Total Satisfaction score is believed to be an accurate

representation of participants' overall views of the sessions and the module. Figure 3.2 presents the frequencies of Total Satisfaction ratings and Table 3.3 shows means and standard deviations. Sessions 3 and 6 did not contain any videos; therefore, two feature-based questions were omitted from the Total Satisfaction scores for these sessions. As shown in Figure 3.2, Total Satisfaction across all ESQs and the EMQ suggest that most participants *very satisfied* or *extremely satisfied* with the program.

Average ratings for all participants for each of the individual dimensions of our modified version of Morville's Honeycomb were calculated across sessions and the module and are reported as a combined average for the three groups (aggregated results available from authors upon request). Average usefulness ratings ranged from 4.28/5 to 4.66/5 across the module with an overall average of 4.50/5 ($SD = 0.31$), where 4.00 = 'agree' and 5 = 'strongly agree'. Similarly, ratings of the module's usability ranged from 4.29/5 to 4.61/5 across sessions and usability was rated 4.48/5 ($SD = 0.39$) on average. In terms of desirability, average ratings across the questionnaires averaged from 4.11/5 to 4.55/5 with an overall average of 4.41/5 ($SD = 0.48$). Accessibility of the program was highly rated with averages ranging from 4.32/5 to 4.60/5 across the module with an overall average of 4.54/5 ($SD = 0.44$). The program was also rated as being credible with average ratings between 4.26/5 and 4.59/5 with an overall average of 4.51/5 ($SD = 0.43$) for the entire module. Finally, the program was rated as being valuable with averages from 4.44/5 to 4.71/5 across the module with a total average of 4.61/5 ($SD = 0.37$).

In terms of readiness for use (Figure 3.3; Table 3.4), the program was rated as *very ready* or *extremely ready* by the majority of participants ($M = 4.14/5$, $SD = 0.47$). Regarding completeness of information (Figure 3.4; Table 3.5), the participants tended to

agree or *strongly agree* that everything they expected to be included was present ($M =$ 4.34/5, $SD = 0.46$). Finally, in terms of willingness to recommend, all participants who completed the program and the EMQ reported they would recommend the program. Overall, both the program features [$M = 4.32/5$, $SD = 0.36$] and appearance [$M = 4.40/5$, $SD = 0.55$] were rated positively. Participants were also asked how they accessed the module and how well it worked. Generally, no major concerns were reported regarding loading time or site crashes regardless of hardware, operating system, or browser used.

Open-Ended Responses

All qualitative data across all items within each ESQ and the EMQ were systematically examined and repeated comments were tallied to calculate the number and percentage of members of each group making a specific suggestion. The number and percentage of members of each group making a comment that countered the suggestion was also calculated. From this, a 'percentage in support of change' was calculated for each suggestion. To determine whether recommended changes should be considered, the percentage of participants making each recommendation was tabulated and contrasted with the percentage of participants making counter comments. For example, four people, representing 24% of the sample, commented that some pages were too dense overall, whereas 1 person (6%) commented that the pages had a good amount of information, so it was deemed that 18% were in favour of reduced content per page. Items were then reviewed by all authors to determine whether the suggested change should be made based on the percentage in support of change and the importance and feasibility of the change. Minor changes (e.g., grammatical error, picture changes, minor addition to content) with positive ratings were all applied. If changes were more substantial, 10% or more in favour

of the change was deemed necessary to be considered; however, some suggestions that met this criterion were not feasible. A list of substantive recommendations with ≥10% in favour is presented in Table 3.6. (A complete list of recommendations and percentages in favour of the changes is available upon request.) Each item on this list was considered for feasibility and appropriateness within the context of the intended purpose of the *Teacher Help for ASD* module. Many participants provided positive qualitative feedback, including comments about the value of the program (e.g., '*I strongly believe that teachers will find this a valuable source of information. Nothing as deep and thoughtful is available right now apart from conferences. With this, the teacher can access and learn from home or school. I hope this becomes open to them soon, and I will be recommending it to every school*' – Young Adult with ASD), the usefulness of various aspects of the program (e.g., '*The videos added extra understanding - especially the first video explaining what ASD is / can be like to students*' – Teacher), and the technology used (e.g., '*The technology worked well in this program which made it easy to move through it at your own pace.*' - Support Professional).

Discussion

The purpose of this study was to evaluate the usability and readiness for effectiveness testing of the *Teacher Help for ASD* module of the *Teacher Help* program, and to obtain feedback to inform any needed modifications. This usability study was achieved by providing access to the module to knowledge users including classroom teachers, support professionals, and advocates with lived experience All participants were asked to review each of the six sessions and respond to questions using a modified version of Morville's User Experience Honeycomb (Morville & Sullenger, 2010)

targeting usefulness, usability, desirability, value, accessibility, and credibility. Participants also responded to questions about program features, readiness for use, completeness of information, and their willingness to recommend to classroom teachers. Participants were also given the opportunity to elaborate on their ratings.

As evidenced by high ratings across the sessions of the module and from all categories of participants, the module was well-received and believed to be 'usable' (Morville & Sullenger, 2010). Furthermore, the module was highly rated in terms of the features, readiness for use, willingness to recommend to classroom teachers, and completeness of information. Specifically, overall average satisfaction scores across all sessions were high (i.e., greater than 4 out of 5, representing 'agree' to 'strongly agree' with statements about usability). The program was also viewed as ready for use with moderately high to high ratings (i.e., greater than 3 out of 5, representing 'moderately ready' to 'extremely ready'), with the module as a whole receiving an average score of 4 out of 5, representing 'very ready'. All sessions had moderately high ratings of completeness of information overall (i.e., greater than 4 out of 5, representing 'agree' that everything expected was included). Finally, all participants who completed the module responded that they would recommend the program to classroom teachers.

Following analyses of participants' comments, minor changes (e.g., clarifications, minor additions, corrections) were addressed. More substantial recommendations were assessed for level of agreement across participants, and a list was collated of 19 recommendations that were supported by 10% or greater of participants (after accounting for participants who contradicted the recommendation). Three authors (N.A., I.S., S.B., & P.C.) reviewed each of these recommendations and independently recorded whether they

believed the recommendation should be implemented and why or why not. Following this, they met to discuss these recommendations to determine the feasibility and appropriateness of each. While most of these recommendations were about clarification or reorganization and were addressed, issues such as how the program looked on tablets were beyond the scope of the *Teacher Help* team but were shared with the software company.

A major strength of this usability study is the recruitment of a variety of knowledge users, including classroom teachers who could provide input as potential implementers, support professionals who could provide feedback from the perspective of support staff working with individuals with ASD in other capacities and who may provide teachers with information about working with students with ASD, and, importantly, input from individuals who understand the lived experience of students with ASD. Another important strength was the fact that the usability of the program itself (e.g., content, interventions) and the technology used for the program were tested simultaneously, which allowed for any technological problems to be addressed before large-scale testing of the module.

An important limitation of the study was that only two advocates, one parent and one young adult with ASD, were recruited. Multiple viewpoints from this group would have potentially enriched the data. However, including those who also worked in an advocate capacity ensured representation of the views of multiple individuals with ASD and their families. An additional limitation was that of 28 participants who consented to participate, just 17 (61%) completed all sessions and all questionnaires. However, responses from participants who did not complete the study indicated that the typical

reason was lack of time rather than lack of enthusiasm for the program. Drop-out rates were similar across groups and participation was adequate in the classroom teachers and ASD support professional groups. While additional ASD advocates would have been ideal to be confident about their experiences of the program, the diversity of the sample was a relative strength particularly given the similarity in ratings and comments across participant types.

This study builds on past research in internet interventions as this module serves as both a means of internet-based teaching and an online intervention implemented by classroom teachers. Research has demonstrated that self-implemented (e.g., Berger et al., 2009; Calear et al., 2009; Proudfoot et al., 2013) and parent-implemented (e.g., Corkum et al., 2016; Morgan et al., 2016; Palermo et at., 2009) online interventions can be effective in treating a variety of mental health concerns including depression, anxiety, insomnia, and eating disorders. Further, schools have been settings for self-implemented online mental health interventions for adolescents (e.g., Wong et al., 2014; Bell et al., 2019). The current study examined the usability of an online intervention that would be implemented by classroom teachers targeting problematic classroom behaviours of students with ASD. To our knowledge, this is the first online intervention designed with this purpose. Based on the usability findings and the subsequent changes, we believe that this module is ready for effectiveness testing.

Many Canadian teachers have identified educating students with NDDs, including ASD, as pressing challenges for schools. Many identify a lack of training for school staff regarding these disorders as a barrier (Froese-Germain & Riel, 2012). Online interventions like *Teacher Help* may provide mainstream classroom teachers with

knowledge and skills to support students at school by meeting the classroom-based needs of children with less severe NDDs. Furthermore, because an online intervention can be accessed widely and eliminates or reduces costs associated with professional development such as travel, time off, and training expenses, online interventions may provide a cost-effective and efficient way to provide psychoeducation and support for implementing classroom interventions. Given the present promising findings, *Teacher Help for ASD* may be well-received and yield positive effects for students with ASD and their teachers.

Table 3.1. *Overview of Session Content for Teacher Help for ASD Module.*

Session	Overview
Session 1: All About ASD	An overview of ASD and interventions • All about ASD • Impact of ASD • Interventions for ASD • Self-care for teachers & the team approach
Session 2: Taking the First Steps	A framework for thinking about behaviour, guidelines for the first steps in developing a functional behaviour plan, and preparation for school-home communication • Toolbox analogy • Behavioural change • ABCs + F framework • Developing a *Teacher Help* support plan • Identifying behaviours to change • Collecting data/Recording behaviours • School-home communication • Special issue: Bullying
Session 3: The Support Plan	Develop and implement a functional behaviour plan • Developing the first part of a *Teacher Help* support plan • Reviewing Step 1 (selecting and recording target behaviours) • Completing Step 2 (examining the data collected on target behaviours) • Teaching new skills • Teaching replacement behaviours • Special topics: Special interests in students with ASD

Session 4: Adding to the Support Plan	Strategies for setting up the classroom to support a student with ASD
	 • Further developing the *Teacher Help* support plan
	 • Antecedent strategies
	     o The physical setting
	     o Instructional strategies
	     o Rules, routines, and transitions
	 • Your student's *Teacher Help* support plan
	 • Special topics: Social scripts/Social narratives

Session	Overview

Session 5: Additional Needs	Characteristics associated with ASD and strategies to support them
	• Adding consequence strategies to the *Teacher Help* support plan
	• Strategies to address associated characteristics
	    o Uneven profiles
	    o Concrete thinking
	    o Weak executive functioning
	    o Emotional dysregulation
	    o Motor challenges
	• Special topics: Academic challenges

Session 6: Keep Moving Forward	Information on planning for the future, addressing comorbid disorders, preparing for transitions, and wrapping up the *Teacher Help* program. • What's next? How to continue with the support plan • Transition planning • Changing symptom presentations • When is further specialised assessment needed? • Helpful resources • Celebrating successes • Points to remember

Note. ASD = autism spectrum disorder; ABC+F = function-based antecedent-behaviour-consequence.

Table 3.2. *Demographic Details Reported by Participants Completing at Least One Session and Questionnaire*

	ASD Support Professionals (*n* = 13)	Classroom Teachers (*n* = 5)	ASD Advocates (*n* = 2)
Self-reported position (relative to assigned group)	Included participants who identified as psychologists (6), paediatricians (2), occupational therapists (1), SLPs (1), and school based ASD consultants (2)	Included classroom teachers who were currently teaching in the classroom or who were former classroom teachers but currently retired or teaching special education	Included volunteering with well-established advocacy groups
Gender	100% female	100% female	100% female
Age	33 - 60+ years* $M \geq 43$ years	30 - 59 years $M = 41$ years	One young adult and one middle-aged adult
Highest education	Master's (7) M.D. (3) Ph.D. (3)	Master's (1) B.Ed. (4)	Both participants had completed at least some secondary education
Years of experience in position	1 – 35+ years $M \geq 16$ years	3 – 18 years $M = 9.6$ years	1 – 2 years $M = 1.5$ years
Groups worked with	Toddlers through young adults with ASD (4) Toddlers through older adolescents with ASD (9)	Elementary students only (3) Elementary through junior high / middle school students (2)	Participants reported working with parents of children with ASD, children with ASD, extended family members of children with ASD, and teachers of students with ASD
Support received in working with students with ASD	N/A	Other teachers (5), TAs (5), parents (5), school based ASD specialists (5), SLPs (5), school psychologists (4), clinical psychologists (2), and OTs (2)	N/A

	ASD Support Professionals ($n = 13$)	Classroom Teachers ($n = 5$)	ASD Advocates ($n = 2$)
Education (i.e., courses during relevant post-secondary degrees)	Courses on ASD = 5 Courses on NDDs = 11	Courses on ASD = 2 Courses on exceptional learners = 3	N/A
Training (e.g., conference, workshop)	Training on ASD = 13 Training on NDDs = 13	Training on ASD = 4 Training on exceptional learners = 4	Training received for advocates was minimal or non-existent
Number of individuals with ASD worked with	15 - 30+ clients* $M \geq 28$ clients	4-10 students $M = 7$ students	N/A
Self-reported knowledge about ASD	Very knowledgeable = 9 Moderately knowledgeable = 4	Moderately knowledgeable = 4 A little bit knowledgeable = 1	N/A

Note. Due to the small number of participants, particularly in the advocates group, some information is redacted or summarized to avoid risk of identification. ASD = autism spectrum disorder; SLP = speech-language pathologist; * = missing data from a single participant; M.D. = Doctor of Medicine; Ph.D. = Doctor of Philosophy; B.Ed. = Bachelor of Education; TA = teaching assistant (or similar); OT = occupational therapist; NDD = neurodevelopmental disorder; N/A = not applicable (not asked).

Table 3.3. *Mean Ratings (Standard Deviation) for Total Satisfaction for Each Session and for Entire Module*

	Session 1 M*(SD)*	Session 2 M*(SD)*	Session 3 M*(SD)*	Session 4 M*(SD)*	Session 5 M*(SD)*	Session 6 M*(SD)*	Entire Module M*(SD)*
Advocate	4.64 *(0.20)* *n* = 2	4.64 *(0.51)* *n* = 2	4.79 *(0.18)* *n* = 2	4.89 *(0.05)* *n* = 2	4.82 *(0.25)* *n* = 2	4.83 *(0.24)* *n* = 2	4.73 *(0.18)* *n* = 2
Support	4.37 *(0.40)* *n* = 13	4.48 *(0.34)* *n* = 12	4.39 *(0.52)* *n* = 13	4.31 *(0.51)* *n* = 13	4.25 *(0.58)* *n* = 13	4.47 *(0.42)* *n* = 12	4.44 *(0.48)* *n* = 11
Teacher	4.49 *(0.28)* *n* = 5	4.13 *(0.51)* *n* = 4	4.33 *(0.25)* *n* = 4	4.32 *(0.31)* *n* = 4	4.23 *(0.46)* *n* = 4	4.27 *(0.30)* *n* = 4	4.38 *(0.52)* *n* = 4
All participants	4.43 *(0.36)* *n* = 20	4.42 *(0.40)* *n* = 18	4.42 *(0.46)* *n* = 19	4.38 *(0.47)* *n* = 19	4.31 *(0.54)* *n* = 19	4.46 *(0.40)* *n* = 18	4.46 *(0.45)* *n* = 17

Note. Satisfaction scores are derived from 12 to 20 items (depending on questionnaire) from the modified version of Morville's User Experience Honeycomb assessing usability. Possible scores range from 0 to 5, with higher numbers representing more positive ratings.

Table 3.4. *Mean Ratings (Standard Deviation) for Readiness for Use for Each Session and for Entire Module*

	Session 1 M(SD)	Session 2 M(SD)	Session 3 M(SD)	Session 4 M(SD)	Session 5 M(SD)	Session 6 M(SD)	Entire Module M (SD)
Advocate	4.00 (*1.41*) *n* = 2	4.50 (*0.71*) *n* = 2	4.50 (*0.71*) *n* = 2	5.00 (*0.00*) *n* = 2	5.00 (*0.00*) *n* = 2	4.00 (*1.41*) *n* = 2	5 .00 (*0.00*) *n* = 2
Support	3.85 (*1.07*) *n* = 13	3.92 (*0.76*) *n* = 13	4.15 (*0.80*) *n* = 13	3.92 (*0.86*) *n* = 13	3.54 (*1.20*) *n* = 13	4.25 (*0.62*) *n* = 12	4.00 (*0.78*) *n* = 11
Teacher	4.20 (*0.45*) *n* = 5	3.75 (*0.50*) *n* = 4	4.00 (*0.82*) *n* = 4	4.25 (*0.50*) *n* = 4	4.00 (*0.00*) *n* = 4	4.25 (*0.50*) *n* = 4	3.75 (*0.50*) *n* = 4
All participants	3.95 (*0.95*) *n* = 20	3.95 (*0.71*) *n* = 19	4.16 (*0.77*) *n* = 19	4.11 (*0.81*) *n* = 19	3.79 (*1.08*) *n* = 19	4.22 (*0.65*) *n* = 18	4.06 (*0.75*) *n* = 17

Table 3.5. *Mean Ratings (Standard Deviation) for Completeness of Information for Each Session and for Entire Module*

	Session 1 M *(SD)*	Session 2 M *(SD)*	Session 3 M *(SD)*	Session 4 M*(SD)*	Session 5 M*(SD)*	Session 6 M*(SD)*	Entire Module M *(SD)*
Advocate	4.00 (*0.00*) *n* = 2	4.50 (*0.71*) *n* = 2	5.00 (*0.00*) *n* = 2	4.50 (*0.71*) *n* = 2	5.00 (*0.00*) *n* = 2	4.50 (*0.71*) *n* = 2	4.50 (*0.71*) *n* = 2
Support	4.08 (0.86) *n* = 13	4.23 (*0.83*) *n* = 13	4.15 (*0.80*) *n* = 13	4.31 (*0.86*) *n* = 13	4.00 (*1.00*) *n* = 13	4.42 (*0.90*) *n* = 12	4.36 (*0.67*) *n* = 11
Teacher	4.40 (*0.55*) *n* = 5	4.00 (*0.00*) *n* = 4	4.25 (*0.50*) *n* = 4	4.00 (*0.82*) *n* = 4	4.50 (*0.58*) *n* = 4	4.25 (*0.5*) *n* = 4	4.25 (*0.50*) *n* = 4
All participants	4.15 (*0.75*) *n* = 20	4.21 (*0.71*) *n* = 19	4.26 (*0.73*) *n* = 19	4.26 (*0.81*) *n* = 19	4.21 (*0.92*) *n* = 19	4.39 (*0.78*) *n* = 18	4.35 (*0.61*) *n* = 17

Table 3.6. *Recommendations with 10% or More of Participants in Favour of Change*

	Recommendation	% in Favour
Session 1	More emphasis that 'no one approach fits all kids'	10%
	Use a Canadian link instead of current link	10%
	Be wary of video stating 'learning styles' have been debunked as this may have been part of teachers' training and they may currently teach based on this theory	10%
Session 2	Move the 'Bullying' section as seemed out of place	16%
	More emphasis on the importance of communication between adults involved	11%
Session 3	Be more explicit that teachers should elicit help from team (e.g., Learning Centre) to develop plan	16%
Session 4	Text too dense on some pages	21%
	Include more videos showing different antecedent strategies	11%
	Reinforce idea to consult with team	11%
Session 5	Emotional Regulation video is too long	21%
	Need more focus on how to support less verbal students	16%
	Text too dense on some pages	11%
	Reinforce idea to consult with team	11%
Session 6	*No recommendations supported by 10% or more of participants*	
Entire Module	Issues with pages not fitting on screen on iPads^{TM} and Chrome Books^{TM}	24%
	Consider that not all schools may have school psychologists working in the same capacity	18%
	Text too tense in some places	18%
	Some font colours (e.g., orange) difficult to read	12%
	Redistribute information so first session is shorter as having it long may deter users from continuing	12%
	A couple of links were not connected to correct documents	12%

Note. The above selection includes the most highly supported recommendations (i.e., those with support of 10% or more of participants). This is not the full list of recommendations nor the full list of changes made based on recommendations; many minor revisions were only endorsed by one participant but warranted modification (e.g., spelling/grammatical errors, minor additions to text, image changes).

Figure 3.1. *Flow Chart Reporting Numbers of Individuals Invited, Providing Consent, and Completing Part or All of the Study, by Group.*

ASD Support Professionals	Classroom Teachers	ASD Advocates
48 invited	14 invited	3 invited
19 consented	7 consented	2 consented
13 completed at least 1 session and questionnaire	5 completed at least 1 session and questionnaire	2 completed at least 1 session and questionnaire
11 completed all sessions and questionnaires	4 completed all sessions and questionnaires	2 completed all sessions and questionnaires

Figure 3.2. *Total Satisfaction Ratings for Each Session and for Entire Module*

Classroom Teachers' Satisfaction

(Bar chart with vertical axis labels: Session 1, Session 2, Session 3, Session 4, Session 5, Session 6, Module; horizontal axis: 0, 1, 2, 3, 4, 5)

Legend:
- Not at all satisfied
- Slightly satisfied
- Moderately satisfied
- Very satisfied
- Extremely satisfied

ASD Support Professionals' Satisfaction

(Bar chart with vertical axis labels: Session 1, Session 2, Session 3, Session 4, Session 5, Session 6, Module; horizontal axis: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13)

Legend:
- Not at all satisfied
- Slightly satisfied
- Moderately satisfied
- Very satisfied
- Extremely satisfied

ASD Advocates' Satisfaction

(Bar chart with vertical axis labels: Session 1, Session 2, Session 3, Session 4, Session 5, Session 6, Module; horizontal axis: 0, 1, 2)

Legend:
- Not at all satisfied
- Slightly satisfied
- Moderately satisfied
- Very satisfied
- Extremely satisfied

Total Sample's Satisfaction

Legend:
- ⋈ Not at all satisfied
- ◺ Slightly satisfied
- ‖ Moderately satisfied
- ▨ Very satisfied
- ‖ Extremely satisfied

Categories (y-axis): Session 1, Session 2, Session 3, Session 4, Session 5, Session 6, Module

X-axis: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Note. Satisfaction scores are derived from 12 to 20 items (depending on questionnaire) from the modified version of Morville's User Experience Honeycomb assessing usability. Possible scores range from 0 to 5, with higher numbers representing more positive ratings. Ratings were rounded to the nearest whole number (i.e., ratings between 3.50 and 4.49 would be displayed as 4).

Figur*e* 3.3. *Readiness for Use Ratings for Each Session and for Entire Module*

Classroom Teachers' Perceptions of Readiness for Use

(Bar chart with categories Session 1 through Session 6 and Module, horizontal axis from 0 to 5)

Legend:
- Not at all ready
- Slightly ready
- Moderately ready
- Very ready
- Extremely ready

ASD Support Professionals' Perceptions of Readiness for Use

(Bar chart with categories Session 1 through Session 6 and Module, horizontal axis from 0 to 13)

Legend:
- Not at all ready
- Slightly ready
- Moderately ready
- Very ready
- Extremely ready

ASD Advocates' Perceptions of Readiness for Use

(Bar chart with categories Session 1 through Session 6 and Module, horizontal axis from 0 to 2)

Legend:
- Not at all ready
- Slightly ready
- Moderately ready
- Very ready
- Extremely ready

Total Sample's Perceptions of Readiness for Use

Figure 3.4. *Completeness of Information Ratings for Each Session and for Entire Module*

Classroom Teachers' Perceptions of Whether All Necessary Information Included

Legend:
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

ASD Support Professionals' Perceptions of Whether All Necessary Information Included

Legend:
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

ASD Advocates' Perceptions of Whether All Necessary Information Included

Legend:
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Total Sample's Perceptions of Whether All Necessary Information Included

Legend:
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Appendix 3.1: Background Information Form for ASD Support Professionals

The following questionnaire asks for some basic information about you and your experiences with students with autism spectrum disorder (ASD). This questionnaire will take approximately 5 minutes to complete.

1) Age [drop down menu][2]
   - ☐ [Numbers for drop down list: 21,22,23,24,25…60+]
   - ☐ Do not wish to disclose

2) Your sex [drop down menu]
   - ☐ Male
   - ☐ Female
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

3) What is your highest degree completed? [drop down menu]
   - ☐ Bachelors (or equivalent)
   - ☐ Masters
   - ☐ M.D.
   - ☐ Ph.D.
   - ☐ Psy.D.
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

4) What is your current occupation? [drop down menu]
   - ☐ Autism Specialist / Consultant
   - ☐ Behaviour Specialist
   - ☐ Occupational Therapist
   - ☐ School Psychologist
   - ☐ Speech-Language Pathologist
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

   4.1 How long have you been in this occupation? [drop down menu] years
   - ☐ [Numbers for years: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10…up to 35+]
   - ☐ Do not wish to disclose

5) Which age groups have the children with ASD you have worked with in your career belonged to? Check all that apply: [check list - unlimited]
   - ☐ Toddler/Preschool age (2 – 5 years)
   - ☐ Children (5 – 12 years)

---

[2] Information in square brackets indicates how questions were presented or how responses were formatted.

☐ Young adolescents (12 – 15 years)
☐ Older adolescents (15 – 18 years)
☐ Young adults (18 - 25 years)
☐ Do not wish to disclose

5.1 [When selected, asks to complete the following question] How many years did you work with this age group? [drop down menu]

☐ [Numbers for menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 35+]
☐ Do not wish to disclose

6) Did you take any courses specifically and exclusively focused on children/youth with ASD during your professional training (including all degrees, e.g., Masters and Ph.D.)? [drop down menu]
☐ Yes
☐ No
☐ Do not wish to disclose

6.1 If you answered "Yes" to the previous question, how many courses focused on children/youth with ASD did you take? (Please estimate to the nearest half-credit/three-month course. For example, if you took one half credit course, select 1, if you took one full credit, select 2): [drop down menu]

☐ [Numbers for drop down menu: 1, 2, 3, 4, 5+]
☐ Do not wish to disclose

6.2 If you answered "Yes" to the previous question, please indicate the names / content of the courses on children/youth with ASD you have taken?

☐ [text box]
☐ Do not remember
☐ Do not wish to disclose

7) Did you take any courses on children/youth with neurodevelopmental disorders (not specifically focused on ASD) during your professional training (including all degrees, e.g., Masters and Ph.D.)? [drop down menu]
☐ Yes
☐ No
☐ Do not wish to disclose

7.1 If you answered "Yes" to the previous question, how many courses on children/youth with neurodevelopmental disorders did you take? (Please estimate

to the nearest half-credit/three-month course. For example, if you took one half credit course, select 1, if you took one full credit, select 2) [drop down menu]

- ☐ [Numbers for drop down menu: 1, 2, 3, 4, 5+]
- ☐ Do not wish to disclose

7.2 If you answered "Yes" to the previous question, please indicate the names / content of the courses on children/youth with neurodevelopmental disorders you have taken?

- ☐ [text box]
- ☐ Do not remember
- ☐ Do not wish to disclose

8) Overall, how much would you say you learned about ASD during your professional training (including all degrees, e.g., Masters and Ph.D.)? [drop down menu]
- ☐ Nothing
- ☐ Very little
- ☐ Some
- ☐ Quite a bit
- ☐ A lot
- ☐ Do not wish to disclose

9) Have you attended any professional development opportunities (e.g., seminars, workshops) specifically about ASD? [drop down menu]
- ☐ Yes
- ☐ No
- ☐ Do not wish to disclose

9.1 If yes, approximately how many hours of professional development training have you completed on ASD? Please round to the nearest hour. If unsure, please estimate. [drop down menu]

- ☐ [Numbers for drop down menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10+]
- ☐ Do not wish to disclose

10) Have you attended any professional development opportunities (e.g., seminars, workshops) about neurodevelopmental disorders in general (e.g., not exclusive to ASD)? [drop down menu]
- ☐ Yes
- ☐ No
- ☐ Do not wish to disclose

10.1 If yes, approximately how many hours of professional development training have you completed on neurodevelopmental disorders? Please round to the nearest hour. If unsure, please estimate. [drop down menu]

- ☐ [Numbers for drop down menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10+]
- ☐ Do not wish to disclose

11) Approximately how many children/adolescents with ASD have you worked with during your career? [drop down menu]
- ☐ [Numbers for drop down menu: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 30+]
- ☐ Do not wish to disclose

12) How would you rate your current knowledge of ASD? [drop down menu]
- ☐ Very knowledgeable
- ☐ Moderately knowledgeable
- ☐ A little bit knowledgeable
- ☐ Not very knowledgeable
- ☐ Not at all knowledgeable
- ☐ Do not wish to disclose

Appendix 3.2: Background Information Form for Classroom Teachers

The following questionnaire asks for some basic information about you and your experiences with students with autism spectrum disorder (ASD). This questionnaire will take approximately 5 minutes to complete.

1) Age [drop down menu] [3]
   - ☐ [Numbers for drop down menu: 21,22,23,24,25…60+]
   - ☐ Do not wish to disclose

2) Sex [drop down menu]
   - ☐ Male
   - ☐ Female
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

3) What is your highest degree completed? [drop down menu]
   - ☐ Bachelors (or equivalent)
   - ☐ Masters
   - ☐ Ph.D.
   - ☐ Ed.D.
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

4) What is/are your *current* position(s)? [check list – unlimited selection]
   - ☐ Teacher in the regular classroom
   - ☐ Specialist teacher (e.g., resource teacher, learning centre teacher)
   - ☐ Administration
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

   4.1 [For each selected item, participants will be asked to answer the following] How long have you been in this position (rounded to the closet year)? [drop down menu] years

   - ☐ [Numbers for years: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 35+]
   - ☐ Do not wish to disclose

   4.2 If selected "teacher in the regular classroom", what grade(s) are you currently teaching? [drop down]

---

[3] Information in square brackets indicates how questions were presented or how responses were formatted.

☐ [Numbers for dropdown menu: P, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12]
☐ Do not wish to disclose

5) What other position(s), if any, have you held in the school system? Please only select positions which you have *not* indicated in question 4. [check list – unlimited selection]
☐ I have not held any positions besides my current position(s) as indicated in question 4
☐ Teacher in the regular classroom
☐ Specialist teacher (e.g., resource teacher, learning centre teacher)
☐ Administration
☐ Other, please specify [text box]
☐ Do not wish to disclose

5.1 [For each selected item, participants will be asked to answer the following] How long were you in this position (rounded to the closet year)? [drop down menu] years

☐ [Numbers for years: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 35+]
☐ Do not wish to disclose

6) Which grade(s) have you taught in your teaching career? Check all that apply: [check list – unlimited selection]
☐ Grade Primary
☐ Grades 1-6
☐ Grades 7-9
☐ Grades 10-12
☐ Do not wish to disclose

6.1 [When selected, asks to complete the following question] How many years did you teach these grades? [drop down menu]

☐ [Numbers for menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 35+]
☐ Do not wish to disclose

7) Did you take any courses specifically and exclusively focused on ASD during teacher training (including your B.Ed. and any graduate training)? [drop down menu]
☐ Yes
☐ No
☐ Do not wish to disclose

7. 1 If you answered "Yes" to the previous question, how many courses specifically focused on ASD did you take? (Please estimate to the nearest half-credit/three-month

course. For example, if you took one half credit, select 1, if you took one full credit, select 2): [drop down menu]

- ☐ [Numbers for dropdown menu: 1, 2, 3, 4, 5+]
- ☐ Do not wish to disclose

7. 2 If you answered "Yes" to the previous question, please indicate the names / content of the courses on ASD you have taken?

- ☐ [text box]
- ☐ Do not remember
- ☐ Do not wish to disclose

8) Did you take any courses in special education/exceptional learners (not specifically focused on ASD) during teacher training (including your B.Ed. and any graduate training)? [drop down menu]
- ☐ Yes
- ☐ No
- ☐ Do not wish to disclose

8.1 If you answered "Yes" to the previous question, how many special education/exceptional learners courses did you take? (Please estimate to the nearest half-credit/three-month course. For example, if you took one half credit, select 1, if you took one full credit, select 2): [drop down menu]

- ☐ [Numbers for dropdown menu: 1, 2, 3, 4, 5+]
- ☐ Do not wish to disclose

8.2 If you answered "Yes" to the previous question, please indicate the names / content of the special education/exceptional learners courses you have taken?

- ☐ [text box]
- ☐ Do not remember
- ☐ Do not wish to disclose

9) Overall, how much would you say that you learned about ASD during your teacher training (including bachelors and graduate training)? [drop down menu]
- ☐ Nothing
- ☐ Very little
- ☐ Some
- ☐ Quite a bit
- ☐ A lot
- ☐ Do not wish to disclose

10) Have you received support from any of the following professionals while working with a student with ASD? (please provide details in the text box)

10. 1 Other Teachers
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

10. 2 Educational Program Assistant/Teacher Assistant
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

10.3 Parents
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

10.4 School-based Autism Specialist/Consultant
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

10.5 Speech-language Pathologist
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

10.6 School Psychologist
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

10.7 Clinical Psychologist
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

10.8 Occupational therapist
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

10.9 Other, please specify
- ☐ Yes [text box]
- ☐ No
- ☐ Do not wish to disclose

11) Have you attended any in-service/professional development training (e.g., seminars, workshops) focused specifically on ASD? [drop down menu]
- ☐ Yes
- ☐ No
- ☐ Do not wish to disclose

11. 1 If yes, approximately how many hours of professional development training have you completed on ASD? Please round to the nearest hour. If unsure, please estimate. [drop down menu]

- ☐ [Numbers for menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 50+]
- ☐ Do not wish to disclose

12) Have you received in-service/professional development training focused on special education/exceptional learners (not focused on ASD specifically)? [drop down menu]
- ☐ Yes
- ☐ No
- ☐ Do not wish to disclose

12.1 If yes, approximately how many hours of professional development training have you completed on special education/exceptional learners (not specifically on ASD)? Please round to the nearest hour. If unsure, please estimate. [drop down menu]

- ☐ [Numbers for menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 50+]
- ☐ Do not wish to disclose

13) Approximately how many students with ASD have you taught during your teaching career? [drop down menu]
- ☐ [Numbers for dropdown menu: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 20+]
- ☐ Do not wish to disclose

14) How would you rate your current knowledge of ASD? [drop down menu]
- ☐ Very knowledgeable
- ☐ Moderately knowledgeable
- ☐ A little bit knowledgeable
- ☐ Not very knowledgeable
- ☐ Not at all knowledgeable
- ☐ Do not wish to disclose

Appendix 3.3: Background Information Form for ASD Advocate – Youth with

Lived Experience

The following questionnaire asks for some basic information about you and your experiences with autism spectrum disorder (ASD). This questionnaire will take approximately 10 minutes to complete. We understand that you may not know the answers to all of the questions, and it is OK to select "Do not know" or "Do not remember".

1) Your Age [drop down menu][4]
   - ☐ [Numbers for drop down menu: 18, 19, 20, 21, 22, 23, 24, 25]
   - ☐ Do not wish to disclose

2) Your sex [drop down menu]
   - ☐ Male
   - ☐ Female
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

3) What is your highest education completed? [drop down menu]
   - ☐ Some High School
   - ☐ High School Diploma
   - ☐ Some Community College
   - ☐ Community College Diploma/Certificate
   - ☐ Some University (Bachelor's or equivalent)
   - ☐ University Degree (Bachelor's or equivalent)
   - ☐ Some University (professional, graduate degree, post-graduate)
   - ☐ University Degree (professional, graduate degree, post-graduate)
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

4) Are you currently attending school?
   - ☐ Yes, please specify: What type of school [drop down menu], and year [drop down menu]
     [Menu for type of school: High School, College, University Undergraduate Degree, University Graduate School]
     [Menu for grade/year: grade 12, 1st year University/College, 2nd year University/College, 3rd year University/College, 4th year University/College, 5th year University/College, 6th year + University/College]
   - ☐ No

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[4] Information in square brackets indicates how questions were presented or how responses were formatted.

□   Do not wish to disclose

5) Are you currently employed? [drop down menu]
     □   Yes (please specify type of employment, e.g., restaurant, retail, research, nurse) [text box]
     □   No
     □   Do not wish to disclose

     5.1 If you answer "yes", please specify your work schedule [drop down menu]

        □   [Drop down menu responses: Full-time, Part-time, Casual]
        □   Do not wish to disclose

6) What foundation and/or organization do you currently work with in the capacity of a youth advocate for individuals with ASD? [text box]

7) How long have you worked with this foundation/organization? [drop down menu] years
     [Numbers for drop down menu: <1, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10+]

     [If 10+ is selected], please indicate the number of years: [text box]

8) Have you received any training related to advocacy for individuals with ASD from this foundation/organization? [drop down menu]
     □   Yes [If selected, participant completes questions 8.1 and 8.2]
     □   No [If selected, participant moves on to question 9]

     8.1 If yes, please indicate the type of training you received from this foundation/organization in the text box: [text box]

     8.2 If yes, how many hours of training have you received from this foundation/organization? If unsure, please estimate to the nearest hour. [drop down menu]

     [Numbers for drop down menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10+]

     [If 10+ is selected], please indicate the number of hours: [text box]

9) Have you received any training related to advocacy for individuals with ASD that was not provided by the foundation/organization? [drop down menu]
     □   Yes [If selected, participant completes questions 9.1 and 9.2]

☐ No [If selected, participant moves on to question 10]

9.1 If yes, please indicate the type of training you received from this foundation/organization in the text box: [text box]

9.2 If yes, how many hours of training have you received from this foundation/organization? If unsure, please estimate to the nearest hour. [drop down menu]

[Numbers for drop down menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10+]

10) Overall, how much would you say you learned about advocating for individuals with ASD during any training (i.e., provided through the foundation/organization and elsewhere) you received? [drop down menu]
   ☐ Nothing
   ☐ Very little
   ☐ Some
   ☐ Quite a bit
   ☐ A lot
   ☐ Do not wish to disclose

11) Who have you worked with in your capacity as a youth advocate of individuals with ASD? [drop down menu, can select multiple options]
   ☐ Children/youth with ASD
   ☐ Parents who have children/youth with ASD
   ☐ Family members, other than parents, of children/youth with ASD (e.g., siblings, grandparents)
   ☐ Teachers who work with students who have ASD
   ☐ Other, please specify [text box]

   11.1 [For each selection] How many of these person(s) did you work with? [drop down menu]
   [Numbers for drop down menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 25+]

12) What age groups have you worked with in your capacity as a youth advocate for individuals with ASD? [drop down menu, can select multiple options]
   ☐ Toddler/Preschool age (2 – 5 years)
   ☐ Children (5 – 12 years)
   ☐ Young adolescents (12 – 15 years)
   ☐ Older adolescents (15 – 18 years)
   ☐ Young adults (18 - 25 years)
   ☐ Adults (25+)

☐ Do not wish to disclose

13) Please describe your personal experience as student with ASD in the Canadian school system during grades 1 to 12 in the text box. Please include both positive and negative experiences: [text box]

14) If applicable, please describe your experience advocating for and/or helping individuals within the ASD community (e.g., children/youth, families, parents etc.) in the Canadian school system in the text box: [text box]

15) Please describe your experience advocating for and/or helping individuals within the ASD community (e.g., children/youth, families, parents, etc.) in general (i.e., outside of the school system) in the text box: [text box]

Appendix 3.4: Background Information Form for ASD Advocate – Parent of Child

with ASD

The following questionnaire asks for some basic information about you and your experiences as a parent of a child with autism spectrum disorder (ASD), as well as your experience as a parent advocate for individuals with ASD. This questionnaire will take approximately 5 to 10 minutes to complete.

1) Your child with ASD's age [drop down menu][5]
   - ☐ [Options for dropdown menu: 5, 6, 7, 8, 9….25+]
   - ☐ Do not wish to disclose

2) Your child with ASD's sex [drop down menu]
   - ☐ Male
   - ☐ Female
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

3) Your child with ASD's current grade [drop down menu]
   - ☐ [Options for dropdown menu: Primary, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, college, university undergraduate degree, university graduate degree, child is no longer in school]
   - ☐ Do not wish to disclose

4) Your age [drop down menu]
   - ☐ [Options for dropdown menu: 21,22,23,24,25…60+]
   - ☐ Do not wish to disclose

5) Your sex [drop down menu]
   - ☐ Male
   - ☐ Female
   - ☐ Other, please specify [text box]
   - ☐ Do not wish to disclose

6) What is your highest education completed? [drop down menu]
   - ☐ Some High School
   - ☐ High School Diploma
   - ☐ Some Community College
   - ☐ Community College Diploma/Certificate
   - ☐ Some University (Bachelor's or equivalent)
   - ☐ University Degree (Bachelor's or equivalent)

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[5] Information in square brackets indicates how questions were presented or how responses were formatted.

- ☐ Some University (professional, graduate degree, post-graduate)
- ☐ University Degree (professional, graduate degree, post-graduate)
- ☐ Other, please specify [text box]
- ☐ Do not wish to disclose

7) What foundation and/or organization do you currently work with in the capacity of a parent advocate for individuals with ASD? [text box]

8) How long have you worked with this foundation/organization? [drop down menu] years
[Numbers for drop down menu: <1, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10+]

[If 10+ is selected], please indicate the number of years: [text box]

9) Have you received any training related to advocacy for individuals with ASD from this foundation/organization? [drop down menu]
- ☐ Yes [If selected, participant completes questions 9.1 and 9.2]
- ☐ No [If selected, participant moves on to question 10]

9.1 If yes, please indicate the type of training you received from this foundation/organization in the text box: [text box]

9.2 If yes, how many hours of training have you received from this foundation/organization? If unsure, please estimate to the nearest hour. [drop down menu]

[Numbers for drop down menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10+]

[If 10+ is selected], please indicate the number of hours: [text box]

10) Have you received any training related to advocacy for individuals with ASD that was not provided by the foundation/organization? [drop down menu]
- ☐ Yes [If selected, participant completes questions 10.1 and 10.2]
- ☐ No [If selected, participant moves on to question 11]

10.1 If yes, please indicate the type of training you received from this foundation/organization in the text box: [text box]

10.2 If yes, how many hours of training have you received from this foundation/organization? If unsure, please estimate to the nearest hour. [drop down menu]

[Numbers for drop down menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10+]

11) Overall, how much would you say you learned about advocating for individuals with ASD during any training (i.e., provided through the foundation/organization and elsewhere) you received? [drop down menu]
- ☐ Nothing
- ☐ Very little
- ☐ Some
- ☐ Quite a bit
- ☐ A lot
- ☐ Do not wish to disclose

12) Who have you worked with in your capacity as a parent advocate of individuals with ASD? [drop down menu, can select multiple options]
- ☐ Children/youth with ASD
- ☐ Parents who have children/youth with ASD
- ☐ Family members, other than parents, of children/youth who have ASD (e.g., siblings, grandparents)
- ☐ Teachers who work with students who have ASD
- ☐ Other, please specify [text box]

12.1 [For each selection] How many of these person(s) did you work with? [drop down menu]
[Numbers for drop down menu: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10… up to 25+]

13) What age groups have you worked with in your capacity as a parent advocate for individuals with ASD? [drop down menu, can select multiple options]
- ☐ Toddler/Preschool age (2 – 5 years)
- ☐ Children (5 – 12 years)
- ☐ Young adolescents (12 – 15 years)
- ☐ Older adolescents (15 – 18 years)
- ☐ Young adults (18 - 25 years)
- ☐ Adults (25+)
- ☐ Do not wish to disclose

14) Please describe your child's experience as a student with ASD in the Canadian school systems during grades 1 to 12 in the text box. Please include both positive and negative experiences: [text box]

15) If applicable, please describe your experience advocating for and/or helping individuals within the ASD community (e.g., children/youth, families, parents, etc.) in the Canadian school system in the text box: [text box]

16) Please describe your experience advocating for and/or helping individuals within the ASD community (e.g., children/youth, families, parents, etc.) in general (i.e., outside of the school system) in the text box: [text box]

Appendix 3.5: End of Session Questionnaire

The following questionnaire asks about your impressions of SESSION [insert 1, 2, 3, 4, 5, OR 6][6] of the *Teacher Help for ASD* program. The survey will take approximately 15 minutes to complete. We will use the information you provide to help us fine-tune the *Teacher Help for ASD* module for use with regular classroom teachers. As such, please provide comprehensive and candid responses based on your perceptions of the program.

Below are a series of statements that relate to your impressions of THIS session of the *Teacher Help for ASD* program. Please indicate your agreement with each statement and then provide comments to support your ratings within each category.

Useful
- This session provided information that will help teachers in the regular classroom to better understand ASD.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
- This session provided information that will help teachers in the regular classroom to implement evidence-based classroom interventions for students with ASD.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree

Please provide comments that support your rating about the **usefulness** of this session. Include any suggestions you may have to improve **usefulness:**

Usable
- This session was user-friendly and could be navigated with ease.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
- This session would take a reasonable amount of time for teachers in the regular classroom to complete.
    - Strongly agree
    - Agree
    - Neither agree nor disagree

[6] Information in square brackets indicated how the session should appear based on session number

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o Disagree
o Strongly disagree

Please provide comments that support your rating about the **usability** of this session. Include any suggestions you may have to improve **usability**:

Desirable
- This session was visually appealing and the organization of information on the screen was clear.
  o Strongly agree
  o Agree
  o Neither agree nor disagree
  o Disagree
  o Strongly disagree

Please provide comments that support your rating about the **desirability** of this session. Include any suggestions you may have to improve **desirability**:

Accessible
- This session was accessible from the chosen device(s) (e.g., tablet, laptop, smartphone) when and where desired.
  o Strongly agree
  o Agree
  o Neither agree nor disagree
  o Disagree
  o Strongly disagree
- The information provided in this session would be easy for teachers in the regular classroom to understand.
  o Strongly agree
  o Agree
  o Neither agree nor disagree
  o Disagree
  o Strongly disagree

Please provide comments that support your rating about the **accessibility** of this session. Include any suggestions you may have to improve **accessibility**:

Features (e.g., Worksheets and Supplemental Materials)
- Teachers in the regular classroom would like the worksheet(s) in this session.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
- Teachers in the regular classroom would like the supplemental material(s) in this session.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
- Teachers in the regular classroom would refer to the worksheets and/or supplemental materials from this session in the future.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree

Please provide comments that support your rating about the **features** of this session.
Include any suggestions you may to improve the **features** included in the session:

Videos [asked only if relevant to the session]
- Teachers in the regular classroom would enjoy the videos recommended/ included in this session.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
- The videos added educational value to this session.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree

Please provide comments that support your rating about the **videos** in this session.
Include any suggestions you may have for alternative **videos**:

- The video titled "What is Evidence" would be valuable for teachers in the regular classroom. [only included for Session 1]
  - Strongly agree
  - Agree
  - Neither agree nor disagree
  - Disagree
  - Strongly disagree

Please provide comments that support your rating about the **video called "What is Evidence"** in this session. Include any suggested changes you may have: [only included for Session 1]

- The video titled "Words, Worlds, and Wisdom" would be valuable for teachers in the regular classroom. [only included for Session 1]
  - Strongly agree
  - Agree
  - Neither agree nor disagree
  - Disagree
  - Strongly disagree

Please provide comments that support your rating about the **video called "Words, World's, and Wisdom"** in this session. Include any suggested changes you may have: [only included for Session 1]

Credible
- The information provided in this session gives the impression of coming from a reputable source.
  - Strongly agree
  - Agree
  - Neither agree nor disagree
  - Disagree
  - Strongly disagree

Please provide comments that support your rating about the **credibility** of this session. Include any suggestions you may have that would help make the information appear more **credible**:

Valuable
- The information provided by this session would be valuable to teachers in the regular classroom.
  - Strongly agree
  - Agree

- o Neither agree nor disagree
- o Disagree
- o Strongly disagree

> Please provide comments that support your rating about the **value** of this session. Include any suggestions you may have to improve the **value** of the session:

Readiness
- How ready is this session for use with teachers in the regular classroom?
  - o Extremely ready
  - o Very ready
  - o Moderately ready
  - o Slightly ready
  - o Not at all ready

> Please provide any additional feedback you have about the session. If you do not believe it is **ready for use**, in what ways must it be modified to be ready?

General Feedback
- Was everything you would expect to be included in this session there?
  - o Strongly agree
  - o Agree
  - o Neither agree nor disagree
  - o Disagree
  - o Strongly disagree
- Overall, how satisfied were you with this session of the *Teacher Help for ASD* program?
  - o Extremely satisfied
  - o Very satisfied
  - o Moderately satisfied
  - o Slightly satisfied
  - o Not at all satisfied
- Would you recommend this session to teachers in the regular classroom?
  - o Yes
  - o Maybe
  - o No

> Please provide comments that support your rating of this session **overall.** Include any suggestions you may have to improve the session **overall**:

Appendix 3.6: Background Information Form for ASD Advocate – Youth with

Lived Experience

The following questionnaire asks questions about your overall impressions of the *Teacher Help for Autism Spectrum Disorder* (ASD) module. The questionnaire will take approximately 25 minutes to complete. We will use your responses to help us fine-tune the *Teacher Help for ASD* module for use with teachers in the regular classroom. As such, please provide comprehensive and candid responses based on your perceptions of the program.

Below are a series of statements that relate to your impressions of the *Teacher Help for ASD* program OVERALL. Please indicate your agreement with each statement and then provide comments to support your ratings within each category.

Useful
- Overall, this eHealth program provided information that will help teachers in the regular classroom to better understand ASD.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
- Overall, this eHealth program provided information that will help teachers in the regular classroom to implement evidence-based classroom interventions for students with ASD.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree

Please provide comments that support your rating about the **usefulness** of the *Teacher Help for ASD* program. Include any suggestions you may have to improve **usefulness:**

Usable
- Overall, this eHealth program was user-friendly and could be navigated with ease.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree

- Overall, this eHealth program would take a reasonable amount of time for teachers in the regular classroom to complete.
  - o Strongly agree
  - o Agree
  - o Neither agree nor disagree
  - o Disagree
  - o Strongly disagree

Please provide comments that support your rating about the **usability** of this the *Teacher Help for ASD* program. Include any suggestions you may have to improve **usability**:

Desirable
- Overall, this eHealth program was visually appealing and the organization of information on the screen was clear.
  - o Strongly agree
  - o Agree
  - o Neither agree nor disagree
  - o Disagree
  - o Strongly disagree
- Overall, the COLOUR SCHEME of this eHealth program was satisfactory.
  - o Strongly agree
  - o Agree
  - o Neither agree nor disagree
  - o Disagree
  - o Strongly disagree
- Overall, the FONT STYLE in this eHealth program was satisfactory.
  - o Strongly agree
  - o Agree
  - o Neither agree nor disagree
  - o Disagree
  - o Strongly disagree
- Overall, the FONT SIZE in this eHealth program was satisfactory.
  - o Strongly agree
  - o Agree
  - o Neither agree nor disagree
  - o Disagree
  - o Strongly disagree
- Overall, the GRAPHICS in this eHealth program were satisfactory.
  - o Strongly agree
  - o Agree
  - o Neither agree nor disagree
  - o Disagree
  - o Strongly disagree

> Please provide comments that support your rating about the **desirability** of the *Teacher Help for ASD* program. Include any suggestions you may have to improve **desirability**:

Accessible
- Overall, *Teacher Help for ASD* program was accessible from the chosen device(s) (e.g., tablet, laptop, smartphone) when and where desired.
    - o Strongly agree
    - o Agree
    - o Neither agree nor disagree
    - o Disagree
    - o Strongly disagree
- Overall, the information provided in this eHealth program would be easy for teachers in the regular classroom to understand.
    - o Strongly agree
    - o Agree
    - o Neither agree nor disagree
    - o Disagree
    - o Strongly disagree

> Please provide comments that support your rating about the **accessibility** of this the *Teacher Help for ASD* program. Include any suggestions you may have to improve **accessibility**:

Features (e.g., Worksheets and Supplemental Materials)
- Overall, teachers in the regular classroom would like the worksheets in this eHealth program.
    - o Strongly agree
    - o Agree
    - o Neither agree nor disagree
    - o Disagree
    - o Strongly disagree
- Overall, teachers in the regular classroom would like the supplemental materials in this eHealth program.
    - o Strongly agree
    - o Agree
    - o Neither agree nor disagree
    - o Disagree
    - o Strongly disagree
- Overall, teachers in the regular classroom would refer to the worksheets and/or supplemental materials from this eHealth program in the future.
    - o Strongly agree
    - o Agree

- o Neither agree nor disagree
- o Disagree
- o Strongly disagree

Please provide comments that support your rating about the **features** of the *Teacher Help for ASD* program. Include any suggestions you may to improve the **features** included in the program:

Videos
- Overall, teachers in the regular classroom would enjoy the videos recommended/ included in this eHealth program.
    - o Strongly agree
    - o Agree
    - o Neither agree nor disagree
    - o Disagree
    - o Strongly disagree
- Overall, the videos added educational value to the eHealth program.
    - o Strongly agree
    - o Agree
    - o Neither agree nor disagree
    - o Disagree
    - o Strongly disagree

Please provide comments that support your rating about the **videos** in the *Teacher Help for ASD* program. Include any suggestions you may have for alternative **videos**:

Credible
- Overall, the information provided in this eHealth program gives the impression of coming from a reputable source.
    - o Strongly agree
    - o Agree
    - o Neither agree nor disagree
    - o Disagree
    - o Strongly disagree

Please provide comments that support your rating about the **credibility** of the *Teacher Help for ASD* program. Include any suggestions you may have that would help make the information appear more **credible**:

Valuable
- Overall, the information provided by this eHealth program would be valuable to teachers in the regular classroom.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree

Please provide comments that support your rating about the **value** of the *Teacher Help for ASD* program. Include any suggestions you may have to improve the **value** of the program:

Readiness
- How ready is this eHealth program for use with teachers in the regular classroom?
    - Extremely ready
    - Very ready
    - Moderately ready
    - Slightly ready
    - Not at all ready

Please provide any additional feedback you have about *Teacher Help for ASD*. If you do not believe it is **ready for use**, in what ways must it be modified to be ready?:

General Feedback
- Was everything you would expect to be included in the eHealth program there?
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
- Overall, how satisfied were you with this eHealth program?
    - Extremely satisfied
    - Very satisfied
    - Moderately satisfied
    - Slightly satisfied
    - Not at all satisfied
- Would you recommend this program to teachers in the regular classroom?
    - Yes
    - Maybe
    - No

Please provide comments that support your rating of the *Teacher Help for ASD* program ***overall.*** Include any suggestions you may have to improve *Teacher Help for ASD* **overall**:

The following questions ask about your experience using the *Teacher Help for ASD* program on your TECHNOLOGY HARDWARE. Please select the response below that best describes the technology you used the most, as well as your experience using this program on your technology.

- What type of hardware did you typically use? [Select multiple options]
  - Desktop
  - Laptop
  - Tablet
  - Smartphone
  - Other [text box]
- What type of OS system were you typically using? [Select multiple options]
  - Windows
  - MAC
  - Google (specific to smartphones)
  - Other [textbox]
  - Unknown

    What version? [appears after each selection]
    - [text box]
    - Unknown
- What internet browser were you typically using? [Select multiple options]
  - Firefox
  - Google Chrome
  - Internet Explorer
  - Microsoft Edge
  - Other [textbox]

    What version? [appears after each selection]
    - [text box]
    - Unknown

- On average, how quickly did the site load?
  - 1 second
  - 2 seconds
  - 3 seconds
  - 4 seconds
  - 5 seconds
  - More than 5 seconds

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- How often did the site crash?
    - Never
    - 1-2 times
    - 3-4 times
    - 4-5 times
    - More than 5 times

  If it did crash, what was happening when it did? [textbox]

- Overall, there were no problems downloading and accessing the features (e.g., worksheets, videos, supplemental documents) in this eHealth program.
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
- Overall, there were no issues accessing the worksheets
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree

Please provide comments that support your rating about the **technology** of this eHealth program. Include any suggestions you may have to improve the **technology:**

CHAPTER 4: BARRIERS AND FACILITATORS TO PARTICIPATION IN AN EFFECTIVENESS STUDY FOR AN ONLINE PROFESSIONAL DEVELOPMENT PROGRAM FOR CLASSROOM TEACHERS

The manuscript based on the interview study is presented here. Readers are advised that Nicole Ali, under the supervision of Dr. Penny Corkum and in consultation with her dissertation committee members (Dr. Isabel Smith and Dr. Sean Mackinnon), was responsible for the research question, the study methodology, critical analysis of the results, and all aspects of the writing process. She received critical editorial feedback from her dissertation committee members and would like to acknowledge Laura Keeler for her support in conducting interviews, Manuela Rendon for transcribing interviews, and Lindsay Rosenberg for being a second rater. The following manuscript is being prepared for submission.

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Abstract

Policies recommending inclusive education wherein students with disabilities are educated with their same-age peers are in effect at global and national levels. However, Canadian teachers report challenges related to understanding and supporting students with disabilities, citing a lack of training and appropriate resources. The *Teacher Help* program was developed to address these challenges for teachers of students with autism spectrum disorder (ASD), attention deficit / hyperactivity disorder (ADHD), and learning disabilities (LDs). During a national effectiveness study, recruitment of teachers was lower than anticipated rendering the quantitative evaluation under powered. Given this, interviews were conducted with 21 participating educational support staff and teachers, and with 8 individuals who were recruited but did participate in the intervention to understand the facilitators and barriers experienced. Responses were analyzed using the Theoretical Domains Framework (Atkins et al., 2017). The *environmental context and resources*, *beliefs about consequences*, and *knowledge* domains were identified as important sources of both facilitating and impeding factors. Additionally, *intentions* and *social influences* were identified as important facilitating domains, whereas *professional role and identity* and *reinforcement*, or lack thereof, were identified as sources of barriers. Environmental factors were considerably more likely to be endorsed as both facilitators and barriers, including challenges related to study logistics, school environments, and resources such as time, support, and the *Teacher Help* program itself. The results supported findings from a small body of school-based intervention implementation research and will inform the future implementation of *Teacher Help* and other such programs.

Introduction

Over the past three decades, global and national education policies have promoted moving from integration to inclusion for students with disabilities (Sokal & Katz, 2015). Integration followed from desegregation and means that individuals with disabilities are expected to be provided with adaptations to help them assimilate into the mainstream classroom (Peters, 2007; Sebba & Ainscow, 1996). That is, the student with a disability is viewed as needing to be changed in order to fit within the context of the larger classrooms. In inclusive education, in contrast, all students are considered as part of the classroom community and given the supports they need, regardless of disability status (Sebba & Ainscow, 1996; Uditsky, 1993). Inclusive education has demonstrated benefits for both students with disabilities as well as their TD peers (Cologon, 2014; Lindsay, 2007; Lynch & Irvine, 2009). In Canada, the shift from integration to inclusion has been challenging for classroom teachers, given that current school structures are more aligned to an integrative model of education (Lynch & Irvine, 2009; Sokal & Katz, 2015). Moreover, research with Canadian teachers has demonstrated their lack of knowledge about various disabilities and about evidence-based interventions to support these individuals appropriately within the inclusive classroom (Fontil & Petrakos, 2015; Froese-Germain & Riel, 2012; Sokal & Katz, 2015). Despite these knowledge gaps, Canadian teachers are generally supportive of inclusive education and have a desire to learn more about students with disabilities given the lack of practical knowledge typically received during their training (Fontil & Petrakos, 2015; Froese-Germain & Riel, 2012; Leblanc et al., 2009).

Research suggests an association between teachers' lower self-efficacy and higher levels of learned helplessness for teaching students with disabilities (Gotshall & Stefanou, 2011). However, classroom teachers who receive on-going consultation to support these students are less likely to experience learned helplessness (Gotshall & Stefanou, 2011). Despite evidence that specialized training, knowledge, and experience concerning students with disability can improve teachers' self-efficacy and effectiveness in the inclusive classroom, Canadian universities generally do not offer comprehensive training opportunities focused on specific childhood disorders and evidence-based interventions for the classroom (McCrimmon, 2015). McCrimmon (2015) suggests that specialized certificate programs focused on specific childhood disabilities, including information about the features of the disorder, the impact of the disorder on learning, and the best practices for educating these students provide a potential solution. Currently only one such type of program is available, through a post-graduate certificate program that can be completed online at a single Canadian university (McCrimmon, 2015).

The *Teacher Help* Program

The *Teacher Help* program provides a concise, accessible option for teachers to gain knowledge and experience regarding specific childhood disorders (i.e., attention deficit/hyperactivity disorder [ADHD], autism spectrum disorder [ASD], and learning disabilities [LDs]). The modules are hosted online so that teachers can access the program remotely while allowing them to implement evidence-based strategies while they complete the program. This fits well with recommendations suggesting that streamlined, cost-effective interventions are needed, particularly those addressing mental health needs (McGoey et al., 2014). Although the *Teacher Help* program was designed to be self-

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contained (i.e., have all the information required), school psychologists were identified as being able to provide additional support if needed. McGoey et al. (2014) also highlight the role of school psychologists in supporting teachers in implementing evidence-based behavioural interventions with students experiencing various disabilities.

After completing systematic literature reviews and usability studies for all three *Teacher Help* modules, plans were made to conduct a Canada wide effectiveness study. A multipronged and extensive recruitment campaign (e.g., conferences, webinars, meetings, advertisements, social media posts) in collaboration with project partners, was aimed at recruiting school boards, school psychologists, and teachers. This resulted in 33 school boards from seven Canadian provinces and one territory expressing interest. Ultimately, 15 school boards, representing five Canadian provinces and one territory, provided ethical approval for the study and 48 school psychologists across these school boards consented to participate. Originally, each school psychologist was expected to recruit and support 12 teacher-parent-student triads in a planned cluster randomized controlled trial (C-RCT). However, the participating school psychologists succeeded in recruiting a total of only 81 teachers. Therefore, the research design was changed from a C-RCT to a pre-post study during which all triads were given access to the appropriate *Teacher Help* module (i.e., ADHD, ASD, or LDs). Due to limited power, no quantitative analyses were conducted but descriptive statistics and qualitative information were examined. Of the 81 teachers who participated in the program, 90% reported learning new information and three-quarters reported improvement in their target student's behaviour and academic performance. Given that the *Teacher Help* program was deemed to be a meaningful and accessible source of information by the teachers who participated, there is a need to

understand the facilitators and barriers that school psychologists and teachers experienced when participating in order to make the program accessible to more classroom teachers.

Barriers and Facilitators to School-Based Implementation

Barriers to Implementing Evidence-based Interventions

Past studies have examined barriers and facilitators to implementing evidence-based interventions in schools in general (i.e., not specifically targeting students with NDDs). These interventions have targeted students' behavioural, social, and emotional challenges in inclusive school settings (e.g., Bambara et al., 2012; Forman et al., 2009; Langley et al., 2010; McGoey et al., 2014). Research has identified numerous barriers to addressing mental health needs with behavioural interventions in schools, including teachers' competing responsibilities, lack of time, lack of support from other school personnel, logistical barriers, lack of engagement from parents, lack of knowledge (i.e., about evidence-based interventions, their importance, and how to implement them), and lack of resources or inaccessible resources (Forman et al., 2009; Langley et al., 2010; McGoey et al., 2014). Successful implementation has been associated with having a facilitating environment (i.e., financial resources, alignment between intervention and school policies), social support (i.e., a network of colleagues implementing the same intervention), administrative support, and appropriate training (Denton et al., 2003; Forman et al., 2009; Langley et al., 2010). Furthermore, work-related stress can play a significant role as it acts not only as a barrier but is also associated with increased likelihood of endorsing other barriers (McGoey et al., 2014).

A large study of behavioural intervention that collected data from various school personnel (e.g., teachers, behavior support specialists, administrators, mental health professionals, teaching assistants) was implemented by Bambara et al. (2012). They reported that commonly endorsed barriers included those related to organizational structure (e.g., insufficient time due to competing responsibilities, unable to meet with team, lack of administrative support), practices/beliefs (e.g., not understanding the intervention, resistance to using behavior management programs), and professional development (e.g., too time consuming to develop and implement, lack of training).

Barriers to Implementing Interventions for Students with NDDs

Only a few studies (e.g., Koegel et al., 2012; Small, 2003) have focused specifically on barriers and facilitators to implementing evidence-based interventions for students with neurodevelopmental disorders (e.g., ADHD, ASD, LDs) in the inclusive classroom setting. The scant research suggests similar barriers and facilitators to those found for students without NDDs, described above. For instance, Small (2003) found that lack of time, lack of training, and large class sizes were the main barriers to implementing interventions for students with ADHD in inclusive classroom settings. Furthermore, although teachers were aware of and comfortable using instructional management practices (e.g., check-ins, prompting) and physical arrangement (e.g., classroom structure); they reported knowing less about and being less likely to implement behavioural management strategies (e.g., token economy, response cost). Teachers also endorsed non-evidence-based interventions such as dietary management (Small, 2003). No studies were found that directly examined barriers and facilitators to implementing ASD intervention in the inclusive classroom setting with general classroom teachers, but

research suggests that factors such as teachers not believing in the importance of research-based interventions, limited available resources, and lack of knowledge about ASD and appropriate interventions are significant barriers (Koegel et al., 2012). Similarly, Denton et al. (2003) reported that teachers' beliefs that evidence-based interventions would not necessarily improve outcomes for their students with LDs and a lack of knowledge about effective practices and how to implement these strategies were the main barriers to implementing evidence-based intervention for students with LDs in the inclusive classroom setting. Taken together, there is clear evidence of barriers to implementing evidence-based interventions across a variety of school settings and student needs. Moreover, little research has focused on barriers and facilitators specifically related to implementing interventions in the inclusive classroom setting for students with ADHD, ASD, and LDs.

The Theoretical Domains Framework

Challenges implementing new practices are common and the Theoretical Domains Framework (TDF; Michie et al., 2005) was developed in response to observed challenges to behaviour change in healthcare. Based on a review of theories of behaviour and behaviour change, the TDF is designed to facilitate the analysis and interpretation of challenges related to implementing evidence-based practices (Michie et al., 2005; Atkins et al., 2017). The current (i.e., second) version of the TDF includes 14 domains: 1) *knowledge*, 2) *skills*, 3) *social/professional role and identity* (hereafter, "*professional role and identity*" given the context of the current study), 4) *beliefs about capabilities*, 5) *optimism*, 6) *beliefs about consequences*, 7) *reinforcement*, 8) *intentions*, 9) *goals*, 10) *memory/attention/decision processes*, 11) *environmental context and resources*, 12)

social influences, 13) *emotion*, and 14) *behavioural regulation* (Atkins et al., 2017). The TDF and recommendations for using the framework are the product of collaborative efforts from researchers from Canada, the United Kingdom, and Australia working in a variety of fields (e.g., health psychology, sociology, implementation research, and clinical practice; Atkin et al., 2017).

To our knowledge, the TDF has been used only once in published literature in the school setting, in a Canadian study examining barriers and facilitators to implementing British Colombia's physical activity policy (i.e., 30 minutes of physical activity per school day; Weatherson et al., 2017). Weatherson et al. found that *environmental context and resources*, *beliefs about consequences*, *social influences*, *knowledge*, and *intentions* were the most commonly endorsed domains for barriers and facilitators. By analyzing reasons for implementation challenges with the TDF, it may be possible to foster more efficient uptake of evidence-based interventions and obtain more effective interventions.

The Current Study

To examine the barriers and facilitators to the *Teacher Help* program, semi-structured interviews were conducted with teachers, school psychologists and other supporting staff, and school liaisons (i.e., individuals associated with school boards who acted as liaisons with the *Teacher Help* research team). The interview questions and the analyses of the interviews were completed based on the TDF (Atkins et al., 2017). Commonly endorsed themes within each domain were examined. Comparisons were made between themes endorsed by teachers and supporting staff (e.g., psychologists), and between those who implemented the *Teacher Help* program and those who did not. The research questions were:

1) Which TDF domains represent the most significant facilitators to implementing *Teacher Help*? What were the common facilitating factors associated with these domains?

2) Which TDF domains represent the most significant barriers to implementing *Teacher Help*? What were the common impeding factors associated with these domains?

3) Were these domains endorsed differently by teachers and supporting staff?

4) Were these domains endorsed differently by those who implemented *Teacher Help* and those who did not?

Methods

Study Design

While the decision to conduct a barriers and facilitators study was made post hoc (i.e., following the completion of the under-powered effectiveness study as opposed to an implementation study), methodology for the current study otherwise followed guidelines from the TDF (Atkins et al., 2017). The stages for the TDF are selecting/specifying target behaviour(s), selecting the study design, developing study materials, deciding on the sampling strategy, collecting data, analyzing data, and reporting findings. As such, the first step was to identify and specify *who* should do *what* differently to increase uptake of the intervention (Atkins et al., 2017). For the *Teacher Help* intervention, classroom teachers, with the support of school psychologists (when requested/needed), were responsible for implementing the intervention. Classroom teachers were expected to implement the *Teacher Help* program with a student in their class during the designated study period and to complete one session per week for 6 weeks, which involved reviewing the session materials online and completing assigned tasks (see Chapter 1,

Table 1.1 for overview of session content). Thus, it was determined that data should be collected from classroom teachers, school psychologists and others who worked in a supporting role for classroom teachers (e.g., behavioural specialist), and school liaisons (i.e., in a few school boards, someone other than a school psychologist who acted as the contact between the research team and participants) to understand what would need to be done differently to increase participation and, subsequent implementation. Individual, semi-structured interviews were chosen as the method of data collection to obtain breadth in potential barriers and facilitators and depth of individuals' descriptions.

Participants[7]

Atkins et al. (2017) recommend sampling broadly to achieve maximum variation in exploratory studies. As such, any individual who had consented to participate in the *Teacher Help* study and to be contacted for follow-up was invited to participate via e-mail, regardless of whether or not they ultimately participated in the program. Invitees included 21 school liaisons, 63 school psychologists and other staff supporting teachers (e.g., behavioural specialist), and 40 teachers. Of the invitees, 30 individuals completed interviews including 2 school liaisons, 13 school psychologists/supporting staff, and 14 teachers[8] completed interviews. Follow-up was not initiated with individuals who did not

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[7] Hereafter, the term "participants" is used to identify those who participated in the current study and "implementer" is used to identify those who participated in the *Teacher Help* effectiveness study (either as an actual implementing teacher or as support staff who recruited an implementing teacher) and "non-implementer" for those who participated in the current study but had not implemented *Teacher Help* (i.e., a teacher who did not implement the program or support staff who were unsuccessful in recruiting an implementing teacher).

[8] Due to a technological failure, one classroom teacher's interview was not recorded, and this teacher is not included in the total ($n = 14$). Based on notes scribed by the interviewer following this interview, no novel information was provided, and responses were similar to those of other participating teachers. This participant's recalled responses were not coded to avoid the introduction of potential error due to memory bias.

respond; however, as the current study was conducted in the final weeks of the academic year, this likely played a factor in participation. Seven of the participants, consisting of the two school liaisons and five of the school psychologists, had been unsuccessful in recruiting teachers and had not accessed the program themselves. These participants were included as it was felt they may offer valuable insight into the challenges they experienced in recruiting teachers. Moreover, Weatherson et al. (2017) also interviewed both implementers and non-implementers in their study. Additionally, one teacher, who had accessed the intervention but was ultimately unable to participate was also interviewed. The remaining 23 participants had implemented, or supported someone implementing, the *Teacher Help* program during the research study. Table 4.1 contains demographic information and notes about role expectations.

Measures

The present study used data collected from the first three questions of a semi-structured interview (see Appendix 4.1 for the full interview schedule[9]). These open-ended questions asked participants to describe: (1) factors that facilitated their ability to participate in the *Teacher Help* program; (2) barriers that impeded their ability to participate in the *Teacher Help* program; and (3) what, if anything, they believed would have helped them overcome each barrier they encountered. As needed, participants were also prompted to describe factors that impeded their colleagues' participation where this affected their own participation (i.e., some support staff reported that they did not

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[9] The full interview consisted of the open-ended questions used in the current study as well as more targeted questions for each of the TDF domains. While similar questions had been previously used in research conducted by L.K., the modified (i.e., changed to be appropriate for the current study) questions were not pilot tested and upon analyses, the potential for bias was deemed to be high and the decision was made to use data only from the initial, open-ended questions.

experience barriers, but that the difficulty was in recruiting others). As participants were from across Canada, interviews were conducted via telephone and recorded. Interviews were scheduled based on participant availability and preference (i.e., some participants chose to participate from a private space at work, others from home) and lasted between 16 and 62 minutes. No follow-up interviews were conducted, and interviewers did not take field notes as the interviews had been recorded. Participants were not provided the opportunity to review their transcripts for comment or correction and this was not requested by any participant.

Analyses

NVivo software was used to facilitate data analysis. As recommended by Atkins et al. (2017), a deductive method was first employed using the TDF and its associated domains. Two independent coders (i.e., N.A. and L.R.) coded the same three randomly selected interviews and these were compared. Differences were discussed, and coders both completed all remaining interviews independently. Each unique idea or concept within a response was coded; that is, it was possible to code a response to a single question with multiple domains and all responses were coded under at least one of the TDF domains. Following independent coding, coders discussed discrepancies and the conceptualization of domains, revisiting the TDF guidelines frequently, and were able to achieve complete agreement within two additional rounds. Participants were not invited to provide feedback on findings, and none had requested this opportunity.

To address the first and second research questions (i.e., barriers and facilitators to implementing *Teacher Help*), the percentages of participants who endorsed each domain as a barrier and as a facilitator were calculated and, in keeping with past TDF research

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(e.g., McSherry et al., 2012; Weatherson et al., 2017), the five most commonly endorsed domains were considered to be the most relevant. However, comments related to less commonly endorsed domains were also reviewed and considered to ensure no rare, but important, perspectives were ignored. The first author also conducted an inductive analysis of common sub-themes within each of the commonly endorsed domains. Following the deductive analysis with an inductive analysis of themes within domains was suggested by Atkins et al. (2017) and used by Weatherson et al. (2017). To assess the third and fourth research questions (i.e., whether these domains were differently endorsed by teachers versus support staff or by implementers versus non-implementers), the percentage of members of each of these groups endorsing these selected domains as barriers or facilitators was examined.

The Research Team

The research team for the current study consisted of authors N.A., L.R. and P.C., project manager L.K., and volunteer researcher, M. R. At the time the study was conducted, N.A. was a doctoral student in Clinical Psychology who held a Bachelor of Education. N.A. was involved in all aspects of the study including conducting, transcribing, and analyzing interviews. L.K., a project manager for *Teacher Help*, held a Master's degree. She was involved in conducting and transcribing interviews. M.R., an undergraduate research volunteer, assisted in transcribing interviews. L.R., a doctoral student in clinical psychology with a Master's degree in School Psychology, was involved in analyzing transcripts. P.C. held a Clinical Psychology PhD and supervised all aspects of the study. All researchers identified as female and no specialized training was received for their work on this study.

Both P.C. and L.K. were involved in recruitment for the *Teacher Help* study and, as such, had established relationships with participants. Some participants were also professional contacts of P.C.; some met P.C. at conferences where the *Teacher Help* program was presented. All participants were informed that the current study was being conducted as part of N.A.'s dissertation research and were informed that the information collected would also be important for the development of *Teacher Help*.

Reflexivity

The authors acknowledge that their vested interest in *Teacher Help* is a potential bias that may have been present at various stages (e.g., conducting interviews, analyzing data) but that all efforts were made to approach interviews and data analyses with neutrality. Additionally, N.A. had previous experience working as an educator, but L.K. was less familiar with this work environment, both of which may have influenced their approaches to the semi-structured interviews. As such, N.A. may have been more likely to assume understanding about phenomenon described but may also have been more likely to recognize nuanced points and to have asked appropriate follow-up questions. In terms of coding, both N.A. and L.R. have experience working in schools with L.R.'s training being based in school psychology while N.A.'s was in education. As such, this may have influenced their interpretations and understandings comments made by support staff and teachers in light of their own experiences and training.

Results

During analysis, it became apparent that participants spoke of two distinct types of barriers and facilitators – those related to implementing the *Teacher Help* intervention and those related to study-factors. Study-related factors are described separately, where

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applicable. Tables 4.2 and 4.3 contain details about the top five endorsed barriers and facilitators, respectively. The tables include details about the frequency of endorsement in total (i.e., number and percentage of endorsing participants) and by groups (i.e., teachers versus support staff; implementers versus non-implementers). Tables 4.4 and 4.5 list the sub-themes, percentage of endorsing participants, and which groups endorsed the theme.

Facilitators

The five most frequently endorsed facilitators were *environmental context and resources*, *social influences*, *beliefs about consequences*, *knowledge*, and *intentions*.

Environmental Context and Resources

Facilitators in the *environmental context and resources* domain included any aspect of the environment that encouraged participation such having access to resources and having positive organizational culture (Atkins et al., 2017). This was the most commonly endorsed domain for facilitating factors, with 72% of participants endorsing facilitating factors in this domain. Teachers and support staff were equally likely to describe facilitating factors related to environmental context and resources and, as might be expected, those who had participated in the *Teacher Help* program were more likely to refer to facilitating factors in their environment (i.e., 86% versus 38% of non-implementers).

Some of the primary facilitators endorsed were related to the value of the *Teacher Help* program itself as a resource in terms of content and materials, usability, and learning experience. Participants also referenced how the online format made it accessible and allowed flexibility. This is captured by one of the participating teachers who commented:

The ease of the program, the modules themselves, the fact that the links all worked, yeah, that's key. I had access to it from wherever I wanted to be, so if I'm at a doctor's appointment and need to get things done I can do that [...] the fact that it was written in a way that was easy to understand – very sequential.

Support staff also believed that *Teacher Help* was a valuable resource. For example, one noted that they believed the module completed with their teacher (i.e., the LD module) "was a really strong module" (participating support staff).

Participants also spoke to facilitators related to the school environment such as having a supportive team and, specifically, support from administration and / or supervisors. The facilitating effect of the latter is illustrated by a participant who noted that having their "supervisor on board" was helpful as this allowed them to do *Teacher Help* as "part of [their] regular day" (participating support staff). Similarly, having extra time in one's schedule was believed to be facilitating. For example, one participant speculated that the teacher who participated with her was able to do so because she was "job-sharing" and had an "80% assignment" and that "just having that extra time in her schedule just made her more apt to do it" (participating support staff). Some participants also reported that having "parents that were very involved" and / or "students that wanted to participate" was helpful (participating teacher). Some participants also noted that they had a classroom that was conducive to participation. For example:

I am kind of in a lucky place in my classroom right now. I have an [educational assistant] in my classroom and the child I am dealing with is probably one of the easiest students I have ever dealt with (participating teacher).

Finally, some support staff noted that familiarity with teachers and students was helpful, which was also categorized as a social influences factor.

Study-Related Factors. Support staff also spoke to a couple of environmental study-related factors that facilitated their experiences. Specifically, they referred to reminder e-mails as being helpful and the online format facilitating distribution of materials and recruitment. That is, "being able to do things by e-mail - having stuff sent to me and all I had to do was forward it to people" reportedly "made life easier" (non-participating support staff). Additionally, the study was described as being well-organized and the program as having been well-presented (i.e., some participants had attended conferences where *Teacher Help* was presented as part of recruitment efforts) with one participant noting that a facilitating factor for them was "the really professional video that was nice and short and got the message across and looked impressive and had the approval by national bodies, research bodies" (participating support staff).

Social Influences

Facilitators in the *social influences* domain are interpersonal processes that impact how one feels, thinks, or behaves and can include factors such as social pressures, norms, support, and modelling (Atkins et al., 2017). Approximately half of the participants (52%) endorsed facilitators related to the *social influences* domain, with implementers (57% versus 38% of non-implementers) and support staff (67% versus 36% of teachers) being more likely to describe positive social influences.

Many environmental factors were also identified as facilitating factors, such as comments about social supports from staff, administration, and supervisors. For example,

a participating teacher noted that "speaking with the psychologist […] was very helpful", and a participating support staff noted about the teacher that "administration of her school would be very supportive of her doing something like this". Similarly, comments about familiarity of support staff with teachers and students tended to fit under both the environmental and social domains:

> When it came to direct clients that I was already involved with I think I was able…I kind of knew better who might be a good candidate for it and what teacher-student pairing might be a good candidate for it and that's ultimately how I got the one person that I did.

Study-Related Factors. Both teachers and support staff reported that the *Teacher Help* team, particularly the project manager L.K., had been helpful in responding to questions and helping them to problem-solve around some barriers:

> I could send her an e-mail and she was very quick to get back to me if it was something that I needed from her or was having difficulty with so that made it easier having someone that I felt like I could reach out to and get support [related to study factors] that way (participating support staff).

Beliefs about Consequences

Facilitators in the *beliefs about consequences* domain are accepted beliefs about the realistic outcomes in a given situation. In addition to being influenced by positive beliefs about the outcomes of participation, this could be influenced by anticipating regret for not participating (Atkins et al., 2017). Across groups, endorsement of facilitators related to *beliefs about consequences* were similar (36% versus 40%).

Specifically, those who endorsed facilitators in this domain tended to reference a belief that *Teacher Help* would have broad positive outcomes and / or would benefit a specific student. This is illustrated in these responses: "we just had a few really challenging students in her class and so she was looking for ways for managing them" (participating support staff), and "I think the fact that I have other students that are going to benefit from this one target student" (participating teacher). Additionally, some participants noted that they believed that the information obtained by participating in *Teacher Help* would further them professionally. For example, a non-participating teacher commented that they "looked at it as an opportunity to further [themself] professionally" noting that they felt "it's really beneficial to many [students]" even though it was "directed at one student".

Knowledge

In the *knowledge* domain, any awareness that makes someone more likely to participate is considered a facilitating factor. This includes knowledge about the procedures and rationale as well as knowledge of one's own environment (Atkins et al.,

2017). The *knowledge* domain was also similarly endorsed across groups, albeit endorsed by slightly fewer non-implementers (25% versus 38% of implementers).

Participants who endorsed this domain tended to reference a desire to acquire knowledge about NDDs or evidence-based interventions, or a desire to help teachers acquire this knowledge, as a motivating factor. For example, a participating support staff participant noted:

> I feel that the individual who participated in my school, it was a teacher who was
> new to that grade level and they were keen to get some information. So, I feel like
> that internal motivation to just try to increase their knowledge based.

Similarly, the non-participating teacher noted, "I thought it was a really great opportunity to learn more about tools that I can use in the classroom with students with learning disabilities because we are always going to have many students with barring abilities".

Additionally, participants reported that *Teacher Help* was a positive learning experience (e.g., the format facilitated learning) as was previously discussed as an environmental resource factor. Likewise, support staff reported that having knowledge about students (e.g., who had recently been diagnosed) and teachers (e.g., who would be a good candidate), was a facilitating factor.

Intentions

The *intentions* domain refers to making a conscious decision to behave in a specific way and the stability of this decision (Atkins et al., 2017). As with the *knowledge* domain, the *intentions* domain was least likely to be endorsed as a facilitator by those

who had not participated in *Teacher Help* (i.e., 13% versus 27% to 38% across other groups).

Participants endorsing this domain tended to reference a strong intention to complete the *Teacher Help* program from the outset and / or to have a strong internal motivation or interest in engaging in the program. This is illustrated in comments such as, "philosophically, I really believe in what you're trying to do with this program – that was part of why I volunteered" (non-participating support staff), "I committed to wanting to be helpful […] once I made that commitment, I just felt motivated to see all of that through" (participating teacher), and "it was great when the opportunity presented itself – as soon as I saw the email come across, I knew this was something I wanted to be a part of" (participating teacher).

Barriers

The top four domains in terms of barriers were *environmental context and resources*, *professional role and identity*, *beliefs about consequences*, and *reinforcement*. The fifth most endorsed barrier was a three-way tie among the *knowledge, intentions,* and *social influences* domains. Given that the majority of the comments about *social factors* and *intentions* were the inverse of facilitators identified in these domains, and that teachers (i.e., the primary implementers) were more likely to identify *knowledge* barriers than those related to intentions or social influences, the decision was made to focus on the *knowledge* domain as the fifth barrier. It is worth noting that *environmental context and resources* was nearly three times more likely to be endorsed than the second most endorsed *professional role and identity* domain for barriers (i.e., 97% versus 34% *)*.

Environmental Context and Resources

Any factor in one's environment that discourages participation would be considered a barrier in this domain. This may include factors such as a lack of resources, environmental stressors, and negative organization culture (Atkins et al., 2017). By far, impediments related to *environmental context and resources* were the most significant barrier experienced in implementing *Teacher Help* with all but one participant (i.e., a participating teacher) endorsing barriers related to this domain.

Participants described several challenges related to the school environment, the most prevalent being related to the busy environment in schools with some participants also noting that they did not have preparation time or any flexibility in their day. For example, one of the participating support staff noted that teachers are "inclined and motivated to learn but they have so many responsibilities, such busy workdays, and other kinds of systems they're supposed to learn". Another participating support staff noted, "it's the time – you know, in the big picture of life, six hours isn't really a big deal, but when you have the pressures of report cards and everything else, six hours seems like an unmanageable amount". A participating teacher noted that "being a full-time teacher with marking and stuff, it was hard to get it all in" and another participating teacher noted that they "could see a busy teacher having difficulty doing the modules in a timely manner" and that they believed the only reason this barrier did not impede them was being they "happen[ed] to have a bit of relief time". Participants often noted that protected professional development time would be needed for them to fully engage in the program.

Other barriers related to the school environment included challenging classrooms (e.g., "I have a lot of needs in my classes"; participating teacher), unexpected changes

(e.g., "one other teacher [agreed] to be part of it but […] he eventually ended up switching classrooms"; participating teacher), and challenges related to the format of secondary schools, for instance:

> And in the junior high model it's different too, like, elementary, you have the kids all day but we're…we share them…we might see the student for an hour or two hours a day or not even at all in day…that made things a little bit more complicated too (participating teacher).

Participants also referenced challenges related to the inaccessibility of school psychologists who were to provide support for the program who had several schools assigned to them, as well as difficulties meeting with their support team due to everyone having busy schedules. This was illustrated by one of the participating teachers who commented:

> Another key factor is school psychologist is generally only here once a month and although she's available by e-mail and she's fabulous that may not be the case for every teacher. As well, […] we are all busy and to get 3 or 4 of us together based on one student takes planning at least a week in advance […] so, if […] have something that you want to take to the team […] it may be a month before that can be implemented. So, it's just the logistics of public schools.

Likewise, one of the implementing support staff participants noted that their "schools are spread-out" with their furthest school being a "1.5 hour car ride away" and that making "additional trips" was "not a feasible commitment" which meant needing to target schools where "the needs are high enough that" they were "there on a regular basis".

Support staff, but not teachers, spoke to the negative climates in schools and among staff as illustrated by comments such as, "it seemed like teachers, they were just kind of done, like […] it's not a requirement of my job so I'm not going to do it" (participating support staff), "it's hard because they do feel – and I think some of it is just the current culture – that they just see it as extra work on their plate" (participating support staff), and "in many of the schools that I work right now, they're undergoing a lot of change and that's creating a lot of, I would say, stress among the different staff members" (non-participating support staff). Participants also noted that sometimes implementing the intervention "got interfered with" by students "who were having more severe difficulties" (participating support staff).

Additionally, support staff noted challenges in communicating with teaching staff, noting that they often did not respond to e-mails, or would respond expressing an interest in the program and then fail to follow up (e.g., "the biggest barrier for me was getting the schools to buy-in…people said, 'Great idea', but then not get back to me"; non-participating support staff). A number of participants felt that a lack of buy-in and support from those in administration or at the board / district level was a barrier and that if the program was undertaken at the school or board / district level, it would be easier to implement. For instance, a participating support staff noted that "if the entire district embraced it as sort of a push or an expectation, then it would be easier to have a big group of people". Similarly, a participating teacher remarked on a similar program being implemented in their school district and why they believed it had been more successful noted that, "teachers were given leave times, half days, full days, to work and collaborate.

So, collaboration time was provided. So, getting districts on board in that sort of

collaborative way would have been really valuable".

Study-Related Factors. It is worth noting that some of the factors described

above may have been related to the study rather than the implementation of *Teacher Help*

itself. For instance, it is possible that when support staff found teachers to be

unresponsive about participating that the teachers were not interested due to the

intervention being part of a research study. Participants described a number of

environmental barriers related to study demands, the primary one being the timing of the

intervention being released. That is, due to efforts to secure approval from research ethics

boards, gain consent from all parties (i.e., school psychologists, teachers, parents, and

students), increase sample size, and ensure all implementers completed the intervention at

the same time to reduce potential confounding factors, implementers were not provided

access to the *Teacher Help* program until March. The challenges related to this are

described by one of the participating teachers:

> Well, the biggest [barrier] was when we started …] I got the enrolment at the end
>
> of the week of March Break and then the first session opened our first day back to
>
> school after March Break which was also the week that our report cards were due
>
> at the end […] to start something new it was really tough […] we were kind of
>
> into April before it felt like we had enough to work with.

Another participating teacher described a similar experience:

The end of the year is very busy, lots of stuff, so trying to fit everything in was

difficult. […] I almost just finished, I didn't really have time to implement and

then see how it worked. I didn't really get to see the strategy I tried or want to try, I tried it for a week or so, a couple weeks. But […] it was really sporadic and difficult [because of end of year events].

This sentiment of not feeling there was enough time to see benefits of the intervention and not having enough time to try different strategies if one strategy did not work well was also echoed by other participants (e.g., "so we tried it for a little while, and then had to regroup and make a change, so then we lost a couple more weeks"; participating teacher). Participants also referenced barriers related to collecting data in a timely manner (i.e., "because so many different people had to complete surveys before the next step was taken […] it made it difficult to then participate because by the time the last person finished it was so far into the year"; non-participating support staff) and not having a way to make up for lost time due to factors such as sick days, suspensions, and students travelling with sports teams (e.g., "there was no consideration for sick days or students on out-of-school suspension […] so, that plays into being able to complete it in a specific amount of time"; participating teacher).

Professional Role and Identity

Barriers in this domain are factors related to one's identity in the work setting that impedes participation. These may be personal, such as one's identity, commitment to their organization or professional responsibilities, or how they interact with others professionally (e.g., professional boundaries and leadership; Atkins et al., 2017). *Professional role and identity*, the second most endorsed barrier, was notably less common than *environmental context and resources* (34% versus 97%). This domain was

mainly endorsed by those who did not participate in the *Teacher Help* program (63% versus 24% of implementers) and support staff (60% versus 7% of teachers).

Specifically, participants tended to reference their job demands impeding their participation (e.g., "it was more place-related demands that made it difficult to prioritize the time to go through the program"; participating support staff) or that others' job demands were a barrier to their collaborative effort (e.g., "in terms of feeling like getting my support team up and running in terms of having all their data and input as well, that took longer"; participating teacher). Some participants felt that this could be addressed by mandating participation at a school, board, or district level as *Teacher Help* would then be considered as a standard part of their roles and included in their planning (e.g., "if it was encompassed in a district project, then I think it would be easier to just get the ball rolling and recruit people and then have avid participation"; participating support staff). Participants also noted that it can be challenging for school psychologists to make time for students who are not on their caseloads and, as discussed within the environmental factors, others referenced that teachers had negative feelings about their identities due larger systemic issues. Regarding school psychologists' caseloads, one participant noted:

> And there's a problem associated with that too because these kids haven't gone through the referral process from the school team and if they aren't one of the priorities in the school, it becomes tough for the psychologist to do services that are required. We are only supposed to do the services that are on our priority list, that have been approved by the school team (non-participating support staff).

Beliefs about Consequences

Beliefs about outcomes that impede participation are considered to be related to the *beliefs about consequences* domain. These may include factors such as not accepting the truth about likely outcomes or not recognizing the reliability or validity of expected outcomes (Atkins et al., 2017). Twenty-nine percent of participants endorsed barriers related to *beliefs about consequences* which were similarly endorsed across all groups (i.e., implementers versus non-implementers and teachers versus support staff).

One of the main barriers that participants reported was a belief that teachers did not recognize how the intervention would help in the long run and were not willing to invest time. For instance, a non-participating support staff noted, "any additional work for teachers […] would be considered, perhaps, burdensome if they didn't understand how helpful this could be for them". Several of the support staff commented on this, often noting that they felt even when they tried to help teachers recognize how helpful it would be the message was not heard (e.g., "they were looking at it like, okay, how can this benefit me, but they wouldn't see the benefit to them – they wouldn't see that"; non-participating support staff).

Study-Related Factors. The other primary barrier in the *beliefs about consequences* domain was considered a study factor. That is, individuals felt that they or others had insufficient time to benefit from the outcomes of the intervention. For example:

So, even though they were interested they felt like, oh, well, I'm not going to have

these students in a couple weeks, so it's not really going to be applicable and I

don't know who will be in my class next semester (participating school staff).

Similarly, a participating teacher noted that, because they "couldn't really see the effect

or modify or change it was difficult" and that they "couldn't really comment on how well

it went" due to only completing it as the very end of the school year.

Reinforcement

The *reinforcement* domain refers to conditions that increase the likelihood of a

behaviour through a dependent or contingent relationship (Atkins et al., 2017). In the

current study, references to potentially reinforcing factors that were reportedly lacking

were considered to be barriers. Although implementers and non-implementers endorsed

barriers related to lack of *reinforcement* similarly, support staff were notably more likely

than teachers to endorse this domain (40% versus 14%).

One of the primary barriers reported was that those participating in the *Teacher*

Help program were not granted professional development time (e.g., "so, yeah, I

think…if there can be relief time then that would be great or if it came with like a

[professional development] day sort of thing; participating teacher). Participants often

reported a need for the school board or district to reinforce participation in order to have

significant uptake or that introducing *Teacher Help* when teachers were setting their goals

for the year (e.g., creating professional growth plans) would be reinforcing. For example,

one non-participating support staff believed that if they "were able to get involved at an

earlier stage" and "make it part of vision of education or professional development for staff" it would have facilitated their experience.

Knowledge

Just as having knowledge can facilitate participation, a lack of knowledge or understanding of how something works can impede participation and would fall in the *knowledge* domain (Atkins et al., 2017). Barriers to the *knowledge* domain were primarily endorsed by support staff (33% versus 14% of teachers) and by those who had not participated in the *Teacher Help* program (50% versus 14% of implementers).

Several participants endorsing knowledge as a barrier had a belief that teachers were not well-informed about the importance of using evidence-based interventions and / or that teachers did not understand how *Teacher Help* would help them. For example, a non-participating support staff commented that "they're not as aware of the impact that strategies taken on in the classroom can assist children with ADHD" and noted that they felt that "there's an awareness piece". Another theme that emerged was that teachers experience information overload in general in their educator role, and as such it can be challenging for them to know where to dedicate their time and effort.

> So, sometimes I found it challenging because they also don't want a lot of information, they don't want to read a lot of text. They don't want to necessarily have any additional work because within the board that I work in, there's so much paperwork anyway (non-participating support staff).

This precarious balance of providing teachers adequate information for understanding but not overwhelming them is illustrated by the following comment where a participating

teacher felt that an overview of the entire intervention would have helped them despite this information being available in several locations including the consent form and the program's website. They said:

> Maybe this was there and I didn't…I didn't pick it up on it, but just to have more of a description of what you would need to do…to be able to look at the overview…I think we had sort of broad themes but…sort of what you're responsible for each day, like, week 1 you'll gather data, week 2 you'll do this…and how many class hours you need to accomplish that (participating teacher).

Overlapping Commonly Endorsed Domains

Figure 4.1 shows a Venn diagram of the most commonly endorsed domains for both facilitators and barriers to participating in *Teacher Help.* The *environmental context and resources*, *beliefs about consequences*, and *knowledge* domains appear to play very important roles in participating in *Teacher Help*. Additionally, *environmental context and resources* emerged as the single most commonly endorsed domain for both barriers and facilitators, suggesting that the environmental context and the available resources are extremely important for the uptake of the *Teacher Help* program.

Other Domains of Interest: Role of Cognitive, Emotional, and Behavioural Regulation

All responses and comments to the initial three questions (i.e., the focus of the current study) were coded into at least one domain and the facilitators and barriers that were coded to other domains (i.e., not described here) had similar themes to those

described above. However, one interesting theme that emerged was from a small sub-set of participants who spoke to challenges with their own cognitive, behavioural, and / or emotional regulation (i.e., the *memory, attention, and decision processes*, *behavioural regulation*, and *emotion* domains, respectively). For instance, one participating teacher explained that "trying to be an effective observer and teach a class at the same time was challenging" and that they "would try to go back later and put down how many times there were" but "that was difficult" thus expressing challenges with attention and memory processes. Similarly, some participants noted a need for more support in planning and implementing, essentially recognizing a need for help in managing and changing their behaviours. For example:

> Sometimes I think that if you had a specified time where you might go online live to do some of this stuff it almost makes you commit to a time. Because often you're like, "oh, God, I [must] do *Teacher Help*," but if you have a specific time and you sort of plan a time when it goes live to see it you might be more likely to see it sort of like a course (participating teacher).

These barriers related to cognitive processes and behaviour monitoring and modification that teachers described may be tied to emotions, specifically, as several supporting staff noted, feeling fatigued and overwhelmed. Participants believed that "people are just generally fatigued and overwhelmed" (participating support staff) and that there was a feeling of not having "the energy" (non-participating support staff). Some participants also noted that starting earlier in the year when people are "fresh and forward looking" (participating support staff) would be better.

The Role of Guilt

Feeling guilty, coded in the *emotion* domain, emerged as both a facilitating and impeding factor with different participants. For instance, a participating support staff reported that "guilt" had been "a big motivator" because they felt the need to honour their commitment, while a participating teacher reported that they had "fallen behind" and when they received reminder e-mails it just made them feel "guilty" and they "just couldn't get back on track" with this negative emotional state. It would seem that guilt motivated the former but not the latter, or at least not enough to overcome other barriers. It is worth noting as well that e-mail reminders emerged as being a facilitator for most participants who mentioned them. No other obvious contradictions emerged.

Discussion

In the current study, we sought to better understand the barriers and facilitators experienced in participating in an effectiveness trial of *Teacher Help* in Canadian schools. The findings are similar to those of past research examining barriers and facilitators to implementing evidence-based interventions in schools. While no extant literature specifically focused on implementing an online intervention targeting students with NDDs was identified, the current findings are discussed in the context of other school-based implementation research examining evidence-based interventions.

Trends in Barriers and Facilitators to Implementing Interventions in Schools

Environmental context and resources emerged as the most significant domain in terms of barriers and facilitators. Inadequate time in the school day to deliver interventions, including time to meet with school teams, is a common theme in school-

based implementation research (e.g., Bambara et al., 2012; Forman et al., 2009; Koegel et al., 2012; Langley et al., 2010; McGoey et al., 2014; Weatherson et al., 2017). Another relatively common environmental factor is having support from other school staff and administration when implementing evidence-based interventions. In general, this has been previously identified by teachers (Bambara et al., 2012; McGoey et al., 2014; Weatherson et al., 2017), school directors and mental health clinicians (Langley et al., 2010) and intervention developers (Forman et al., 2009). The developers in Forman et al.'s (2009) study reported that working with schools to integrate interventions into the school curriculum and / or to plan implementation is helpful. The need for support from staff was also identified by Koegel et al. (2012) when specifically examining the implementation of interventions for students with ASD. The *Teacher Help* program itself was largely identified as a facilitating factor. Previous research (e.g., Bambara et al., 2012; McGoey et al., 2014; Weatherson et al., 2017) has noted the importance of having good training materials and resources as a facilitating factor in implementing interventions.

Unique to the current study were barriers related to a reportedly negative climate in schools and among teaching staff. It is worth noting that in the years just before and after the effectiveness study, multiple Canadian provinces were undergoing negotiations for teachers' contracts leading to planned and actual strikes. Yet, while support staff reported this barrier, generally identifying teachers as the ones who were experiencing negative feelings about their jobs and work environment, teachers did not. This is likely explained by a few factors, one of which being that teachers may not have felt that it was safe or appropriate to disclose this. It is also likely that if teachers were feeling the way some support staff suggested, they likely did not participate in *Teacher Help* and, as such,

are not accurately represented by the teacher sample which included only one non-implementer.

In the current study, *beliefs about outcomes* emerged as a potential facilitator (i.e., if one had positive beliefs about outcomes) or barrier (i.e., if one was unaware of the potential positive outcomes). Denton et al. (2003), Bambara et al. (2012), and Weatherson et al. (2017) all noted that teachers' beliefs about the value of an intervention and whether they believed it would benefit them and their students is an important influencing intervention. Similarly, the knowledge domain emerged as both a facilitator and a barrier with support staff reporting a belief that a lack of knowledge about the importance of evidence-based interventions and about what the *Teacher Help* program included impeded teacher participation. This is surprising given that the program was comprehensively described in the recruitment materials, consent forms, and elsewhere. It is possible that this reflected the information overload that support staff reported teachers experience. Denton et al. (2003) and Koegel et al. (2012) identified a lack of knowledge about the importance of evidence-based interventions as barrier to implementation as well. Moreover, Small (2003) and Weatherson et al. (2017) identified a lack of knowledge about interventions and what they entail could impede participation.

The *social influences* and *intentions* domains emerged as facilitating domains. Social support is viewed as an important facilitator not only in the current study, but also in past research into school-based implementation research (e.g., Bambara et al., 2012; Forman et al., 2009; Koegel et al., 2012; Langley et al., 2010; McGoey et al., 2014). Aside from the Weatherson et al. (2017) study, participants' intentions were not a factor that appears to have been identified in past school-based implementation research.

Forman et al. (2009), Langley et al. (2010), and Weatherson et al. (2017) each identified competing job demands (i.e., *professional role and identity*) as a common barrier to implementation. As with intentions, specific barriers about reinforcement were identified by Weatherson et al. (2017) but not in other reviewed studies. As both the current study and Weatherson et al. (2017) used TDF to analyze and code data, these nuanced topics such as intentions and reinforcement may have emerged more distinctly than they would using other methodologies. However, these are certainly valuable domains to consider as they are important to behaviour change and may indicate factors that are not always considered when studying school-based implementation. Reinforcement, in particular, may be an area that requires more attention as in both the current study and Weatherson et al.'s (2017) study it was identified as primarily a barrier due to a lack of reinforcement.

As with the factors related to the *intentions* and *reinforcement* domains, specific factors related to cognitive processes, emotions, and behavioural regulation were not common in extant literature with the exception of Weatherson et al. (2017). As with the current study, these domains were not frequently endorsed by the teachers in Weatherson et al.'s (2017) study but likely represent important factors related to implementation and behaviour change that are often overlooked. In both studies, a small subset of participants noted that having reminders or making the intervention a part of the routine was an important way to help to regulate their own behaviour.

Group Differences

As in past TDF research (e.g., McSherry et al., 2012; Weatherson et al., 2017), we also considered whether members of different groups (e.g., teachers versus support staff; those who implemented *Teacher Help* versus those who did not) identified different

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barriers and facilitators. Participants who did not implement in *Teacher Help* were more likely to identify barriers related to *knowledge* and *professional role and identity*. Meanwhile, those who had participated were more likely to discuss facilitators related to *intentions*, *environmental context and resources,* and *social influences*. Some of these observed differences may suggest factors that can predict whether one might participate in a program like *Teacher Help* (e.g., having supportive school staff) while other differences are likely impacted by their actual experience or lack thereof (e.g., seeing the program as valuable). Other factors, such an intention, are more challenging to disentangle as it may be that having strong intention increases the likelihood of participation, but it is also possible that hindsight bias influenced how participants spoke about their initial intentions.

Differences were also observed between responses of teachers and support staff. Like those who did not complete the *Teacher Help* program, support staff were more likely to identify barriers related to *knowledge, reinforcement,* and *professional role and identity*. Support staff endorsed more facilitators related to the *social influences* domain. What is interesting about these findings is that many of the endorsements more frequently made by support staff were assumptions about teachers (e.g., teachers not understanding importance of evidence-based interventions, teachers feeling negatively about their roles, a need to include *Teacher Help* in teachers' growth plans / goal setting; teachers lacking intention or their intention faltering). It is difficult to know whether these were truly barriers that teachers were less likely to recognize or verbalize or whether support staff tended to misinterpret teachers' thoughts and behaviours.

Implications

Given that Canadian teachers report a lack of knowledge about evidence-based interventions for the students with disabilities in their classrooms (Fontil & Petrakos, 2015; Froese-Germain & Riel, 2012; Sokal & Katz, 2015) and that teachers are at increased risk of experiencing learned helplessness associated with feelings of inadequate teaching efficacy related to these students (Gotshall & Stefanou, 2011), it is important to understand the barriers and facilitators that teachers, and the supporting staff, experience with programs like *Teacher Help.* What is promising about the current findings is that some of the most common barriers were related to the logistics of awaiting approval from research ethics boards and ongoing recruitment efforts – a barrier that would not be present if *Teacher Help* were being used as a resource by schools without being a part of a research study.

Of course, this presents a quandary in regard to how to assess the effectiveness of the program, particularly in terms of student-based outcomes. Also due to these research-related challenges, we were unable to assess whether students' behaviour improved with the *Teacher Help* program. However, based on qualitative information from the effectiveness study, improvements were observed and the program itself was viewed positively overall. It is important to note that the *Teacher Help* modules are composed of evidence-based information and intervention strategies, having been developed by a team of researchers in the fields of NDD and education based on the extant literature and best clinical and educational practice. Several participants noted that they hoped the program would become available, that they had learned new strategies that were working well in their classrooms, and that they had saved many of the resources provided for future use.

A Future for *Teacher Help*?

Teacher Help has been generally well-received and believed to be a useful and valuable resource. One consideration mentioned by a participant was whether *Teacher Help* could be part of teacher education programs. This may also offer an opportunity to test the effectiveness of the program in the classroom setting if pre-service teachers were to work with their supervising teachers to implement the program while on practicum. Using this approach, some of the additional work (i.e., research requirements) that presented a challenge for many of our participants might be alleviated while also providing an invaluable experience for the student-teachers.

Similarly, another possibility is that *Teacher Help* could be developed to fit into a specialized certificate program like that suggested by McCrimmon (2015). That is, *Teacher Help* provides psychoeducation about the specific disorder (e.g., ASD, ADHD, LD), explains how the disorder impacts learning and classroom behaviour, provides teachers with recommendations, and guides them through implementing evidence-based behavioural intervention, all through an online platform. Perhaps, as suggested by many participants, this could be offered in the summer, allowing teachers to implement the intervention once they return to the classroom in the fall. If research ethics approval could be obtained prior to the beginning of the school year, this may also be a feasible option for testing the program's effectiveness.

As noted above, it would likely be helpful to address the barriers that were more frequently endorsed by those who had not participated and to try to augment the presence of identified facilitating factors for future implementers. Some of these factors are difficult to address and change (e.g., teachers' attitudes, individuals' intentions) but

several are more amendable. For instance, it would be prudent to ensure teachers are given clear, concise messages about the importance and usefulness of evidence-based practices and the potential benefits. For supporting staff, this might mean that in certain schools and boards / districts, teachers may be better supported by other staff (e.g., behavioural specialists) if these personnel are more frequently available or have more flexibility to see students who are not on their current caseload. Based on participants' responses, ensuring that administrators are supportive of their staffs' participation is also an important element. Some participants suggested that if administrators (as opposed to school psychologists) were to talk their staff, they may be more likely to take part than when it is presented by school psychologists.

Strengths and Limitations

Using the TDF to analyze participants' responses to open-ended questions about barriers and facilitators greatly assisted the analytic process as it provided the coders with a standardized set of domains known to be relevant in implementation science for the healthcare context in which it was developed (Atkins et al., 2017). We ultimately decided that responses to open-ended questions about barriers and facilitation would be most representative of the experience of our participants; but there are consequences to this approach. Specifically, Atkins et al. (2012) note that researchers may choose to design interviews that target each domain, which may result in uncovering important factors related to other domains that did not arise spontaneously (e.g., our interviews rarely spoke about factors related to the domains of *optimism*, *beliefs about capabilities*, or *goals*). However, while using responses from more directed questions was considered, it was ultimately deemed that this could lead to inadvertently giving too much weight to

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domains that were less important to the participants. For instance, in the longer interview, participants were asked whether they had had clear goals at the outset of their participation and while many reported that they did not, they also tended to think that this had not hindered their participation. So, while this question was asked based on knowledge about the importance of goal setting, we felt that reporting this as a barrier would misrepresent the participants' interpretation of their experience.

Another complicating factor in the current study was that some factors did not neatly fit into a single domain. For instance, facilitating factors related to social support were coded in both the *environmental context and resources* domain and the *social influences* domain (i.e., having a supportive staff). This challenge has been previously noted by other researchers using the TDF (Weatherson et al., 2017) and Atkins et al. (2012) acknowledge this challenge and encourage researchers to code barriers and facilitators under multiple domains when it seems appropriate.

In terms of recruitment, this study may have been strengthened by interviewing potential teachers and support staff who did not express interest in participation at all. That is, while we gained perspective from support staff who wanted to participate but were unable to recruit teachers, we did not interview teachers or support staff who declined to participate entirely. While this would have provided interesting data, it would not be possible from an ethical standpoint given they did not consent to participating. It is also worth noting that examining differences between implementers and non-implementers based on post-study interviews must be interpreted with caution as their responses may be influenced by their participation status. For instance, those who did not participate are potentially more likely to reflect on reasons why participation was

hampered and may be less likely to recognize the potential facilitating factors that were present.

Summary

The current study found that, consistent with past research into school-based implementation of evidence-based interventions (e.g., Bambara et al., 2012; Denton et al., 2003; Forman et al., 2009; Koegel et al., 2012; Langley et al., 2010; McGoey et al., 2014; Small, 2003; Weatherson et al., 2017), the most prominent barriers to implementation were related to the domains of *environmental context and resources*, *professional role and identity*, *beliefs about consequences*, *reinforcement*, and *knowledge*. Also consistent with past research (e.g., Forman et al., 2009; Langley et al., 2010; Weatherson et al., 2017), facilitating factors in the domains of *environmental context and resources*, *social influences, beliefs about consequences*, *knowledge*, and *skills* were noted. Some of the most problematic factors identified in the *environmental context and resources* domain were related to the logistics of research, as opposed to implementing the *Teacher Help* program itself. Participants provided a significant number of both experienced and suggested facilitators (i.e., suggestions about what they believed would have facilitated participation) to help mitigate the barriers described. This is promising in terms of the potential for *Teacher Help* to be a valuable resource for Canadian schools but presents challenges for how to test the effectiveness of the program.

Table 4.1. *Role Descriptions and Demographic Details for Participants*

	School liaisons (*n* = 2)	Support staff (*n* = 13)	Teachers (*n* = 14)
Role description and expectations	In some school boards, liaisons worked with the research team to get school psychologists involved. In most school boards the research team worked directly with school psychologists.	School psychologists were the targeted supports for participating classroom teachers. However, in some schools, this role was taken on by other supporting staff. The current sample included 11 school psychologists and 2 other supporting staff (i.e., a behavioural specialist and a consulting psychologist).	Classroom teachers were the targeted implementers for the *Teacher Help* program. However, in some schools, other teaching staff were recruited. The current sample included 11 classroom teachers and 3 specialized teachers (i.e., special education or integration support).
Sex	NR*	Female (12) Male (1)	Female (13) Male (1)
Age	NR*	38 - 64 years** *M* = 47.0 years**	25 – 52 years *M* = 41.8 years
	School liaisons (*n* = 2)	Support staff (*n* = 13)	Teachers (*n* = 14)
Highest education	NR*	Master's (11) Ph.D. (2)	Master's (3) B.Ed. (9) Ed.D. (2)
Years of experience	NR*	3 – 30 years *M* = 14.7 years	2 – 23 years *M* = 14.4 years
Province	Ontario (1) Nova Scotia (1)	Alberta (1) British Colombia (1) Ontario (3) Nova Scotia (8)	Alberta (1) British Columbia (4) Nova Scotia (4) Saskatchewan (3) Ontario (2)

Note. NR* = As only one school liaison responded to the demographic questions, the data for the other participant is not reported to protect anonymity; ** = missing data from a single participant who did not provide age; Ph.D. = Doctor of Philosophy; B.Ed. = Bachelor's of Education; Ed.D. = Doctor of Education.

Table 4.2. *Overview of Most Commonly Endorsed Facilitators to Implementing Teacher Help*

TDF Domain	Implementer (*N*=21)	Non-Implementer (*N*=8)	Teacher (*N*=14)	Support Staff (*N*=15)	TOTAL (*N*=29)
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Environmental context/resources	18 (86%)	3 (38%)	10 (71%)	11 (73%)	21 (72%)
Social influences	12 (57%)	3 (38%)	5 (36%)	10 (67%)	15 (52%)
Beliefs about consequences	8 (38%)	3 (38%)	5 (36%)	6 (40%)	11 (38%)
Knowledge	8 (38%)	2 (25%)	5 (36%)	5 (33%)	10 (34%)
Intentions	8 (38%)	1 (13%)	5 (36%)	4 (27%)	9 (31%)

Note. Each participant is counted in three columns (i.e., either participant or non-participant, either teacher or support staff, and total); "non-implementer" describes an participant who did not participate in the *Teacher Help* effectiveness study; TDF = theoretical domains framework; % = percent of group in column endorsing; *n* = number of endorsing participants in group.

Table 4.3. *Overview of Most Commonly Endorsed Barriers in Implementing Teacher Help*

TDF Domain	Participant (*N*=21) *n* (%)	Non-Participant (*N*=8) *n* (%)	Teacher (*N*=14) *n* (%)	Support Staff (*N*=15) *n* (%)	TOTAL (*N*=29) *n* (%)
Environmental context/resources	20 (95%)	8 (100%)	13 (93%)	15 (100%)	29 (97%)
Professional role/identity	5 (24%)	5 (63%)	1 (7%)	9 (60%)	10 (34%)
Beliefs about consequences	6 (29%)	3 (38%)	4 (29%)	5 (33%)	9 (31%)
Reinforcement	5 (24%)	3 (38%)	2 (14%)	6 (40%)	8 (28%)
Knowledge	3 (14%)	4 (50%)	2 (14%)	5 (33%)	7 (24%)

Note. Each participant is counted in three columns (i.e., either participant or non-participant, either teacher or support staff, and total); "non-implementer" describes an participant who did not participate in the *Teacher Help* effectiveness study; TDF = theoretical domains framework; % = percent of group in column endorsing; *n* = number of endorsing participants in group.

Table 4.4. *Overview of Emergent Sub-Themes in Five Most Common Domains for Facilitators and Types of Participants Endorsing the Theme*

TDF Domain & Sub-Themes	I	N	T	S	Tot %
1) Environmental context/resources					
Teacher Help is a good resource (e.g., good information; hands-on learning positive experience)	x	x	x	x	24%
Teacher Help is a user-friendly (e.g., well laid out; easy to navigate)	x		x	x	21%
Teacher Help is convenient (i.e., can access anywhere)	x		x	x	14%
Having a flexible schedule / planning time in schedule	x		x	x	14%
Online format facilitates distributing materials / recruiting implementers*	x	x		x	14%
Supportive school team	x	x	x	x	10%
Familiarity with students and other staff	x		x	x	10%
Supportive administration / board / supervisors, etc.	x			x	7%
Student eager to participate	x		x		7%
Student's parents supportive	x		x		7%
Receiving Teacher Help reminders*	x			x	7%
Having a classroom environment conducive to participating (e.g., low needs)	x		x		7%
Teacher Help study was well-organized and well-presented*	x			x	7%
2) Social influences					
Good relationship with target student and / or teacher	x		x	x	14%
Support from *Teacher Help* team*	x	x	x	x	14%
Supportive school team	x	x	x	x	10%
Supportive administration / board / supervisors, etc.	x			x	7%

TDF Domain & Sub-Themes	I	N	T	S	Tot %
3) Beliefs about consequences					
Belief that *Teacher Help* could have broad positive outcomes	x	x	x	x	24%
Belief that *Teacher Help* could help a specific student and / or teacher	x		x	x	10%
Belief that *Teacher Help* could further one professionally		x	x	x	7%
4) Knowledge					
Teacher Help as a way to increase knowledge about NDDs and EBIs	x	x	x	x	21%
Teacher Help as a positive learning experience (e.g., online format conducive to learning)	x		x	x	7%
Knowing which student-teacher pair to target (e.g., knowing a student had a recent diagnosis)	x			x	7%
5) Intentions					
Having internal motivation, intrigue, or interest	x		x	x	17%
Intention was strong at the outset	x	x	x	x	10%

Note. Marks (i.e., "x") indicate that at least one member of the group identified in the column endorsed the sub-theme; TDF = theoretical domains framework; I = implementer; N = non-implementer; T = teacher; S = support staff; % = percent of group in column endorsing; * = sub-theme related to study factors as opposed to intervention itself; NDD = neurodevelopment disorder.

Table 4.5. *Overview of Emergent Sub-Themes in Five Most Common Domains for Barriers and Types of Participants Endorsing the Theme*

TDF Domain & Sub-Themes	I	N	T	S	Tot %
1) Environmental context/resources					
School day is busy and challenging to find time	x	x	x	x	76%
Timing of study implementation (i.e., too late in year); need for access in summer / September*	x	x	x	x	72%
Challenges related to others being unresponsive / not following up	x	x	x	x	28%
Felt that more time was needed for *Teacher Help* than was allowed (e.g., needing more time per session to read and implement)*	x	x	x	x	24%
School psychologists not accessible enough (e.g., not present face-to-face frequently)	x	x	x	x	24%
Challenges related to secondary school format (e.g., only seeing student a few days a week for part of day)	x		x	x	17%
Other study factors (e.g., needing to wait for others to complete measures to move forward)*	x	x	x	x	17%
School climate / Staff attitudes negative	x	x		x	14%
Classroom environment not conducive to participation (e.g., high needs class	x	x	x	x	10%
Challenges related to absenteeism, illness, storm days, suspensions, etc. as could not make up for them with timelines*	x		x		10%
Challenges to meet with team as suggested in *Teacher Help*	x			x	10%
Not having planning time / flexibility in schedule	x	x	x	x	10%
A need for getting buy-in from administration, board / district, supervisors, etc.	x		x	x	10%
A need for protected professional development time	x		x	x	10%
Challenges in allocating time to target students over students with more immediate needs	x	x		x	10%
Unexpected changes (e.g., teaching reassignment)	x		x		7%

TDF Domain & Sub-Themes	I	N	T	S	Tot %
2) Professional role and identity					
Job demands and / or job-related challenges	x	x	x	x	14%
Belief that teachers are feeling negatively about their role identity	x	x		x	10%
Challenging for school psychologists to spend time on students who are not on their caseload		x		x	7%
Belief that need to make participation an expectation	x			x	7%
3) Beliefs about consequences					
Belief that teachers are failing to recognize how *Teacher Help* can help them	x	x		x	14%
Belief there was not enough time (i.e., left in school year) to benefit from the intervention*	x		x	x	14%
4) Reinforcement					
Need for more collaboration and / or reinforcement from school board / district, administration, and / or unions	x	x	x	x	14%
Need to include *Teacher Help* in professional development planning / professional growth plans	x	x		x	14%
Need for protected professional development time	x	x	x	x	10%
5) Knowledge					
Did not have a clear understanding of what *Teacher Help* involved	x	x	x	x	10%
Belief that teachers do not understand the importance of EBI		x		x	7%
Belief that teachers experience information overload due to receiving a lot of recommendations and information from various sources	x	x		x	7%

Note. Marks (i.e., "x") indicate that at least one member of the group identified in the column endorsed the sub-theme; TDF = theoretical domains framework; I = implementer; N = non-implementer; T = teacher; S = support staff; % = percent of group in column endorsing; * = sub-theme related to study factors as opposed to intervention itself; NDD = neurodevelopmental disorder; EBI = evidence-based intervention.

Figure 4.1. *Venn Diagram of the Most Commonly Endorsed Domains for Facilitators and Barriers for Participation in Teacher Help*
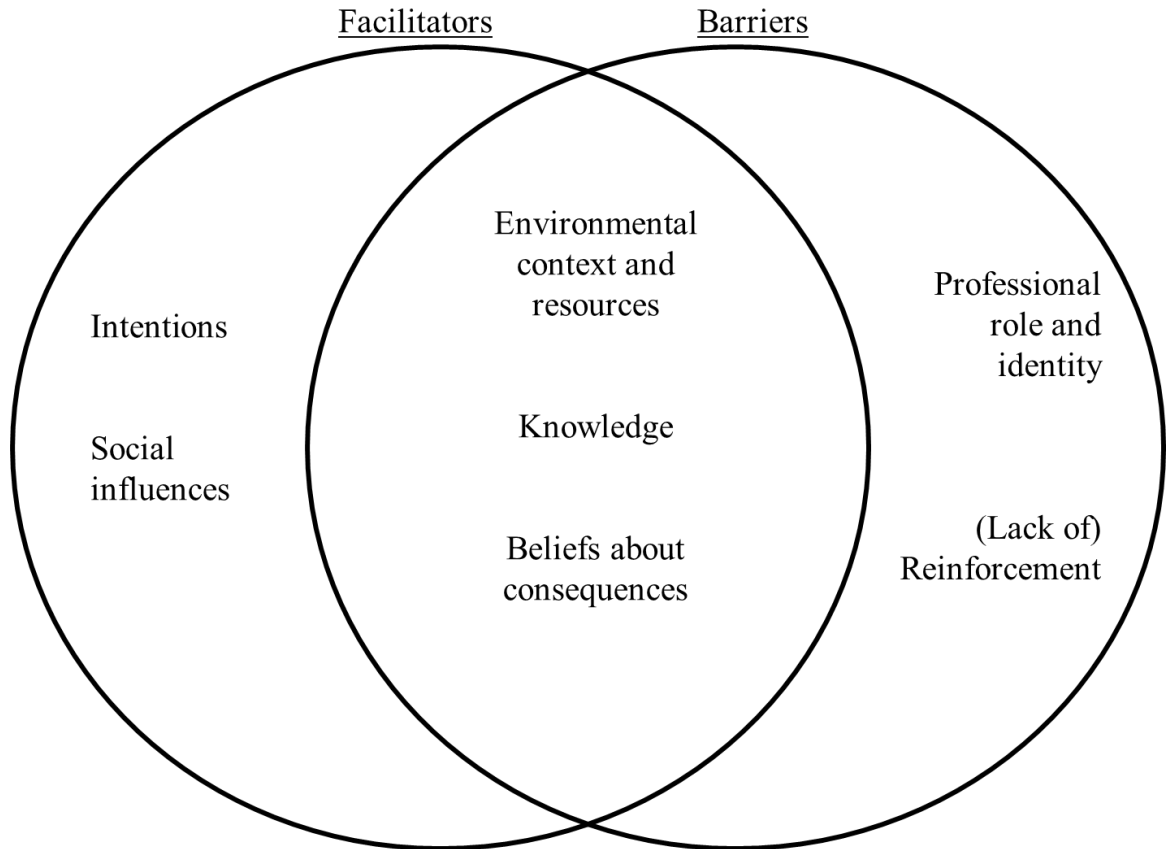
Appendix 4.1: Exit Interview - Script for a Semi-Structured Interview

Nicole Ali (PhD student) or Laura Keeler (Project Coordinator) will conduct the exit interview by phone. The interview will be transcribed and coded qualitatively for key themes.

Thank you for your interest in completing this interview about your impressions of the barriers and facilitators to implementing the *Teacher Help* program. As you know, your feedback in this study is directly contributing to how we develop and modify *Teacher Help*. This interview will be used as part of (my/Nicole Ali's) PhD dissertation project to inform the further development of the *Teacher Help* program.

Please be aware that your participation in this interview is voluntary and that you can discontinue your participation at any time. Any data that is collected through the interview process will be confidentially stored, just as your data from the *Teacher Help* study was. This interview is being recorded and will be transcribed, analyzed, and major themes will be reported. Deidentified, direct quotes may be included in a published manuscript.

Before we begin, do you have any questions?

General Questions:

I am going to start by asking some general questions about your experience and then follow up with some specific questions that will help us to understand the barriers and facilitators to participating in the *Teacher Help* program.

	Liaisons	Psychologists	Teachers
General Questions			
#1	1. Can you think of any barriers you experienced that impeded your ability to participate in the *Teacher Help* program? Prompt: In terms of recruiting school psychologists, were there any barriers that you believe impeded their abilities to participate, whether or not they	1. Can you think of any barriers you experienced that impeded your ability to participate in the *Teacher Help* program? Prompt: In terms of recruiting teachers, were there any barriers that you believe impeded their abilities to participate, whether or not they ultimately participated? Prompt: Were there any barriers in	1. Can you think of any barriers you experienced that impeded your ability to participate in the *Teacher Help* program?

	ultimately participated? Prompt: Were there any barriers in disseminating *Teacher Help* study materials to school psychologists and teachers?	disseminating *Teacher Help* study materials to teachers?	
#2	2. As needed (repeat as necessary for each barrier): What, if anything, do you believe could have helped you overcome the barrier of (insert barrier they provided)?		
#3	3. Can you think of anything that facilitated your experience to participate in the *Teacher Help* program? Prompt: In terms of recruiting school psychologists, was there anything you believe facilitated their ability to participate, whether or not they ultimately participated? Prompt: Was there anything you believe facilitated distribution of *Teacher Help* study materials to school psychologists and teachers?	3. Can you think of anything that facilitated your ability to participate in the *Teacher Help* program? Prompt: In terms of recruiting teachers, was there anything you believe facilitated their ability to participate, whether or not they ultimately participated? Prompt: Was there anything you believe facilitated distribution of *Teacher Help* study materials to teachers?	3. Can you think of anything that facilitated your ability to participate in the *Teacher Help* program?
Domain 1: Knowledge	4. Do you feel that you had a clear understanding of what the *Teacher Help* program was when you were asked to participate? 5. How did the knowledge you had about the *Teacher Help* program impact your decision to participate? 6. What additional information would have been useful for you when making your decision about the program?		

Domain 2: Skills	7. How easy/difficulty was it for you to participate in *Teacher Help?* Prompt: Do you feel you had the skills required to recruit schools and school psychologists to participate in and implement *Teacher Help*? Prompt: What do you think would help you improve these skills?	7. How easy/difficulty was it for you to participate in *Teacher Help*? Prompt: Do you feel you had the skills required to support classroom teachers in implementing *Teacher Help*? Prompt: What do you think would help you improve these skills?	7. How easy/difficulty was it for you to participate in *Teacher Help*? Prompt: Do you feel you had the skills required to implement *Teacher Help*? Prompt: What do you think would help you improve these skills?
Domain 3: Social / Professional Role & Identity	8. Do you feel that, as a school liaison, the role you were asked to play in implementing the *Teacher Help* program is consistent with your professional responsibilities? Prompt: Why or why not? Prompt: Whose role do you think it is to implement *Teacher Help* in school settings?	8. Do you feel that, as a school psychologist, the role you were asked to play in implementing the *Teacher Help* program is consistent with your professional responsibilities? Prompt: Why or why not? Prompt: Whose role do you think it is to implement *Teacher Help* in school settings?	8. Do you feel that, as a teacher, the role you were asked to play in implementing the *Teacher Help* program is consistent with your professional responsibilities? Prompt: Why or why not? Prompt: Whose role do you think it is to implement *Teacher Help* in school settings?
Domain 4: Beliefs about Capabilities	9. Did you feel confident in your capabilities to fulfill the role you were asked to play in implementing *Teacher Help*? (If participants feel they need clarification … Some people may feel they have the skills required but would not be capable due to, for example, time constraints) As needed (repeat as necessary for each impediment): Do you have any suggestions for ways (insert impediment to their capability) could be addressed to improve your capability?		
Domain 5: Optimism	10. When you heard about *Teacher Help*, were you optimistic that the desired goals would be achieved with this program? Prompt: Why or why not? 11. How confident did you feel in your ability to participate in the *Teacher Help* program?		

Domain 6: Beliefs about Consequences	12. Do you believe that schools can benefit from programs like *Teacher Help*? Prompt: Why or why not? 13. What are the draw backs to no participating in programs like *Teacher Help*? Prompt: Why or why not?
Domain 7: Reinforcement	14. What are the benefits of *Teacher Help*? Prompt: What motivated you to participate in *Teacher Help*? Prompt: Did you receive any type of reinforcement that you can think of for your role in *Teacher Help*? (If asked, can say …For example, some people may have received professional development time or special recognition at a staff meeting) 15. Are there specific reinforcements you can think of that you believe would have further encouraged you to participate in the *Teacher Help* module?
Domain 8: Intentions	16. When you first learned about *Teacher Help*, how strong was your intention to see the program through? (as needed, if intention not strong): Can you think of anything that would have improved your intention to see the program through?
Domain 9: Goals	17. At the outset of your involvement with *Teacher Help*, did you have a clear vision of your goals for the program? Prompt: What did you want to accomplish in participating in the *Teacher Help* study? (as needed if no goals/unclear goals): Do you think having clear goals would have benefitted you? What would you need to set goals more clearly?
Domain 10: Memory, Attention, Decision Making Processes	18. Are there any things that were happening in your role that made it hard to focus on *Teacher Help?* 19. At any time did you find it difficult to make decisions around the implementation of the program?
Domain 11: Environmental Context & Resources	20. What factors in your environment influenced your ability to participate in *Teacher Help*? Prompt: Do you feel that you have sufficient support for your role in implementing *Teacher Help?* (as needed, if "yes"): Where did this support come from? Prompt: Are there ways you believe you could be better supported? 21. Would you consider *Teacher Help* as a long-term/sustainable resource for classroom teachers?
Domain 12: Social Influences	22. Did your colleagues' opinions about participating in the *Teacher Help* program influence your opinions either negatively or positively?

	(as needed, if "yes"): Without providing names, what positions were held by these colleagues? 23. Did your colleagues' opinions about other behaviour management strategies and recommendations influence your decision to participate in *Teacher Help*? (as needed, if "yes"): Without providing names, what positions were held by these colleagues?
Domain 13: Emotion	24. Do you feel your emotional state/personal struggles ever made it difficult to carry out your role in the *Teacher Help* program?
Domain 14: Behavioural Regulation	25. Do you think additional learning/education regarding evidence-based research is needed for teachers and school psychologists to benefit from *Teacher Help*? 26. Would hearing from those (teachers, school psychologists) who have already participated in the *Teacher Help* program be beneficial to program uptake?
Wrap-Up	27. At this point, are there any other barriers or facilitators to participating in *Teacher Help* that we have not discussed that you would like to add? 28. If we were to do another iteration of *Teacher Help,* what would you like to see? Prompt: what other modules would you like to see besides ADHD, ASD & LD? 29. Do you have any ideas about how we could engage more schools, school psychologists, and teachers? 30. Do you have any final comments or questions?

Thank you for taking the time to participate in this interview! We appreciate your feedback, which will be invaluable in helping us develop *Teacher Help*. Please contact me by email at teacherhelp.admin@dal.ca if you have any questions.

CHAPTER 5: DISCUSSION

In this chapter, I first contextualize and review the goals of the current dissertation. After this, I summarize and briefly discuss the findings related to each research question. In the next section, I comment on the current use of evidence-based interventions in the inclusive classroom with special attention to the Canadian perspective and the potential for *Teacher Help* to meet the needs of educators. I also discuss clinical implications related to this field of research. Finally, I will review the strengths, limitations, and future research directions related to this dissertation.

Summary of Dissertation Objective

Recommendations emerging in the early 1990s represented a shift toward the *inclusive* model of education where the focus moved towards providing education for each student based on their needs and fostering a community wherein each student is viewed as a valuable member of the inclusive classroom (Cologon, 2014; Emanuelsson, 1998; Sebba & Ainscow, 1996; Uditsky, 1993). Research suggests that teachers are inadequately trained in inclusive education (Chu et al., 2020; McCrimmon, 2015) and that they struggle with selecting interventions and may opt to implement interventions that are not evidence-based (Hess et al., 2008). Moreover, teachers face barriers in implementing classroom-based interventions, including a lack of knowledge, understanding, and resources (Chu et al., 2020; Lindsay et al., 2013). Given that children and youth spend a significant part of their days in school, this is considered the optimal setting for treating behavioural, emotional, and learning challenges (Kasari & Smith, 2013; Koegel et al., 2012; Ringeisen et al., 2003). Furthermore, educators generally support the concept of inclusion (Cologon, 2014; Lynch & Irvine, 2009; Sokal & Katz, 2015), despite the

aforementioned challenges; however, there is a tendency for teachers to minimize the important of inclusion when their training in this area is inadequate (Chu et al., 2020). It is evident that classroom teachers in Canada require more education about students with disabilities and evidence-based interventions (Chu et al., 2020; Fontil & Petrakos, 2015; Froese-Germain & Riel, 2012; McCrimmon, 2015; Sokal & Katz, 2015).

Teacher Help was developed over the past 14 years. *Teacher Help* is an online, professional development program designed to provide research-based information about students with NDDs and how these disorders present in the classroom setting to classroom teachers while guiding them in developing and implementing evidence-based intervention. I was involved in the development and evaluation of the ASD module over the past five years. Currently, *Teacher Help* includes modules for ASD, attention deficit / hyperactivity disorder (ADHD), and learning disabilities (LDs). The program consists of six sessions which guide classroom teachers through developing and implementing an individualized behavioural plan for their student with ASD. The purpose of this dissertation was to examine the potential for an online, behaviourally based intervention for classroom teachers to use with students with ASD in the inclusive classroom. We used a stepped approach, including a systematic literature review and usability testing of *Teacher Help for ASD,* followed by effectiveness testing, and, due to challenges in implementation during effectiveness testing, an examination of barriers and facilitators to implementing *Teacher Help*.

Research Question 1: Are there Effective Interventions for ASD that can be Implemented by Classroom Teachers in the Inclusive Classroom?

As part of the development of the *Teacher Help for ASD* module, I conducted a systematic literature review of the extant research on classroom-based, teacher-implemented interventions for students with ASD. While several reviews had examined the effectiveness of school-based interventions for students with ASD, I believe that the systematic review described in Chapter 2 is the first to focus on interventions that were implemented in the inclusive classroom setting by the classroom teacher. This is an important distinction given that when studies examine the implementation of intervention outside the regular classroom or with implementers aside from the classroom teacher, it is not possible to determine the feasibility of a classroom teacher in the inclusive classroom setting implementing the intervention.

Based on our interpretation of the study findings, 11 of these studies reported positive findings, one reported mixed findings (i.e., one participant did not have positive change for one of the target behaviours), and one found that the first tier of the intervention was ineffective, but positive outcomes were observed when the second tier was added. We calculated a quality rating for each study based on a modified version of Downs and Black (1998) quality assessment (i.e., excluding the final question which applies to statistical power which was deemed to be inappropriate given the single-subject design of all included studies). Ratings ranged from 14 to 18 out of a possible 27.

Currently, there appears to be a paucity of research focused on classroom-based, teacher-implemented intervention for high school students. Generally, these findings suggest that classroom-based, teacher-implemented behavioural intervention for students with ASD are feasible, at least for elementary and junior high students. However, with only 33 participants, there is a clear need for more classroom-based, teacher-implemented

research if general education teachers are to be expected to support students with ASD in the inclusive classroom setting. Furthermore, even when implemented by teachers, interventions in the existing literature tended to utilize in-person training, raising questions about whether teachers would be able to implement such interventions without this face-to-face training.

Research Question 2: Is an Online, Behavioural Intervention Implemented in the Inclusive Classroom Appropriate for Students with ASD and their Classroom Teachers?

To assess the usability of *Teacher Help for ASD*, classroom teachers, ASD support workers (e.g., psychologists, speech language pathologists), a parent of a child with ASD. and a young adult with ASD were granted access and asked to review program content, format, and features using Morville and Sullenger's (2010) User Experience Honeycomb. They were also asked to answer questions about specific components (e.g., videos, worksheets), the appearance, the comprehensiveness of the program content, readiness for use, and their willingness to recommend the program to classroom teachers. Finally, participants were provided with the opportunity to provide qualitative feedback on any of the above-mentioned items.

Participants who reviewed at least one session included 13 ASD support professionals, 5 classroom teachers, and 2 ASD advocates with lived experience (i.e., one parent of a child with ASD and one young adult with ASD). Quantitative analyses demonstrated consistently positive (i.e., "agree" to "strongly agree") ratings across all dimensions of the User Experience Honeycomb. Similarly, program components, appearance, readiness for use, comprehensiveness, and willingness to recommend were

all positively rated. We analyzed the qualitative results, and each recommendation was considered accounting for the number of participants who endorsed the recommendation as well as the importance and feasibility of the recommendation. Minor modifications (e.g., grammatical error, clarifications) were applied and more substantial modifications, where feasible, were applied if supported by at least 10% of the participants. The most frequently endorsed recommendations focused on features and appearance (i.e., text too dense on some pages, specific video too long, issues using the program on tablets) and were easily addressed.

In addition to the consistently positive responses across all sessions and questions, all participants who completed the review of the module reported that they would recommend the program to classroom teachers of students with ASD. Taken together with the positive reception of the program content, features, and appearance, the research team believed that *Teacher Help for ASD* was appropriate for classroom teachers of students with ASD. Thus, following the implementation of the feasible recommendations made by participants in the usability study, we determined that *Teacher Help for ASD* was ready for effectiveness testing.

Research Question 3: What are the Challenges to Implementing an Online, Behavioural Intervention in the Inclusive Classroom for Classroom Teachers?

Following an extensive recruitment effort to engage school boards, schools, school psychologists, and teachers across Canada, the *Teacher Help* team conducted an effectiveness study to assess the three modules, including *Teacher Help for ASD*. While recruitment targets for school boards and school psychologists were generally met (i.e., 15 school boards and 48 school psychologists engaged in the study), the participating

school psychologists were only successful in recruiting a total of 81 teachers despite original intentions of having approximately 500 classroom teachers participate in the study. As a result, we lacked the power to conduct quantitative analyses, but qualitative information and descriptive information were analyzed. These findings suggested that the majority of participants (i.e., 90%) reported learning from *Teacher Help* and three-quarters reported observed improvement in their students' academic performance and classroom behaviours. Additionally, teachers believed that the program was "an excellent source of information" and found *Teacher Help* to be meaningful and accessible. At the conclusion of the effectiveness study, we conducted semi-structured interviews with individuals who had participated in the effectiveness study as well as those who had intended to participate but did not. We analyzed the responses the Theoretical Domains Framework (Atkins et al., 2017) which is designed to analyze and guide behaviour change implementation efforts across 14 domains known to be relevant to behaviour change and implementation of evidence-based programs.

The most strongly endorsed barriers were those associated with the *environmental context and resources*, *professional role and identity*, *beliefs about consequences*, *reinforcement*, and *knowledge* domains with the environmental context and resources being the single most significant barrier with 28 of the 29 participants endorsing at least one challenge in this domain. The most strongly endorsed domains for facilitating factors were *environmental context and resources*, *social influences*, *beliefs about consequences*, *knowledge*, and *intention*. Again, the *environmental context and resources* domain emerged as the most relevant with many participants endorsing that *Teacher Help* itself

was a valuable and user-friendly resources and that the online format was a facilitating factor.

Implications for Implementation

Given the lack of research identifying easily accessible and feasible interventions for classroom teachers of students with ASD. *Teacher Help* was developed with these needs in mind and consists of evidence-based information and recommendations that are appropriate for classroom teachers. The results of the usability testing suggest that the intervention is user-friendly and feasible. Moreover, it was well received in both the usability study and the effectiveness study. However, the potential to assess the actual effectiveness of the intervention itself was impeded by the low recruitment of teachers into the planned RCT. The barriers and facilitators study highlighted common challenges faced by support staff and teachers and provided direction for future implementation.

Some of the difficulties that arose are related to the nature of conducting research (e.g., waiting for ethics approvals and recruitment of other participants, strict timelines, requirements to collect baseline and follow-up data) and are discussed below. Other common challenges that could potentially be addressed are to ensure that teachers are provided with clear messaging about the importance of selecting evidence-based interventions and that they understand how programs like *Teacher Help* can help them to be more effective inclusive educators. Additionally, given that the resource of time was one of the most commonly endorsed themes, future iterations of the *Teacher Help* program should take into consideration timing so that teachers may have access for longer periods of time, ideally beginning early in the school year when motivation is high. In examining barriers to implementing a physical activity program in schools, Weatherson et

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al. (2017) found that teachers often reported challenges related to time constraints. However, one teacher remarked that over time and with familiarity with their own schedule and demands, they were able to actually work the intervention into their own schedule (Weatherson et al., 2017). Another reason that providing teachers with access to *Teacher Help* as close to the beginning of the year as possible is that it typically takes about 25 teaching episodes (i.e., instances in which the teacher applies the strategy in the classroom setting with any student / students) for a new practice to become integrated and likely to be maintained (Denton et al., 2003). Thus, not only did teachers in our barriers and facilitators study identify not having access to the intervention early enough as a barrier, research supports the idea that early access may both facilitate one's ability to plan for time to implement the intervention and increase the likelihood of the new skills becoming crystalized.

Comments on Inclusive Education and Evidence-based Interventions

The Inclusive Classroom

The shift to inclusion is described in detail in Chapter 1. In brief, there have been challenges in reaching a coherent definition of inclusion (Uditsky, 1993), but there is now general consensus that inclusion means changing the classroom environment to suit the needs of each individual student in the classroom as opposed to expecting students with disabilities to assimilate (Cologon, 2014). Cologon (2014) notes that inclusion is not a privilege (i.e., permitting the student with disabilities to join the class as a courtesy or kindness) but a right afforded to every student, regardless of disability status. Nearly 30 years ago, Uditsky (1993) noted that unlike integration, which has a clear endpoint,

inclusion is a process wherein educators and educational institutions must continually adapt to suit the needs of their students.

The goals of inclusive education are both academic and social inclusion free from discrimination (Cologon, 2014). Research has demonstrated that inclusive classrooms are associated with better academic outcomes for students with disabilities compared to segregated classrooms, despite the fact that segregated classrooms contain more adults per student (Cologon, 2014). Furthermore, academic outcomes for peers without disabilities are as good or better in inclusive classrooms than when their peers with disabilities are excluded (Chu et al., 2020; Cologon, 2014). Students in inclusive classrooms also gain social and behavioural benefits including increased membership (i.e., being welcomed into the school community), friendships, independence, acceptance, responsiveness, patience, and trust (Cologon, 2014; Uditsky, 1993).

Teacher Education in Inclusion

To meet the mandate and achieve the benefits of inclusive education, teachers must be able to do their part to support the needs of all students in their classroom. As noted by Uditsky (1993), good teaching is good for all students. This means that it is not only the students in the classroom who must be well-supported, but also the teachers. Part of inclusion is ensuring teachers can collaborate and consult with their colleagues, are provided time for appropriate professional development, and that resources and supports are available to teachers (Uditsky, 1993). Yet, decades after inclusive education movements, Canadian teachers still face challenges.

One of the major challenges for teachers is that while standards for pre-service teacher education are set at provincial / territorial levels, there is far less oversight in terms of the professional development (i.e., in-service) in which active teachers (i.e., those currently working) engage (Sokal & Katz, 2015). Sokal and Katz note that this often means that the school division decides on what professional development teachers will receive and this may or may not align with improving inclusive education. Canadian teachers are typically in favour of inclusion but feel that they require more resources to be effective teachers in inclusive classrooms, resulting in negative attitudes and reduced backing of inclusion when they are unable to access the supports and professional development they need (Chu et al., 2020; Sokal & Katz, 2015). Essentially, Canadian teachers are stuck in a loop wherein they advocate for more support in inclusive education, develop negative attitudes towards inclusivity when their needs are not met and then become less open to inclusive education. The best way to improve attitudes about inclusivity is to provide teachers with professional development focused on inclusion (Chu et al., 2020; Sokal & Katz, 2015). Although this may not change behaviour, evidence suggests that students who have teachers trained in inclusive practices outperform classes of students who do not (Chu et al., 2020).

Research with pre-service teachers suggests that the relationships among education, experience, and self-efficacy in inclusive education may be complex (Lancaster & Bain, 2007). In a 13-week inclusive education course, students were allocated to one of three conditions: course work only, course work with a practicum in providing classroom support in an inclusive classroom, or course work with a practicum providing mentorship one-on-one to a student identified as being at risk of

underachievement including students receiving additional services for disability. While self-efficacy in working with students with disabilities improved for all pre-service teachers, the greatest improvements were observed by those in the course work only condition (Lancaster & Bain, 2007). Meanwhile, the trainee teachers who had received the most direct experience working with an individual with a disability (i.e., the mentoring condition) felt the least effectual. These findings suggest that once pre-service teachers are exposed to the challenges in teaching students with disabilities, they recognize that the education provided in their courses is insufficient (Lancaster & Bain, 2007). In fact, the students in the mentoring condition tended to report that they needed more instruction and experience about disabilities and about appropriate accommodations for these students (Lancaster & Bain, 2007).

More recent publications suggest that the coursework and experiential learning in education degrees remains inadequate in Canada. McCrimmon (2015), noting the lack of training and understanding about childhood disabilities and intervention reported by Canadian teachers, reviewed four major education programs in Canada and found they typically only offered a single course on inclusive education, often covering a range of diverse learners. I cross-referenced three "Top Ten" lists reporting on Canadian education programs (i.e., MacLean's, University Magazine, and Campus Rankings Blog) and reviewed course lists finding that thirteen of the fourteen institutions currently offering BEd programs appear to require students to take at least one course in inclusive education, and only one program mentioned a specific practicum with diverse learners. Moreover, "diverse learner" was broadly defined. Given the above-reported findings that a 13-week course focused on learners with disabilities felt inadequate to the pre-service

teachers who were actually exposed to teaching a student with disabilities, it is highly unlikely that the courses offered in Canadian education programs are adequate to prepare teachers for inclusive classrooms. Furthermore, some universities allow students to choose a focus for their diversity credits which may include options such as poverty, immigrants, or First Nations students (Sokal & Katz, 2015). As such, some pre-service teachers may enter the inclusive classroom with little to no knowledge about common childhood disabilities impacting learning.

Given that Canadian education programs already include a considerable number of courses and practicum experiences (McCrimmon, 2015), there is little wonder why more comprehensive courses on students with disabilities are typically not available to pre-service teachers and active teachers are often left to gain this knowledge and skill once they are working. Unfortunately, a paucity of research has examined whether teachers are able to learn and implement interventions effectively in the inclusive classroom. In a large-scale study examining a decade of research on professional development for inclusive education, only 11% of the included studies actually reported on student outcomes and instead tended to measure success by knowledge acquired or behavioural changes in teachers (Waitoller & Artiles, 2013). The success of professional development to classroom practice is variable (Battey & Franke, 2008; Ingvarson et al., 2005); however, effective professional development is associated with teachers successfully applying the knowledge acquired in the classroom (Battey & Franke, 2008; Denton et al., 2003; Ingvarson et al., 2005). As such, I argue that there is a need to increase our understanding of the relationship between professional development and effective classroom practice in inclusion research.

Lack of Evidence-based Intervention for Students with ASD in Inclusive Classrooms

As reported in Chapter 2, I conducted a systematic review of classroom-based, teacher-implemented intervention for students with ASD with a focus on student-based outcomes. This resulted in only 13 studies, all of which were single-subject designs. A study published in 2013 reported similar findings; that is, that most of the research examining interventions targeting school-based outcomes for ASD were single-subject designs implemented outside the classroom and by someone other than the classroom teacher. On the rare occasion larger studies were conducted, they were performed in labs or clinics (Kasari & Smith, 2013). Kasari and Smith (2013) noted that even when studies were implemented in the inclusive classroom, which was rare, they were typically implemented by a researcher. Kasari and Smith (2013) acknowledge that the paradox is that researchers are keen to maintain rigor and fidelity to assess effectiveness accurately, but in exchange there is a loss of ecological validity as these studies cannot inform us as to whether the intervention would be effective when implemented in schools.

ASD Inclusive Education Support in Practice

The lack of research on interventions that classroom teachers can implement in inclusive classrooms for students with ASD is reflected in the research examining current practices. In a study surveying Canadian parents of students with ASD about unmet needs, parents reported a lack of appropriate support for their children (Brown et al., 2012). This included concerns about lack of support from educational assistants as well as a belief that teachers did not have adequate knowledge or understanding about students with ASD and how to support them. Indeed, one of the top five needs reported in a survey

conducted by a Canadian NDD research network (Kids Brain Health Network [KBHN]; 2017) was for mandatory, in-depth training for school staff, including teachers.

Koegel and colleagues (2012) reported that when selecting interventions for students with ASD, teachers tended to choose interventions based on perceived appropriateness and availability of materials and supports. Teachers also tended to select interventions that aligned with their beliefs about pedagogy, but whether the interventions were research-based did not typically factor into their decisions (Koegel et al., 2012). In a study conducted in the United State of America (USA) examining commonly implemented interventions for students with ASD, the top ten lacked sufficient evidence to be considered scientifically supported (i.e., these interventions were considered to have "promising" or "limited" evidence; Hess et al., 2008). The study reported on intervention use across different settings (i.e., inclusive classrooms, integrated classrooms, and specialized classrooms) and found that only one scientifically supported intervention (i.e., discrete trial training) was being used in an inclusive classroom at the elementary school level (i.e., no scientifically supported interventions were being used at the middle or high school level). While Hess et al. (2008) did not report how frequently this intervention was being used specifically in inclusive elementary school classrooms, they reported it was only used by 11% of respondents across all settings (i.e., including inclusive, integrated, and specialized settings) and levels (i.e., preschool, elementary, middle, and high school). Additionally, while only one of the scientifically supported interventions (i.e., Learning Experiences: An Alternative Program for Preschoolers and Parents [LEAP]) was being used in integrated elementary school classrooms, it is only based on evidence for use with pre-school children (Hess et al., 2008). One of the reasons for the lack of use of evidence-

based interventions may be due to poor fit for the classroom (Kasari & Smith, 2013) which is further evidence of the need for research conducted in classrooms with classroom teachers.

One American study demonstrated that within special education classrooms, teachers could be effective in implementing evidence-based interventions for ASD with appropriate training and sufficient time to reach fidelity (Stahmer et al., 2015). As previously noted, larger scale research examining teacher effectiveness in implementing evidence-based interventions in the inclusive classroom is needed. Furthermore, Canadian teachers are seeking more training, resources, and supports for understanding and addressing challenging behaviours of students with ASD (Lindsay et al., 2013). Lindsay and colleagues (2013) noted that teachers reported challenges related to socio-structural barriers (e.g., lack of training, incongruent school policies) and a lack of understanding and support from other school staff about their efforts at inclusion.

A Place for Teacher Help

Given the established importance of inclusive education, the lack of teacher education focused on understanding and supporting students with ASD and other disabilities is extremely concerning. Also concerning is the lack of research examining the impact that teachers' uptake of professional development training about diverse learners has on students. While improving teachers' knowledge about and attitudes towards students with disabilities is important, it is insufficient to guarantee the success of students with disorders affecting learning, including ASD. Furthermore, given that research suggests that teachers often select and implement interventions that are not supported by evidence, there is a need to promote evidence-based interventions. *Teacher*

Help can fill this gap by providing teachers with psychoeducation about developmental disorders, including how they present in the classroom and their impact on learning, and by guiding teachers through the implementation of appropriate evidence-based recommendations within the classroom. While *Teacher Help* was designed and tested for in-service teachers, it could potentially also be accessed by pre-service teachers as part of their education degree or as supplemental professional development. However, as a large part of the program is experiential, requiring implementation throughout the module, it would be ideal if pre-service teachers had an opportunity to implement the intervention in practice under the guidance of a supervising teacher. This would also mitigate some of the time issues as student-teachers have fewer responsibilities than their supervising teachers

Clinical Implications

Given that children with ASD generally receive services in the public school setting (Locke et al., 2019; School-Based Mental Health and Substance Abuse Consortium [SBMHSA], 2013), it is problematic that the interventions implemented are rarely evidence-based (Hess et al., 2008). Despite the fact that academic and social benefits of inclusive education are typically experienced by students with disabilities in general (Uditsky, 1993), an Australian study found that students with ASD were more likely to be under-achieving academically (i.e., performing below their ability) due to teacher-rated challenges in focusing their attention and regulating emotions (Ashburner, Ziviani, & Rodger, 2010). Thus, programs like *Teacher Help* not only serve to fill a knowledge and practice gap, as described above, but also may be necessary to mitigate negative outcomes for students with ASD by providing teachers with behavioural

recommendations for challenges related to concerns about focus and emotional regulation.

The best-practice educational recommendations for ASD fit well with the inclusive education model (i.e., supportive/adapted curriculum content; supports for teachers/students; collaboration between sites [e.g., preschool and schools] and disciplines [e.g., healthcare and education]; family involvement; Lynch & Irvine, 2009). However, Brown et al. (2012) found that, in Canada, parents of students with ASD note two important needs that are not being met in school -- continuity of services and their children being understood by their peers. Similarly, Shepherd and Waddell (2015) noted that Canadian parents of children with ASD report a need for more comprehensive supports across the lifespan with some of their main concerns including the transition into the school system, lack of accountability within the school system, and a disconnect between schools and healthcare systems. Parents noted a need for more comprehensive services across their children's lifespans, including a need for school systems to have better understanding of ASD and staff to have more skills for supporting students in their classrooms. There is a need to improve schools' abilities to support students with ASD. Many of the needs described above can be addressed with *Teacher Help for ASD*. *Teacher Help for ASD* guides and helps teachers in supporting and adapting curriculum content for students with ASD, encourages communication and collaboration with parents and other school staff, and provides recommendations for continuity of care for students transitioning to new schools (e.g., from elementary to secondary school). The program also provides the teacher with recommendations about helping peers to understand differences and helps teachers and other school staff to understand ASD. Finally, the

development of *Teacher Help* has involved collaboration between clinicians and educators, which helps to bridge the gap between healthcare and education systems by finding ways to translate clinical research findings to the classroom.

Strengths and Limitations

One of the primary strengths of the current research was the stepped and empirical approach. Starting with a systematic review of the extant literature was useful in gaining perspective on the current situation. This review revealed that there was a small, but positive, amount of research examining classroom-based, teacher implemented interventions for students with ASD. By following this with a usability study, we were able to assess the perceived usefulness and usability of the *Teacher Help for ASD* program and to make necessary modifications prior to effectiveness testing. Following up the effectiveness study by immediately interviewing implementers and non-implementers was useful in understanding the challenges implementing the *Teacher Help* program.

Another strength of this dissertation was the novelty of the three studies included herein. While systematic reviews examining school-based ASD interventions had been published, this was the first review to focus specifically on classroom-based, teacher implemented intervention literature. Given that the vision for inclusion includes having students remain in their regular classroom as much as possible, focusing on this area of research served to synthesize this specific type of intervention. *Teacher Help for ASD* is the first intervention of its kind (i.e., online professional development for classroom teachers that guides them through implementing intervention with students with ASD) and conducting a usability study helped us to gain perspective about how both classroom teachers and key stakeholders (i.e., ASD support professionals, ASD advocates)

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perceived the intervention before beginning a larger study. Finally, based on review of the literature, the interview study appears to be the first to directly assess barriers and facilitators related to a school-based intervention for ASD. While findings from the current interview study may not generalize to other ASD interventions, valuable lessons about the challenges in conducting research in school were also learned.

This research also had some limitations, the most obvious being that it was ultimately not possible to evaluate the effectiveness of the *Teacher Help* modules due to recruitment challenges. Similarly, it would have been valuable to have interviewed more non-implementing teachers for the barriers and facilitators study. However, this was not possible as teachers who had not consented to participate would not have been among our contacts who consented to being contacted for any follow-up research. While support staff provided perspective on why they believed teachers were not participating, the voices of the non-implementing teachers are lacking. While we valued gaining perspective about the study-related factors that were barriers, we cannot assume that without the constraints of a research study the intervention would have been implemented easily. Given that the majority of the implementation barriers and facilitators reported were similar to those that emerged in other school-based implementation research, it is likely that challenges would exist regardless. It is also extremely difficult to assess effectiveness in a rigorous way without having the research-related barriers.

Research Directions

To be effective and inclusive educators, teachers require ongoing professional development and training about common childhood disorders and evidence-based interventions (Koegel et al., 2012). However, resources such as teachers' time and

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funding for education systems is limited so careful attention must be paid to ensuring the training teachers receive is relevant, appropriate, and can be translated to the classroom. The best way to ensure that training meets these goals is to engage teachers in research wherein they implement interventions directly in the classroom and outcomes are measured.

Kasari and Smith (2013) noted that the decisions to conduct research in clinics or alternative settings within the school is to maintain tightly controlled environments. Similarly, the decision to have researchers implement the intervention in school-based studies is typically to maintain this control and rigor (Kasari & Smith, 2013). The trade-off is that this type of research is a barrier to ecological validity as it does not provide evidence of the potential for the intervention to be implemented in the typical setting (i.e., in an inclusive classroom by a classroom teacher). However, Kasari and Smith (2013) note that collaboration is a key aspect of success in these types of implementation studies. Given that some of the participants in the barriers and facilitators study (see Chapter 4) also spoke to a belief that a more collaborative approach (i.e., greater focus on implementation science methods) would improve uptake, this is one avenue worth considering for future research with *Teacher Help.* Participants endorsing this approach spoke about participating in the research study at a school or board / district level as this would be reinforcing (i.e., having administration, supervisors, unions leaders, etc., recommending or enforcing participation by including it as a part of a school-wide goal). While conducting a nation-wide study was initially viewed as the best approach to ensure generalizability, it is worth considering how a more targeted approach with increased collaboration (e.g., obtaining research ethics approval ahead of time and then working

with the school to present the program to all staff and supporting administration in rolling the program out) might facilitate the research process.

Another potential method to examine the effectiveness of *Teacher Help* might be to present it like the specialized certificate courses described by McCrimmon (2015). Given that several participants reported that it would have been helpful to be able to review the program over the summer and then include it in goal-setting / professional growth plans created at the beginning of the school year, *Teacher Help* may work well if offered as a complementary course for teachers and support staff willing to collect data during the following school year. While some rigor may be lost in this approach (e.g., implementation timing may vary) it would likely still result in valuable information about the potential for classroom teachers to use *Teacher Help* in their classrooms.

More generally, it is evident that there is still a great need for research examining the implementation of evidence-based interventions for students with disabilities in inclusive classrooms by classroom teachers. Efforts for schools to become more inclusive have been ongoing for three decades and yet, teachers continue to struggle with knowing how to support students with disabilities. Given the potential for academic, social, and behavioural benefits of inclusion, as well as need for community-based services for students with disabilities, schools must be able to support these students in appropriate ways. Furthermore, teachers need support and training so that they can be effective educators for all the students in their classrooms and to reduce their own risk of developing negative attitudes towards inclusion. Given that teachers express high levels of stress and a lack of resources such as support and protected time, the best training would be flexible, accessible, and user-friendly, which would make online programs an

excellent platform to meet teachers' needs. As such, programs like *Teacher Help* may

help with some of the current challenges faced in inclusive education.

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