INFORMING PRACTICE FOR THE DEVELOPMENT AND DISSEMINATION OF PHYSICAL ACTIVITY MESSAGES TARGETING PARENTS OF CHILDREN WITH DISABILITIES

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ABSTRACT

Children with disabilities (CWD) engage in less physical activity (PA) compared to children without disabilities. There has been a call to develop evidence-informed strategies to promote PA among CWD. Considering that parent support is one of the strongest correlates of PA among CWD, it is important to develop strategies that can promote parent support for PA through message development and dissemination. At a high level, this dissertation is guided by the theory of planned behaviour (TPB) and the multi-process action control (M-PAC) model.

Phase 1 utilized a pre-post quantitative design to examine the effects of various PA messages on psychosocial antecedents of support for PA and self-reported parent support for PA among parents of CWD. Baseline parent support acted as a moderator on the effects of messages on attitudes toward child PA, subjective norms toward child PA, subject norms toward parent support for PA, and planning. Parents preferred the inclusive message most.

Phase 2 utilized a systematic scoping review guided by the framework for knowledge transfer to identify strategies that can inform practices regarding the development and dissemination of PA messages. Strategies unique to parents of CWD were identified for message development (e.g., targeting salient barriers) and dissemination (e.g., utilizing preferred sources).

Phase 3 addressed the lack of targeted information for parents of CWD highlighted in Phase 2. A mHealth program was developed to disseminate targeted messages to encourage planning for PA support among parents of CWD. Utilizing qualitative methodologies (i.e., thematic analysis) and informed by the PRACTical planning for Implementation and Scale-up (PRACTIS) guide, Phase 3 identified facilitators (e.g., user-friendly interface) and barriers (e.g., too much information) to the implementation of the mHealth program. Results also identified

suggestions for implementation improvement (e.g., quick reminders and condensed information) as well as credible organizations to support implementation (e.g., local organizations).

This research collectively advances the understanding of the development and dissemination of PA messages targeting parents of CWD. The results of this research offers strategies to inform PA message practices to enhance support for PA among parents of CWD.

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"The only true wisdom is in knowing you know nothing." ― Socrates

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CHAPTER 1 – Literature Review

1.1 Prevalence of Children with Disabilities in Canada

According to the best available data, approximately 200,000 children and youth in Canada are living with a disability (Statistics Canada, 2013). A more recent survey asked families to report on their children's difficulties with activities of daily living (Statistics Canada, 2022). Although the survey did not ask families to report on "disability" per se, findings from the survey suggest that 13.5% of Canadian children aged zero to 14 years are likely to have a disability. In Canada, learning disabilities, chronic health conditions and mental, psychological or emotional health conditions are the most commonly reported with 7.9%, 4.0% and 4.0% cases respectively (Statistics Canada, 2022). There are many children with disabilities[1] (CWD) in Canada who can benefit from supports to improve quality of life.

1.2 Physical Activity and Children with Disabilities

CWD experience greater health complications and negative outcomes, have less access to services and programs like education or extracurricular activities and are more likely to be living with low income compared to children without disabilities (World Health Organization, 2021). Participating in physical activity (PA) can promote positive quality of life outcomes and healthy living among CWD. PA participation has a number of benefits beyond positive physical health such as providing CWD with the opportunity to develop a sense of identity, meet and make new friends, increase social acceptance, develop positive self-image and confidence as well as decrease the risks of developing secondary health problems (Bloemen et al., 2017;

[1] The term "children" is used to describe the relation between a parent and their child. This term is used to encompass children, youth, adolescents, and emerging adults up to the age of 24 years.

Murphy & Carbone, 2008). The benefits of participating in PA are well known, however PA rates among CWD are consistently low (Figueiredo et al., 2016). Although there is limited data on the PA rates of children with all types of disabilities, there is data available on certain cohorts of CWD. For example, almost 56% of children with sensory and physical disabilities are meeting PA guidelines (Arbour-Nicitopoulos et al., 2021) demonstrating that a large percentage of CWD are still not engaging in enough PA. It is also unknown what percentage of children with more severe disabilities are achieving PA guidelines. While there is not a comprehensive consensus on PA levels among all CWD in Canada, it is estimated that 8.5-40.4% of CWD between 11-15 years of age are meeting PA guidelines in European countries, with girls being consistently less active than boys (Ng et al., 2017). In the United States, among children with various developmental disabilities, less than 20% were meeting guidelines of 60 minutes of daily PA (Case et al., 2020). As the evidence suggests that many CWD are not engaging in sufficient PA, there has been a call to develop evidence-informed strategies to promote PA among CWD (Smith et al., 2021; Jeong et al., 2015).

1.3 Childhood Physical Activity and the Role of the Parent

It has been suggested that strategies to promote PA among children should include parents (Bloemen et al., 2017; Gustafson & Rhodes, 2006) and specifically target parent support for PA (Rhodes & deBrujin, 2013). Children spend a large amount of time with their parents and with that, parents can be considered as gatekeepers to PA opportunities (Gustafson & Rhodes, 2006). Parent support for PA can be defined as the interactions between a parent and child that intentionally promote PA through prompting, discussing or providing opportunities to engage in PA (Beets et al., 2010). Examples of parent support for PA can include tangible support such as doing PA with the child, providing equipment, paying for program costs, and providing

transportation as well as intangible support such as advocating for their child and providing encouragement (Bloemen et al., 2017). By providing support, parents can create more PA opportunities for their child which positively reinforces PA (Ku & Rhodes, 2020). Among children without disabilities, parent support behaviours such as logistic support, co-participating in PA and providing encouragement were found to be significant factors that influence child PA participation (Rhodes et al., 2020). Parent support for PA is suggested to be an impactful facilitator of PA among children without disabilities in the medium-sized effect range (Hutchens & Lee, 2018; Xu et al., 2015; Yao & Rhodes, 2015).

Although there has not been as much research on parent support for PA among parents of CWD, it is considered one of the strongest correlates of PA (Ku & Rhodes, 2020; Siebert et al., 2017; Kowalchuk & Crompton, 2009). In a review of studies related to PA behaviours among CWD, parent support was significantly and positively associated with PA (Ku & Rhodes, 2020). Similarly, when parents of CWD were surveyed about influences on their child's PA, parent support for PA was identified as a significant predictor of child PA (Siebert et al., 2017). Finally, parent support for social activities including PA can give CWD a boost in confidence and positively promote their engagement in PA (Kowalchuk & Crompton, 2009). Given the evidence substantiating the role that parent support for PA has in facilitating PA participation, it is an important variable to target when developing strategies to promote PA among CWD.

1.4 Messages to Promote Parent Support for Physical Activity

One strategy for promoting parent support for PA is through the development and dissemination of targeted PA messages (Gainforth et al., 2016). A message is defined as specific content that is to be communicated to an audience and can include persuasive, informational or motivational content (Williamson et al., 2020). PA messages can be used as a strategy to help

parents of CWD translate their motivation into actual support for PA. PA messages can be delivered through a variety of forms including digital means like mHealth platforms and television commercials or more traditional forms like brochures or radio broadcasts (Faulkner et al., 2016). These motivational messages can target a number of variables related to parent support for PA such as attitudes, intentions and planning. PA organizations have employed campaigns that have demonstrated success by using persuasive messages targeting parents' motivation to provide support for PA (Gainforth et al., 2016; Latimer-Cheung et al., 2014; Huhman et al., 2010). For example, PA campaigns such as the ParticipACTION Think Again campaign in Canada and the VERB campaign in the United States have been found to increase parents' awareness of the importance of support for PA (Gainforth et al., 2016; Huhman et al., 2010). Awareness about parent support for PA has been positively associated with parents' knowledge of PA guidelines, intentions to support their child in meeting those guidelines and parent support for PA behaviours (Gainforth et al., 2016). In controlled research settings, persuasive PA messages have been shown to have positive effects on parents' attitudes toward child PA and intentions to provide support for PA (Berry et al., 2014). Even more, when examining the effects of messages on parent support for PA, psychosocial antecedents to parent support for PA increased including perceived behavioural control (PBC), attitudes toward parent support for PA, planning, subjective norms and intentions (Bassett-Gunter et al., 2017b). These findings are critical as both parental attitudes and intentions are important predictors of parent support for PA (Gainforth et al., 2016). The findings from these studies suggest that messaging can be a valuable strategy to target parent support for PA and its psychosocial antecedents.

1.5 Physical Activity Messages Targeting Parents of Children with Disabilities

Messages targeting the general parent audience (i.e., parents of children without disabilities) may not have the same effects on parents of CWD. Instead, targeted messages designed for a specific subgroup of people that share similar features are particularly effective (e.g., parents of CWD, Kruter & Wray, 2003). Targeted messages can work to increase cognitive processing, feelings of relevance toward a message (Cacioppo & Petty, 1982), attention paid to a message (Kreuter & Wray, 2003), and the overall likelihood of the message promoting behaviour change (Hawkins et al., 2008). Considering that parents of CWD have unique PA messaging needs and preferences (Bassett-Gunter et al., 2017a), PA messages targeting parents of children without disabilities may not be effective at targeting parents of CWD.

Optimally effective messages must meet the needs and preferences of a target audience (Bassett-Gunter et al., 2017a; Letts et al., 2011; Lavis et al., 2003) and may be more effective in targeting pre- and post-intentional factors related to support for PA compared to messages that do not meet the needs and preferences of a target audience (Williamson et al., 2020; Cheval et al., 2015; Leahy et al., 2009; Latimer et al., 2008; Berry, 2006). One study explored PA message needs and preferences of parents of CWD (Bassett-Gunter et al., 2017a) and identified several strategies that were thought to be valuable among parents of CWD including targeted language and images portraying inclusivity and belongingness, credible dissemination sources from the disability community, and information resources such as planning tools to provide guidance when planning to provide support for PA. This research was valuable in that it highlights unique PA message needs among parents of CWD that might differ from those of parents of children without disabilities. The exploratory nature of the Bassett-Gunter et al. (2017a) study highlights the need for more experimental research examining the effects of PA messages on parent support for PA among parents of CWD specifically. It is known that parents of CWD face unique

barriers to providing support for PA (Natkunam et al., 2020; Bassett-Gunter et al., 2017b; Jaarsma et al., 2019), but there are currently no studies that examine the effects of PA messages on parent support for PA and its psychosocial antecedents among parents of CWD. There is a need to explore the effectiveness of PA messages to understand and inform the development of messages to enhance parent support for PA among parents of CWD. As such, Phase 1 of this dissertation examined the effects of PA messages on parent support for PA and its psychosocial antecedents among parents of CWD.

1.6 Informing Optimally Effective Messages

The development and dissemination of PA messages has been studied in various capacities over several decades of research. Some strategies that have been researched include the use of gain-framed messages when promoting PA, avoiding fearful or threatening language, highlighting the benefits of PA, and targeting specific constructs related to behaviour change such as attitudes or intentions (Williamson et al., 2020; Latimer-Cheung et al., 2010). Recently, there has been a call for the development of inclusive PA messages targeting the disability community (Smith et al., 2021). A recent scoping review highlighted the need for PA messages targeting people with disabilities through the use of inclusive images, content regarding short-term affective outcomes of engaging in PA and delivery via credible and reliable sources (Williamson et al., 2020). While the review from Williamson and colleagues (2020) is a positive step forward in identifying PA messaging strategies for the disability community, there is currently no review of the greater literature surrounding PA messages targeting parents of CWD. There is a lack of PA information targeted to parents of CWD and this gap serves as a barrier to parent support for PA and subsequently, PA participation among CWD (Tristani et al., 2017; Gorter et al., 2016). Therefore, a synthesis of existing literature is necessary to identify strategies

to inform the development and dissemination of targeted PA messages for parents of CWD. There may be value in also considering PA messaging literature targeting parents of children without disabilities given that some aspects of developing and disseminating PA messages will likely be shared between parents of children with and without disabilities. However, it is also possible that targeted messages that consider the unique PA experiences and needs of parents of CWD (Bassett-Gunter et al., 2017a; Bloeman et al., 2015) may be optimal for motivating parent support for PA among parents of CWD. Phase 2 of this dissertation utilized a systematic scoping review to identify strategies within the literature that can be used to inform the development and dissemination of PA messages targeting parents of CWD.

1.7 Theoretical Frameworks to Inform Messaging Research: The Theory of Planned Behaviour and The Multi-Process Action Control Model

PA interventions are more effective if they are based on a behaviour change theory (Glanz et al., 2008; Rhodes et al., 2010). An appropriate theoretical framework can act as a guide to understanding what constructs the intervention is targeting and inform researchers about important constructs related to behaviour change (Patrick & Williams, 2012). As such, integrating theory-based constructs and components that contribute to behaviour change can enhance the effectiveness of interventions and provide future understanding of theory (Michie & Prestwich, 2010). PA messages show promise when they are theory-based and the content is targeted to specifically influence variables related to behaviour change (Latimer-Cheung et al., 2010). With regards to messages targeting parent support for PA, such messages should be theory-based and target psychosocial constructs (Latimer-Cheung et al., 2010) such as attitudes, intentions and planning related parent support for PA.

Two behaviour change theoretical frameworks can be useful in guiding research regarding the development of PA messages targeting parent support for PA among parents of CWD: (a) the theory of planned behaviour (TPB; Ajzen, 1991) and (b) the multi-process action control (M-PAC) model (Rhodes, 2017). The TPB suggests that one's motivation (i.e., intention) to engage in a behaviour (e.g., parent support for PA) is influenced by one's attitudes (i.e., an individual's evaluation of the desired behaviour), subjective norms (i.e., an individual's perceptions of how important others want them to behave) and PBC (i.e., an individual's perception of whether they have control over carrying out the desired behaviour; Ajzen, 1991). The TPB has been applied when examining parent support for PA among parents of CWD (Bassett-Gunter et al., 2020; Jeong et al., 2015). In one study, attitudes and subjective norms were found to significantly predict intentions to provide parent support for PA and intentions predicted parent support for PA behavior (Jeong et al., 2015). More recently, PBC and intentions predicted parent support for PA among parents of CWD (Bassett-Gunter et al., 2020).

Although the TPB has been useful for understanding motivation, it is often scrutinized for the inability to explain why strong intentions do not always translate into behaviour. This intention-behaviour gap is robust (Rhodes & de Brujin, 2013) and has been observed among parents of CWD (Brown et al., 2020; Jeong et al., 2015). That is, although many parents of CWD have strong intentions to support their child's PA (Jeong et al., 2015) some are unsuccessful in translating their intentions into behaviour. For example, over 70% of parents of children with autism were unsuccessful in translating their intention to provide parent support for PA into actual support behaviours (Brown et al., 2020). The M-PAC model attempts to address the intention-behaviour gap and therefore may be useful for informing research regarding messaging strategies to promote parent support for PA among parents of CWD. The M-PAC model posits

that intentions are translated into actions through the use of behavioural regulation (the process of regulating one's behaviours to ensure they align with the desired behaviour) which supports behaviour change efforts until they become reflexive or habitual (Rhodes, 2017). The M-PAC model has been used to extend the TPB and examine parent support for PA among parents of children without disabilities (Rhodes et al., 2016) and parents of CWD (Bassett-Gunter et al., 2020; Brown et al., 2020; Tanna et al., 2017). Among parents of CWD, the inclusion of the M-PAC model variables of behavioural regulation, habit (reflexive behaviour brought about by learned stimulus-response association) and identity (how one views themselves in a given role) explained 18% of the variance in parent support for PA in addition to 51% of the variance explained by TPB constructs (Bassett-Gunter et al., 2020). These findings highlight the importance of considering post-intentional factors in designing PA information interventions. Accordingly, the TPB and M-PAC model are suitable theories to guide research regarding the use of targeted PA messages to motivate parent PA support among parents of CWD. The TPB and M-PAC model were used to guide the methodology and analysis of Phase 1, and the general direction of the systematic scoping review for Phase 2. Guided by the concept of targeting post-intentional factors, and in particular the construct of behavioural regulation, the TPB and M-PAC model shaped the focus of Phase 3 in the design of a mHealth program that delivered PA messages aimed at motivating parents of CWD to plan to support their child's PA.

1.8 The Importance of Planning

Behavioural regulation strategies such as planning can help parents translate intentions into support for PA behaviour (Jaarsma & Smith, 2018; Tanna et al., 2017; Mistry et al., 2015; Schwarzer et al., 2011; Latimer et al., 2006). One component of the M-PAC model that has shown promise in promoting parent support for PA is planning. Planning is defined as the act of

creating a narrative in which a series of actions follow a meaningful sequence leading to a positive outcomes (Sjastad & Baumeister, 2018) and is an important post-intentional factor to target to promote parent support for PA (Bassett-Gunter et al., 2020; Rhodes, 2017; Tanna et al., 2017; Rhodes et al., 2016). Planning can be targeted through persuasive messages as well as through providing informational messages to support planning strategies.

Parents of CWD have identified the need for PA messages that encourage and support behavioural regulation strategies regarding parent support for PA (e.g., planning; Bassett-Gunter et al., 2017a). There is a lack of accessible PA information targeting behavioural regulation available to parents of CWD. For example, in a content analysis of online PA information targeting parents of CWD, it was found that less than 10% of PA website content included information about self-regulation, self-monitoring, and planning (Tristani et al., 2017). There is a need to explore the use of messages in helping parents of CWD support their children's PA through planning. There is currently only one known study that examines the effectiveness of an informational planning intervention developed specifically for parents of CWD (Tanna et al., 2017). In this study, parent support for PA behaviours did not differ between the experimental (i.e., parents who received telephone assistance with planning information) and control conditions (i.e., parents who did not receive telephone assistance with planning information). Parents of CWD indicated that they required support to implement the informational planning tool developed for the study. As such, it is possible that the self-directed planning tool did not meet the needs and preferences of parents of CWD, and thus was ultimately not effective. Nonetheless, behavioural regulation was still the strongest correlate of post-intervention parent support for PA (Tanna et al., 2017) suggesting that further research is needed to understand the use of informational resources to motivate and guide parents of CWD in planning to support PA.

Phase 3 of this dissertation aimed to examine the use of a planning tool delivered through a mHealth program (described in Section 1.9) targeting parents of CWD's planning behaviours to support their child's PA.

1.9 The Plan to Move Your Kids Program: An Evidence-Based mHealth Information Intervention

The Plan to Move Your Kids (PTMYK) program is an evidence-based messaging intervention developed to motivate planning for parent support for PA among parents of CWD. The PTMYK intervention was developed by targeting key theoretical constructs from the TPB and M-PAC model (i.e., attitudes toward child PA, attitudes toward parent support for PA, behavioural regulation, and planning) through the provision of information delivered to an online mHealth community of parents of CWD. Existing evidence as identified through Phase 2 of this dissertation was used to inform the PTMYK program. Together in partnership with a digital software company, the research team developed the mHealth program which offered a 12-week interactive mobile-based app that provided daily PA information content, check-ins from a community coach and an opportunity for parents of CWD to network and chat with each other parents about strategies to facilitate PA for their CWD. The weekly content provided parents with information about the benefits of child PA and supporting it, practice activities centered around developing a plan to support their child's PA and self-monitoring the plan they created. The PTMYK program is the first known mHealth program to deliver PA messages targeting planning to provide parent support for PA among parents of CWD. The format of a mHealth program meets the messaging needs of parents of CWD as they desire mobile and "on-the-go" information (Bassett-Gunter et al., 2017a) as well as frequently using the internet and technology

to search for PA-specific messages (Tristani et al., 2017). Phase 3 of this dissertation aimed to understand facilitators and barriers to implementation of the PTMYK among parents of CWD, which can inform future strategies regarding the development and dissemination of online PA message interventions targeting parents of CWD.

1.10 Facilitators and Barriers to the Implementation of Physical Activity Interventions

It is important to consider facilitators (i.e., factors that promote implementation) and barriers (i.e., factors that hinder implementation) related to the implementation of PA message interventions. Implementation can be referred to as "what a program or intervention consists of when it is delivered in a particular setting" (Durlak & DuPre, 2008, p. 329). Durlak and DuPre (2008) describe elements of implementation and highlight one element to be the target audience's responsiveness to the intervention. As such, it is important to examine the users' perspectives regarding facilitators and barriers of implementation. Other elements of implementation include: quality (i.e., how well different program components have been delivered), program reach (ie., participation rates and program scope) and adaptation (i.e., changes made in the original program for future implementation). Durlak and DuPre (2008) also propose that a number of factors including community, provider and program characteristics affect the implementation process.

Without an implementation plan, PA interventions may be rendered useless as they may not target their intended audience. Unfortunately, there are few studies that report on implementation factors with regard to PA interventions in practice (Wong et al., 2022; Cooper et al., 2021). Information regarding barriers and facilitators to implementation of PA interventions targeting parents of CWD is particularly limited. Scant literature has explored facilitators and barriers to the implementation of PA mHealth interventions more broadly. For example, a study

examining the use of a mHealth program to increase PA among patients with breast cancer identified facilitators such as attitudes towards the benefits of PA, motivation and preplanning PA sessions (Martin et al., 2021). A systematic review examining community-based PA interventions identified 82 facilitators and barriers to PA community-based intervention implementation in the real world (Cooper et al., 2021). Some facilitators to implementation included positive attitudes toward the intervention by participants, clear information and communication, credibility from evidence sources, pragmatism of the intervention content, collaborative effort, and engagement of stakeholders in decision-making. Some barriers to implementation included lack of evidence-based information, safety concerns, insufficient resources to support implementation, and technology failures (Cooper et al., 2021). A study involving a school-based PA intervention among children with asthma identified facilitators to PA intervention implementation including attitudes toward the benefits of PA and enjoyment of the intervention content while barriers to implementation included timing, competing interests and lack of motivation (Sharp et al., 2020). Although the evidence regarding facilitators and barriers to implementation is not specifically related to parents of CWD nor mHealth per se, this information can be useful to consider when examining interventions targeting this population.

When examining the implementation of technology-based interventions, it is important to consider multiple levels of characteristics that can act as barriers to implementation from an end-user perspective. A study examining the implementation of electronic-learning resources identified a total of 61 unique barriers ranging from individual (e.g., motivation), pedagogy (e.g., credibility) and technology (e.g., software design) levels (Ali et al., 2018). A systematic review of qualitative studies identified facilitators (e.g., user-centered design and accessibility) and barriers (e.g., disengaging content) to using mHealth programs (Shabir et al., 2022).

Understanding barriers to implementation from an end-user perspective can provide guidance when developing and disseminating interventions. Phase 3 of this dissertation aimed to identify facilitators and barriers to the implementation of the PTMYK program targeting parents of CWD from the user perspective. Findings from Phase 3 can be used to inform the future design and implementation of mHealth interventions targeting parents of CWD.

1.11 The PRACTical planning for Implementation and Scale-up (PRACTIS) Guide

The PRACTical planning for Implementation and Scale-up (PRACTIS) guide can act as an outline for researchers and stakeholders wishing to translate evidence-based interventions into practice by identifying facilitators and barriers to implementation (Koorts et al., 2018). In the context of this dissertation, the PRACTIS guide was used as a framework to examine the PTMYK program and discuss the implementation of similar PA messaging interventions from the perspectives of parents of CWD. The PRACTIS guide is comprised of four steps: "Step 1) Characterize the parameters of the implementation setting; Step 2) Identify and engage key stakeholders across multiple levels within the delivery system(s); Step 3) Identify contextual barriers and facilitators to implementation, and; Step 4) Address potential barriers to effective implementation" (Koorts et al., 2018, pg. 3). The PRACTIS guide prioritizes the identification of facilitators and barriers to implementation to improve intervention design, delivery and sustainability. In the context of this dissertation, PRACTIS Step 1 (i.e., Characterize the implementation setting) was identified as any community-based organization that would reach parents of CWD. To help disseminate the PTMYK program to key stakeholders (i.e., parents of CWD), a partnership was formed with a local community-based organization called the Abilities Centre which has a strong connection to the disability community. The Abilities Centre has a long history of partnerships with disability advocacy groups such as the Canadian Disability

Participation Project and they are leaders in inclusive PA. PRACTIS Step 2 (i.e., identify key stakeholders) was considered as parents of CWD. Finally, PRACTIS Step 3 (i.e., identify facilitators and barriers of implementation) was the focus of Phase 3. Therefore, the perspectives of parents of CWD were considered in understanding facilitators and barriers of implementation. The findings of Phase 3 can inform future mHealth interventions that address identified barriers and facilitators (PRACTIS Step 4) when targeting parents of CWD through PA mHealth interventions. The findings from Phase 3 can also be used to inform strategies regarding the implementation and scale-up of other PA mHealth interventions for parents of CWD.

1.12 Purpose of the Dissertation

The overarching aim of this dissertation was to conduct the following three studies to inform the understanding of strategies regarding the development and dissemination of PA messaging interventions targeting parent support for PA among CWD: Phase 1) an examination of the effects of pre-existing PA messages among parents of CWD, Phase 2) a systematic scoping review of the current literature regarding PA messages targeting parents and Phase 3) a qualitative study identifying facilitators and barriers regarding the implementation of a PA messaging intervention delivered via mHealth. This work can inform future PA messaging research and practice to support the promotion of parent support for PA among CWD.

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Chapter 2: Phase 1- The Effects of Physical Activity Messages on Physical Activity Support Behaviours and Motivation among Parents of Children with Disabilities

This is a manuscript in preparation for submission.

2.1 Abstract

Persuasive messages and social marketing campaigns can motivate parent support for physical activity (PA). Unfortunately, many PA messages targeting parents are not necessarily inclusive of parents of children with disabilities (CWD) and the effects of messages on the support behaviours of parents of CWD is unknown. Guided by the theory of planned behaviour and multi-process action control model, the relative effects of PA messages were examined among parents of CWD. Parents (N=135) were randomized to view one of four PA messages from existing PA campaigns. Parent support for PA and various psychosocial antecedents (e.g., attitudes, subjective norms, perceived behavioural control, intention, behavioural regulation, and planning) were assessed before, immediately post- and two-weeks post message viewing. Message preference was assessed at the end of the study. Baseline parent support for PA acted as a moderator on the effects of message viewing. Effects of messages did not differ between message conditions. Overall message effects were observed for attitudes toward child PA, subjective norms toward child PA, subjective norms toward parent support, and planning. Parent support for PA increased only among parents with low baseline parent support. Parents of CWD preferred the inclusive PA message most. This study can inform the development of PA messages targeting parent support for PA among parents of CWD.

2.2 Introduction

Persuasive messages have shown utility in physical activity (PA) promotion. One population that can benefit from PA promotion strategies are children with disabilities (CWD). Considering that PA engagement remains disproportionately low among CWD compared to children without disabilities (Wouters et al., 2019), there is a need for evidence-informed strategies to promote PA among CWD (Larocca et al., 2021; Tanna et al., 2017; Rhodes et al., 2015). Strategies that target parents may be advantageous in promoting PA among CWD (Bloemen et al., 2017) with a specific focus on motivating parent support for PA (Rhodes & deBrujin, 2013). Parent support for PA can be defined as the interactions between a parent and child in which the parent prompts, discusses, and provides PA-related opportunities for the child (Beets et al., 2010). Parent support for PA can be demonstrated through behaviours such as providing transportation or financial support, participating in PA with the child and providing encouragement (Beets et al., 2010; Wilson et al., 2010). Parent support for PA is consistently recognized as one of the strongest correlates of PA among children with and without disabilities (Rhodes et al., 2020; Siebert et al., 2017; Yao & Rhodes, 2013; Davison et al., 2011; Kowalchuk & Crompton, 2009). However, parent support for PA can be considered a behaviour unto itself as parents may require motivation and behavioural regulation to support their child's PA (Tanna et al., 2017; Rhodes et al., 2016). Given the important role of parent support in facilitating PA among CWD (Siebert et al., 2017), evidence to inform strategies to motivate parent support for PA among parents of CWD is needed.

Social marketing campaigns and persuasive messages have demonstrated positive effects on motivating parent support for PA among parents of children without disabilities (Gainforth et al., 2016; Latimer-Cheung et al., 2014; Huhman et al., 2010). For example, the VERB campaign

in the United States successfully targeted parents' motivation to support their children's PA (Huhman et al., 2010). Parents' awareness of PA campaigns was positively correlated with their support behaviours and related constructs such as knowledge of PA guidelines and motivation to provide parent support for PA (Gainforth et al., 2016; Huhman et al., 2010). Parents of children without disabilities have reported increased motivation, behavioural regulation (e.g., planning for parent support for PA) and support behaviours following exposure to persuasive messages (Bassett-Gunter et al., 2017b). Although the use of persuasive messages holds promise as a strategy to motivate parent support for PA, there is no known research to examine the effects of PA messages among parents of CWD.

A recent study explored the PA messaging needs and preferences of parents of CWD (Bassett-Gunter et al., 2017a). Several PA messaging strategies were identified as valuable and unique among parents of CWD including: targeted language and images portraying inclusivity and belongingness, credible messaging sources from the disability community, and strategies to support parents' self-regulation of parent support for PA behaviour. These data suggest that parents of CWD have unique PA messaging needs (Bassett-Gunter et al., 2017a) implying that they prefer certain characteristics of PA messages. Given the unique PA experiences and needs of parents of CWD, there may be unique factors to consider when developing messages targeting parents of CWD. However, there is no known research that explores the effects of existing PA messages or the preferences of PA messages among parents of CWD. Such research can provide value regarding parents' preferences in relation to existing PA messages to further understand aspects of PA messages that meet the needs of parents of CWD which can inform the development of messages targeting parents of CWD to motivate parent support for PA.

Messages are most effective if they target constructs from behaviour change frameworks (Latimer et al., 2010). Based on recent research regarding predictors of parent support for PA, it may be argued that psychosocial antecedents of behaviour drawn from the theory of planned behaviour (TPB; Ajzen, 1991) may be valuable targets for measuring the effectiveness of messages targeting parents of CWD. The TPB is a behaviour change theory which suggests that one's motivation (i.e., intentions) to engage in a behaviour (e.g., parent support for PA) is predicted by one's attitudes (an individual's evaluation of the desired behaviour), subjective norms (an individual's perceptions of how important others want them to behave) and perceived behavioural control (PBC; an individual's perception of whether they have control over carrying out the desired behaviour; Ajzen, 1991). The TPB has been employed to examine parent support for PA among parents of CWD (Bassett-Gunter et al., 2020; Tanna et al., 2017; Jeong et al., 2015). Attitudes, subjective norms and intentions have been shown to significantly predict parent support for PA behaviours (Jeong et al., 2015) and PBC and intentions have been show to predict parent support for PA among parents of CWD (Bassett-Gunter et al., 2020). Accordingly, it would be valuable to understand if PA messages impact constructs within the TPB among parents of CWD.

However, one limitation of considering message effectiveness in relation to the TPB variables alone is that the theory has an inability to explain why strong intentions do not always translate into behaviour (i.e., intention-behaviour gap; Rhodes & de Brujin, 2013). The intention-behaviour gap has been observed among parents of CWD (Brown et al., 2020; Jeong et al., 2015) and there has been a call to examine post-intentional factors (Rhodes, 2017) that may help explain how motivation is translated into behaviour. The multi-process action control (M-PAC) model posits that intentions are translated into behaviour through the use of behavioural

regulation processes (Rhodes, 2017). The M-PAC model has been used to extend the TPB and examine parent support for PA among parents of children with (Bassett-Gunter et al., 2020; Brown et al., 2020; Tanna et al., 2017) and without disabilities (Rhodes et al., 2016). These studies found that post-intentional factors such as behavioural regulation (the process of regulating one's behaviours to ensure they align with the desired behaviour) in general, and planning specifically, were related to parent support for PA (Brown et al., 2020; Tanna et al., 2017; Rhodes et al., 2016). In one study among parents of CWD, M-PAC model variables (i.e., behavioural regulation, habit and identity) explained an additional 18% of the variance in parent support for PA beyond the variance explained by the TPB variables (Bassett-Gunter et al., 2020). It has been suggested that research regarding parent support for PA consider both pre- and post-intentional factors (Bassett-Gunter et al., 2020). As such, it is valuable to consider the impact of PA messages on both pre- and post-intentional factors within the TPB *and* M-PAC model among parents of CWD.

There is no known research examining the effects of PA messages on parent support for PA or the psychosocial antecedents of behaviour identified within the TPB and M-PAC model among parents of CWD. The purpose of this study was to explore the relative effects of four existing PA messages on a) pre- and post-intentional psychosocial antecedents of parent support for PA and b) parent support for PA behaviour among parents of CWD. A secondary purpose was to identify which message were preferred by parents of CWD. Given the exploratory nature of the study, there were no a priori hypotheses.

2.3 Methods

2.3.1 Participants

Participants (N=135) included parents of CWD recruited online through social media and via existing participant databases. Eligibility criteria included: (a) being a parent of at least one CWD (disability was broadly conceptualized via self-report in order to favour an extensive spectrum of individuals), (b) having access to a computer and internet and (c) having the ability to read and write in English. It is important to note that parents of CWD were included in the study if their CWD was between 5 and 24 years old. The upper range of 24 years was chosen because UNESCO recognizes a child to be up to and including 24 years (UNESCO, 2017). Participants gave informed consent and received an honorarium of $40.00. Research ethics approval was received from the lead author's institution.

2.3.2 Materials - Physical Activity Messages

Four existing PA messages were selected from popular Canadian and American PA campaigns led by reputable PA promotion organizations. Each message was between 45 and 60 seconds in length (M = 56.25 seconds). Videos were categorized as:

(1) Targeted. This message was targeted to parents of CWD and included only CWD; the PA took place within a sport environment;

(2) Generic. This message was targeted to parents in general but did not include images of any children;

(3) Non-Inclusive. This message was targeted to parents of children *without* disabilities and showed only images of children *without* disabilities participating in unstructured PA, and

(4) Inclusive. This message was targeted to all parents and showed images of children *with* and *without* disabilities engaging in PA within an unstructured environment.

2.3.3 Measures

Demographics

Participants were asked to self-report on a series of basic demographic characteristics including sex, ethnicity, marital status, education, and household income. Participants also answered questions about their CWD including sex, type of disability and whether the disability was acquired or congenital.

Psychosocial Antecedents of Parent Support for PA and Parent Support for PA

Full details regarding the study measures can be found in Appendix C. Participants were asked a series of questions assessing psychosocial antecedents of parent support for PA based on the TPB and M- PAC model (i.e., attitudes toward child PA and parent support for PA, subjective norms toward child PA and parent support for PA, PBC toward child PA and parent support for PA, intentions to provide parent support for PA, behavioural regulation, and planning to provide parent support for PA). Participants were also asked about their parent support for PA behaviours. Finally, participants were asked to report message preferences by ranking the PA messages (1= favourite to 4= least favourite).

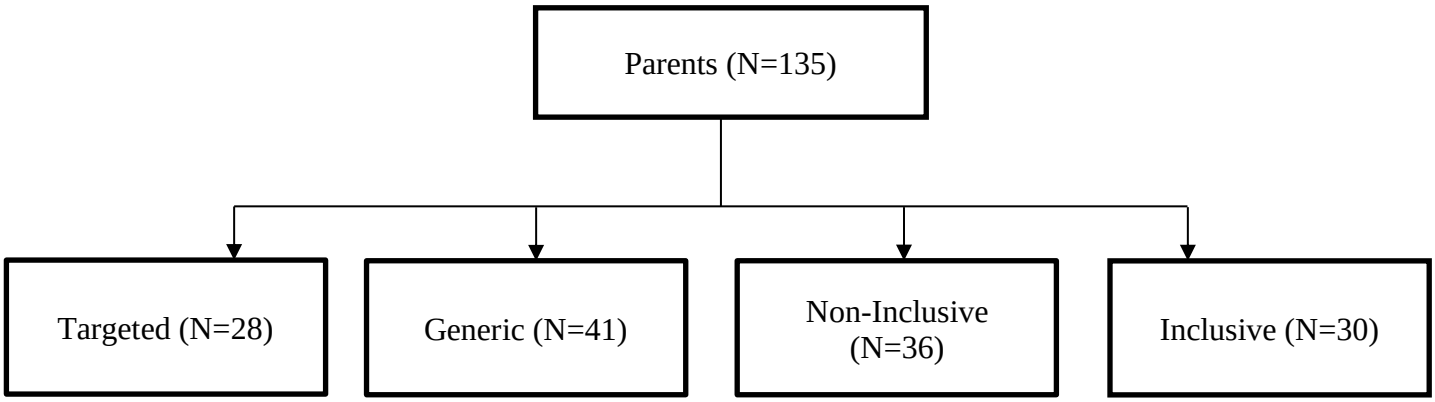
2.4 Procedure

All data were collected online. Eligible participants provided consent and were emailed a link to complete a baseline questionnaire assessing: (a) demographic characteristics, (b) psychosocial antecedents of parent support for PA and (c) parent support for PA behaviour over the past 2 weeks. Upon completion of the baseline questionnaires, participants were randomized to view one of four PA messages (Figure 1). Immediately following message viewing,

participants completed a questionnaire that re-assessed psychosocial antecedents of parent support for PA. Two weeks later, parents were emailed a link to a follow-up survey which assessed (a) psychosocial antecedents of parent support for PA and (b) parent support for PA behaviour over the two weeks since message viewing. Upon completion of the follow-up survey, participants viewed all four PA messages and were asked to rank the messages in terms of preference.

Figure 1.

Randomization Flowchart



2.5 Results

2.5.1 Data Cleaning and Assumption Testing

Statistical analyses were performed using SPSS version 24 (IBM Corporation, Armonk, NY, USA). Data were cleaned and inspected for violations of statistical assumptions (i.e., outliers distribution normality, and assessment of missing data). Outliers were identified as having a z-score of ± 3.29 (Field, 2009) and were then replaced with the next highest or lowest acceptable value. A total of 11 outliers from nine participants were identified and changed. Next, data distributions were examined by evaluating the skewness and kurtosis ratios. Data were normally distributed across all variables (±2; George & Mallery, 2012; Ferketich & Verran,

1994). Finally, a missing data pattern analysis was run along with Little's MCAR test to determine if the data were missing completely at random (Little, 1988). Thirty-seven data points across 135 participants and 318 item measures were missing. All missing data were indicated to be missing completely at random and therefore, all participants were included in analyses and pairwise deletion was employed.

2.5.2 Descriptive Results

Participant characteristics are detailed in Table 1. Characteristics of the CWD are described in Table 2. The mean age of parents was 39.44 (*SD* = 7.36) and the mean age of their CWD was 13.82 (*SD* = 3.20).

Table 1.

Participant Characteristics

	N (%)
Sex	
Male	33 (24.4)
Female	102 (75.6)
First Language English	113 (84.3)
Visible Minority	41 (30.4)
Indigenous Person	2 (1.5)
Post-Secondary Education	110 (81.5)
Married/Common Law	106 (78.5)
Single/Divorced/Other	29 (21.5)
Household Income <$100,000	74 (54.8)

Household Income >$100,000	43 (31.9)

Note. 18 participants did not report household income

Table 2.

Characteristics of Children with Disabilities

	N (%)
Sex	
Male	91 (60.7)
Female	59 (39.3)
Type of Disability	
Physical	35 (23.3)
Psychological	40 (26.7)
Developmental	46 (30.7)
Multiple	24 (16.0)
Other	5 (3.3)
Congenital or Acquired Disability	
Congenital	120 (80.0)
Acquired	25 (16.7)

2.5.3 Testing for Potential Covariates and Group Equivalency

ANOVA were calculated to examine demographic variables as possible covariates for parent support for PA. No significant covariates were identified. Chi-square analyses and ANOVA were calculated to examine group equivalency at baseline. There were no significant

between-group differences in sex, income, education level, and child disability type. There were also no significant between-group differences in parent support for PA or its psychosocial antecedents at baseline.

2.5.4 Effects of Physical Activity Messages on Psychosocial Antecedents of Parent Support for Physical Activity

A three (time; baseline vs. immediately post-viewing vs. two weeks post-viewing) x four (message type; targeted, generic, non-inclusive, inclusive) repeated measures MANOVA was calculated. Baseline parent support for PA was considered as a possible moderator variable because the effects of exposure to PA messages may vary depending on the level of parent support for PA at baseline. As such, a median split approach was used to identify participants with *high* (i.e., above the median of 4.85) versus *low* (i.e., below the median of 4.85) baseline parent support for PA (Innocenti et al., 2011; Clark et al., 2008; Wheeler et al., 2002).At the multivariate level, there was a significant main effect for time (F (16, 488) = 2.54, p = <0.01; partial η^2=.08), which was superseded by a significant time x baseline parent support for PA behaviour interaction (F (16, 499) = 1.86, p = 0.02; partial η^2=.06). There were no significant time x message condition interactions (F (48, 1488) = 1.01, p = 0.45; partial η^2=.03) or time x baseline parent support for PA behaviours x message condition interactions (F (48, 14800) = 1.21, p = 0.16; partial η^2=.04).

Given the presence of a significant multivariate interaction effect, a series of repeated measures ANOVAs were calculated to examine each psychosocial variable at the univariate level. Because there were no main or interaction effects for message condition at the multivariate level, conditions were collapsed for univariate analyses. For each psychosocial variable (i.e., attitudes, subjective norms, PBC, intentions, planning and behavioural regulation), a three (time;

baseline vs. immediately post-viewing vs. two weeks post-viewing) x two (high vs. low baseline parent support for PA) repeated measure ANOVA was calculated. A main effect for time was observed for attitudes toward child PA (F (2, 132) = 10.78, p = <0.01; partial η^2=.14) such that parents' attitudes toward child PA increased following message exposure. Time x baseline parent support for PA interactions were observed for the following variables: (a) subjective norms toward child PA (F (2, 266) = 11.80, p = <0.01; partial η^2=.08), (b) subjective norms toward parent support for PA (F (2, 262) = 6.24, p = <0.01; partial η^2=.05) and (c) planning for parent support for PA (F (2, 266) = 4.28, p = 0.02; partial η^2=.03). Post-hoc paired samples t-tests were calculated to further understand the effects observed in the ANOVA models. In order to reduce the risk of type I error, a Bonferroni adjustment was used and a p-value of 0.02 was determined as the appropriate indicator of significance. The results of these post-hoc tests are described below:

Subjective Norms Toward Child Physical Activity. Among parents with low baseline parent support for PA, there was a significant increase in subjective norms towards child PA from baseline to two-weeks post-viewing (t(55) = -3.13, p=<.01, Cohen's d=0.44); and from immediately post-viewing to two weeks post-viewing (t(55) = -2.52, p=.02, Cohen's d=0.17).

Subjective Norms Toward Parent Support for Physical Activity. Among parents with low baseline parent support for PA, there was a significant increase in subjective norms toward parent support for PA from baseline to two-weeks post-viewing (t(55) = -2.53, p=.02, Cohen's d=0.32).

Planning for Parent Support for Physical Activity. Among parents with low baseline parent support for PA, there was a significant increase in planning from baseline to immediately post-viewing (t(55) = -3.39, p=<.01, Cohen's d=0.38). Among parents with high baseline parent

support for PA, there was a significant increase in planning from baseline to immediately post-viewing ($t(78) = -2.49$, $p=.02$, Cohen's d=0.22) and a significant decrease in planning from immediately post-viewing to two-weeks post-viewing ($t(78) = 2.63$, $p=.01$, Cohen's d=0.24).

2.5.5 Effects of Messages on Parent Support for PA Behaviour

A two (time; baseline vs. two weeks post viewing) x four (message condition; targeted, generic, non-inclusive, inclusive) repeated measures ANOVA was calculated. Consistent with the approach to examine the effects of messages on psychosocial antecedents of parent support for PA, baseline parent support for PA (high versus low) was included as a possible moderator variable. There was a significant main effect for time (F (1, 127) = 4.15, p = 0.04; partial η^2=.03), which was superseded by a significant time x baseline parent support for PA interaction (F (1, 127) = 32.75, p = <0.01; partial η^2=.21). There were no significant time x message condition (F (3, 127) = .11, p = 0.95; partial η^2=.00) or time x message condition x baseline parent support for PA interactions (F (3, 127) = .39, p = 0.25; partial η^2=.03). Post hoc analyses were calculated to further understand the moderating role of baseline parent support for PA. Because there were no main or interaction effects regarding message condition, message conditions were collapsed for the post-hoc analysis. Paired sample t-tests were calculated to examine changes in parent support for PA behaviour among parents with high versus low baseline parent support for PA behaviour. Among parents with high baseline parent support for PA, there was a significant decrease in parent support for PA from baseline to two-weeks post-viewing ($t(78) = 5.82$, p=<.01, Cohen's d=0.58). Among parents with low baseline parent support for PA, there was a significant increase in parent support for PA from baseline to two-weeks post-viewing ($t(55)$ =- 2.91, p=<.01, Cohen's d=0.18).

2.5.6 Message Preferences Among Parents of Children With Disabilities

Based on the message ranking, the inclusive PA message was preferred most while the generic and targeted PA messages were preferred the least (Table 3).

Table 3.

Message Preferences Among Parents of Children With Disabilities

Rank	Targeted	Generic	Non-Inclusive	Inclusive
Favourite	34	3	19	77
Second Favourite	31	23	29	51
Third Favourite	18	58	54	5
Least Favourite	49	51	33	2
No response	3	0	0	0

2.5.7 Summary of Findings

Attitudes toward child PA increased following message exposure regardless of message condition. Subjective norms toward child PA and toward parent support for PA increased following message exposure but only for parents with low baseline parent support for PA. Planning for parent support for PA increased following message exposure among parents with low and high baseline parent support for PA. However, planning decreased at the two-week post-message exposure among parents with high baseline parent support for PA. Parent support for PA increased following message exposure but only for parents with low baseline parent support for PA. The inclusive message was preferred most among participants.

2.6 Discussion

Guided by the TPB and M-PAC model, the purpose of this study was to explore the relative effects of existing PA messages on parent support for PA behaviour and its psychosocial antecedents among parents of CWD. An improved understanding regarding how persuasive PA

messages might impact parent support for PA among parents of CWD can inform the development of optimally effective targeted messages.

2.6.1 Effects of PA Messages on Psychosocial Antecedents of Parent Support for Physical Activity

Attitudes toward child PA increased following message exposure regardless of baseline parent support for PA, which corroborates previous research suggesting PA messages are effective for boosting parents' attitudes toward child PA among children without disabilities (Crozier et al., 2018). The findings from this study highlight the importance of targeting attitudes toward child PA when developing PA messages for parents of CWD because attitudes are a strong predictor of motivation (Ajzen, 1991) and research specifically examining parent support for PA among CWD has identified attitudes as a strong predictor of intentions to provide support for PA (Jeong et al., 2015). Further, among parents of children with developmental disabilities, child PA was predicted by parents' attitudes toward child PA (Pitchford et al., 2016). Parents of CWD may already be aware of the benefits of PA for their child, however, using messages that target attitudes toward child PA may boost awareness or feelings of favourable attitudes (Bassett-Gunter et al., 2017a). Although there were no differences in the effects of the different types of messages, it may be too soon to discount the importance of message type when promoting parent support for PA among CWD. Considering that the sample in this study consisted of parents of CWD with a variety of disabilities, differences in the effects of message type may have gone undetected. Future research should consider using a homogenous sample of parents whose children have the same or similar disabilities or recruit parents with similar baseline parent support behaviours to explore the effects of PA messages.

Among parents with low baseline parent support for PA, the following psychosocial antecedents of behaviour change increased following message exposure: subjective norms toward child PA, subjective norms toward parent support for PA and planning. Subjective norms may play a relatively important role in understanding parent support for PA (Jeong et al., 2015). Parenting is a role subject to social pressure and subsequently parents could feel guilty if they are not providing sufficient support for PA (Stanley et al., 2020; Mistry & Latimer-Cheung, 2014). The parents in this study may have reported an increase in subjective norms after message viewing because of the perceived social pressure to provide support for their children's PA. Research examining TPB variables and parent support for PA among parents of CWD identified subjective norms as a strong predictor of intentions (Jeong et al., 2015) which suggests that parents of CWD may place high value on what important others think about PA for CWD and providing support for PA. The results of the current study identify subjective norms as a unique psychosocial antecedent to consider when developing PA messages for parents of CWD. Future research is encouraged to further understand the relationship between subjective norms and parent support for PA within a messaging context. In particular, it may be valuable to understand what PA message content or sources may be optimal in targeting subjective norms.

Planning increased following message exposure among all parents, but decreased after two weeks among parents with high baseline parent support for PA. These results imply that PA messages may have short term effects on post-intentional factors related to parent support for PA. Previous research has explained similar changes without long-lasting effects among parents of children without disabilities (Bassett-Gunter et al., 2017b). Planning is considered an important post-intentional factor in facilitating the translation of intentions to behaviour and mitigating the intention-behaviour gap (Rhodes & de Bruijn, 2013). Behavioural regulation

strategies and M-PAC variables, such as planning, are important predictors of parent support for PA behaviours among parents of CWD (Bassett-Gunter et al., 2020; Brown et al., 2020). Using PA messages as a component of PA interventions may be effective in boosting behavioural regulation strategies to mitigate the intention-behaviour gap (Rhodes et al., 2020; Rhodes et al., 2016). Future research should consider exploring how to optimally target variables like behavioural regulation or planning in PA messages especially because parents of CWD desire such messages (Bassett-Gunter et al., 2017a).

Finally, it is important to highlight that no message effects were detected for PBC and intentions. According to the TPB, it is theorized that PBC and intentions together predict behaviour (Ajzen, 1991). However, the messages employed in the study did not enhance feelings of PBC or intentions among parents of CWD. There may be specific message content that is necessary to evoke enhanced PBC and intentions but this content may have been absent from the messages used in the current study. It is also possible that no effects were observed for PBC and intentions because messages may not be an effective method to target these variables without the use of messaging strategies like repeated exposure. In a study examining PA messages among parents of children without disabilities, cognitions regarding PA and parent support for PA returned to baseline after single-message exposure (Bassett-Gunter et al., 2017b) suggesting that there is value in repeated message exposure to prime motivation (Latimer et al., 2010). Parents of CWD desire self-regulatory tools and resources when seeking information (Larocca et al., 2021; Bassett-Gunter et al., 2017a) and these needs should be considered when developing PA messages for parents of CWD. Messages alone may not facilitate changes in motivation and may need to be supplemented with self-regulatory tools and resources (e.g., planning tools or PA ideas) for parents of CWD to make them feel equipped to can carry out parent support for PA

behaviours and ultimately motivate them to provide support for PA. Further, in the current study, it is likely that viewing a message once or twice may not have effectively targeted these psychosocial predictors enough to detect change suggesting that repeated exposure may be an important factor in targeting antecedents to parent support for PA behaviours.

2.6.2 Effects of Messages on Parent Support for Physical Activity

Messages are most impactful in influencing audiences with low intentions and low engagement in the desired behaviour (Martin Ginis et al., 2013; Huhman et al., 2007; O'Cass & Griffin, 2006). As such, messages were most impactful among parents with low baseline parent support for PA in the current study. However it is important to note that within the sample the "low" scores for baseline parent support for PA were still relatively high. This is not to suggest that there is no value in providing messages to parents who are already engaging in some parent support for PA. Rather, developing messages that are tailored to a message recipient's readiness to change may be advantageous (Campbell et al., 1994). In the context of this study, parents with low parent support for PA behaviour could benefit from messages that target pre-intentional factors (e.g., attitudes and PBC) highlighting *why* and *how* they should provide support for PA. Alternatively, parents with high support for PA behaviour may benefit from messages that target post-intentional factors (e.g., planning) providing strategies to enhance behavioural regulation and positive encouragement to continue their support behaviours. Future research should explore additional strategies to optimize messages working to motivate parent support for PA among parents of CWD. For example, tailoring messages to characteristics like a recipient's motivational orientation may be a particularly effective strategy (Joyal-Desmarais, 2020). Although there is no known research to test this tailoring strategy in messages targeting parents

or parents of CWD, it has been shown to boost message effectiveness in other health behaviour messaging research (Latimer et al., 2007; Vandelanotte & De Bourdeaudhuij, 2003).

The observed decrease in parent support for PA two-weeks after message viewing among parents with high baseline parent support for PA warrants discussion. Although it is reasonable to expect that the messages were more effective among parents with low baseline support for PA, it is unexpected that such a decrease in behaviour would be observed among parents with high baseline support behaviour. It is possible that this decrease was the result of an overestimation in parent support for PA at baseline. Parents who reported high support for PA at baseline might have been subject to social desirability bias in which they claim socially desirable traits (Nederhof, 1985) such as providing parents support for PA. This type of over-reporting has been observed in the PA literature (Tourangeau & Yan, 2007) and among parents reporting on their support related to their children's health behaviours (Sanzone, 2013). It is important that PA messages targeting parent support for PA promote positivity and encouragement to evoke feelings of motivation rather than guilt which have been perceived as demotivating (Mistry & Latimer-Cheung, 2014). Future research among parents of CWD should be conducted to explore the role of parent-level factors (e.g., guilt or anxiety toward parent support for PA) and how such constructs may interact with message effects.

2.6.3 Message Preferences Among Parents

Parents preferred the inclusive PA message which aligns with the reported preference for inclusive PA messages expressed by parents of CWD (Natkunam et al., 2020; Bassett-Gunter et al., 2017a). In addition to aligning with parents' preferences, messages that are targeted to an audience are thought to be most effective (O'Cass & Griffin, 2006). In the current study, although message preference was clear (i.e., parents preferred the inclusive PA messages), there

were no differences observed in message effectiveness. However, this may in part be due to the study design and the fact that parents were "forced" to view and pay attention to one specific message. That is, preferences were not considered at the time when message effects were tested. In a more real-world context, where parents have the opportunity to choose what messages they pay attention to, there could in fact be differences in message effectiveness that align with parents' attention and perceptions of preferences and relevance. Future research should explore the likely relationships between PA message content, preferences, attention, relevance and effectiveness. Although message effects did not differ by condition in the current study, it is recommended that PA promotion efforts include inclusive PA messages that both meet the preferences of parents of CWD (Larocca et al., 2021; Bassett-Gunter et al., 2017a) and address the call for improved representation of people with disabilities in promotional messages (Benjamin et al., 2021; Houston, 2019) and PA messages (Smith et al., 2021).

2.7 Limitations and Future Directions

Despite the novelty of this study, there are limitations that should be considered. It is important to note that the sample in this study was comprised of parents of CWD with a broad age spectrum (i.e., five to 24 years) and varying disabilities. Strategies for parent support for PA can differ for children of different ages, abilities and developmental stages. The study design was purposefully inclusive due to its exploratory nature and the no known literature examining message effects on parent support for PA among parents of CWD. However, the effects of PA messages targeting parents of CWD may vary among parents who have children in certain age or disability groups. Future research is encouraged to examine the effects of PA messages among parents of CWD who belong to specific age groups or developmental stages. Second, a no-message control group was not included in the current study, which limits the ability to ensure

that observed changes in parent support for PA and its antecedents were the result of the message exposure. Third, the messages used in this study were gathered from past and present PA campaigns. Although the researchers chose the messages mindfully, it was impossible to control the specific content of each message. Strategies to identify and control for message content may be valuable in furthering an understanding of the specific aspects of messages that can influence parent support for PA and its antecedents. Fourth, although measuring aspects of message preference is important, the measure employed in this study was very crude and an enhanced conceptualization of preference is warranted. A qualitative study examining PA message preferences more deeply can provide valuable knowledge regarding optimal PA message development targeting parents of CWD. Fifth, only behavioural regulation and planning were measured from the M-PAC model and future research is encouraged to understand longitudinal effects of PA messages on the other constructs within the model (i.e., habit and identity). Finally, this study used only a single message exposure to examine the effects of messages. Future research should consider the role of multiple exposures given that this is important in overall message effectiveness and possibly long-term effectiveness (Bélanger-Gravel et al., 2016; Price et al., 2008).

2.8 Conclusion

Guided by the TPB and M-PAC model, this study is the first to examine the effects of existing PA messages on parent support for PA and its psychosocial antecedents among parents of CWD. Baseline parent support for PA was a moderator on the effects of messages highlighting the importance of considering parent-level factors when developing PA messages. Key findings include the effects of messages on both pre- and post-intentional factors, namely, attitudes toward child PA, subjective norms toward child PA and parent support for PA as well

as planning. PBC and intentions did not change following message exposure which is interesting and should be further explored in future research given the important theoretical roles of these variables in predicting behaviour (Bassett-Gunter et al., 2020; Brown et al., 2020; Jeong et al., 2015; Ajzen, 1991). Parent support for PA increased only among parents with low baseline parent support suggesting that PA messages may be most valuable to boost motivation among parents with lower motivation to provide support for PA. These findings also suggest that PA messages can be useful among all parents but may need to be tailored to parent-level factors (e.g., motivation) to elicit optimal outcomes. Although null effects were observed across message conditions, it is likely unfair to dismiss the importance of considering targeted PA messages to motivate parents of CWD to provide support for PA as parents clearly preferred the inclusive message.

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Chapter 3: Phase 2 - Developing and Disseminating Physical Activity Messages Targeting Parents: A Systematic Scoping Review

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3.1 Abstract

Background: Physical activity (PA) messages have demonstrated success in targeting parent support for PA. However, little research exists to inform the development and dissemination of optimally effective PA messages targeting parents. A synthesis of existing literature is necessary to inform message development and dissemination strategies. Unique considerations for parents of children with disabilities (CWD) should be identified given a need for inclusive PA messaging that consider the needs of CWD and their families. Methods: Systematic scoping methodologies included a peer-reviewed literature search and expert consultation to identify literature regarding PA messages targeting parents, and considerations for parents of CWD. Results: Thirty-four articles that met eligibility criteria were included for examination. Twenty-eight studies were identified regarding the PA messages targeting parents; six themes and 12 subthemes emerged from these articles. Six studies were identified regarding unique considerations for parents of CWD; three themes and four subthemes emerged from these articles. Conclusions: Through knowledge synthesis, this research can contribute to a knowledge translation process to inform practice guidelines for the development and dissemination of PA messages targeting parents, while also providing unique considerations for PA messages targeting parents of CWD.

3.2 Introduction

Physical activity among children is on the decline. For example, only one third of children in Canada and one quarter of children in the United States are meeting recommended physical activity (PA) guidelines [1,2]. There is a need for strategies to increase PA among children and it is suggested that such strategies should target parent support for PA [3–5] as it is an important determinant of PA participation among children [5–9].

One strategy for increasing parent support for PA is through the development and dissemination of targeted PA messages [10]. Messages can include motivational statements or information about PA [11], such as the benefits of PA or the importance of supporting PA. Messages can be disseminated (i.e., purposely distributed) via different media channels (e.g., social media campaigns, mass media messaging) to a target audience such as parents [12]. Various PA campaigns have demonstrated success using persuasive messages targeting parent support for PA and its antecedents (e.g., motivation, attitudes, self-efficacy, planning) [10,13–16]. However, there are no known practice guidelines for the development and dissemination of PA messages targeting parents. An important first step in understanding such practices is a comprehensive synthesis of the peer-reviewed literature to identify strategies that have been employed in research regarding PA messages targeting parents.

When developing and disseminating PA messages targeting parents, it may be necessary to consider the unique needs of parents of children with disabilities (CWD) [17]. CWD are less active than their peers without disabilities [18] and often rely on parent support to facilitate PA [8,19]. PA promotion efforts have been successful in increasing planning to provide support for PA [20] and psychosocial antecedents of parent and self-reported parent support for PA [21] holding promise as a strategy to motivate support for PA among parents of CWD [17,22].

Parents of CWD have expressed unique and specific messaging needs [17] and there has been a call for inclusive PA message practices that meet the specific needs of people with disabilities [23]. However, there is currently no known synthesis of research regarding strategies for developing and disseminating PA messages targeting parents of CWD. Considering the unique needs of parents of CWD a review of the literature could inform practice guidelines for motivating support for PA among parents of CWD through targeted messages.

The framework for knowledge transfer [24] can guide the process of consolidating research findings to aid informed decision making around message development and dissemination to a target audience. Within the context of the current review, the framework guided the clear identification of: (a) a target audience (i.e., parents and parents of CWD), (b) literature supporting the development of PA messages targeting parents and (c) literature supporting the dissemination of PA messages targeting parents. Therefore, this review has two purposes: (a) to identify considerations within the peer-reviewed literature regarding the development and dissemination of PA messages targeting parents and (b) to identify considerations regarding the development and dissemination of PA messages specifically targeting parents of CWD.

3.3 Materials and Methods

A systematic scoping methodology was used to couple the rigor and replicability of a systematic review with the exploratory lens of a scoping review [25]. This review was conducted according to the PRISMA Extension for Scoping Reviews (PRISMA-ScR) Checklist [26] and the following systematic scoping methods: (a) identifying the research questions, (b) identifying relevant search records, (c) record selection, (d) charting the data, and (e) collating, summarizing, and reporting results [25,27–29].

3.3.1 Identifying the Relevant Search Records

A peer-reviewed literature search and expert consultation were used to capture broad and comprehensive literature [29]. Search terms were determined in consultation with a librarian after the detailed assessment of indexing terms applied to a 'known' set of articles [10,17,30,31]. A combination of terms for PA, exercise, parents, child, mass media, dissemination, and messages was applied for the searches to identify relevant literature. In addition to these terms, the term disability was added in a secondary search to identify research specific to parents of CWD. An example of a full electronic search strategy is as follows: A keyword search string of "physical activity AND parents AND child AND messages OR mass media OR dissemination" was entered into the journal database PsychInfo. Limits were applied in line with eligibility criteria. The following concepts were defined before conducting the search to provide clarity and consistency for the researchers: PA, parent, child, disability, messages, and dissemination (See Table 1).

Table 1.

Working Definitions for the Purpose of This Research

Term	Working Definition
Physical Activity	Any bodily movement produced by skeletal muscles that results in energy expenditure and results in increased heart rate and breathing was used to describe both structured PA such as sports and programs, as well as leisure time unstructured PA such playing with friends, dancing, or walking. Active transportation was also included. Types of "play" were included in the review as long as they were specified as physical or active play.
Parent	Biological or legal guardian and/or caregiver.
Child	Anyone up to and including age 24.
Disability	Activity limitation or participation restrictions caused by impairment.
Messages	All information or knowledge about PA to be conveyed to a message recipient. All forms of information and messages were allowable and included (e.g., digital, print, radio).
Dissemination	Distribution of messages to a target audience via purposeful channels and strategies. All forms of dissemination were allowable and included (e.g.,

	social media campaigns, mass media messaging/commercials, posting guidelines on websites, or communications with a practitioner).

3.3.2 Eligibility Criteria

Articles were limited to peer-reviewed publications. Inclusion criteria were as follows: (a) a target population of parents or parents of CWD, (b) the age of the children (if specified) up to and including 24 years of age because UNESCO recognizes anyone up to the age of 24 a child or youth, (c) published between 2000–2020, and (d) full text available in English. Along with meeting the required eligibility criteria above, the focus of the article must have also included one of more of the following: (a) PA messages, (b) PA message and development strategies, (c) dissemination strategies. Exclusion criteria were as follows: (a) a target population that did not include parents, (b) the age of the children is over 24 years of age, (c) published outside of 2000–2020, and (d) full text not available in English. Articles were excluded if they discussed the promotion of other health behaviours but not specifically PA or if they discussed caregivers but not specifically parents. Articles were included if they discussed multiple health behaviours with specific discussion of PA, although only information regarding PA was examined for the review. Likewise, articles were included if parents were discussed alongside caregivers more broadly.

3.3.3 Peer-Reviewed Databases

A systematic scoping search of the following databases was performed by a single researcher (May–June 2019): (a) CINAHL, (b) PsychInfo, (c) PubMed, (d) Scopus, (e) Sport Discus, and (f) Google Scholar. The first search identified literature regarding PA message development and dissemination targeting parents. The second search identified literature regarding PA message development and dissemination specifically targeting parents of CWD. A total of eight search term combinations using traditional “AND OR” approaches were applied to

all six databases. Google Scholar searches included only the first five pages of each search result [32]. Searches were replicated on December 1st, 2020 to ensure that papers published since the initial search were included.

3.3.4 Expert Consultations

Content experts (n = 28) included the first author listed on each of the records identified through database searches. They were contacted via email (September–October 2019) and informed of the study objectives and were asked to provide any relevant literature. Four authors could not be reached, 18 authors responded, six authors did not respond.

3.3.5 Record Selection and Charting the Data

A reference managing software (i.e., Mendeley, London, United Kingdom) was used. The initial title and abstract screening was performed by one researcher (VL). Two researchers (VL and AM) screened the full-text of remaining records independently based on the eligibility criteria. Among these two researchers, there was 80.5% agreement when screening full-texts for inclusion. Any discrepancies in agreement were resolved by discussion and consensus amongst all authors. One researcher (VL) manually searched the reference lists of eligible articles to identify any additional relevant records and screened records from the expert consultations. A second researcher audited the manual search.

3.3.6 Collating, Summarizing, and Reporting Results

One researcher (VL) extracted the following data from eligible articles: (a) record characteristics (i.e., author, title, year, study design, and participant characteristics), (b) article focus (i.e., message development, message dissemination, or both), (c) message development or dissemination strategy used or discussed, and (d) key findings. One researcher (VL) developed

preliminary themes and subthemes across the records using a thematic analysis approach. These themes and subthemes were discussed and finalized among all authors.

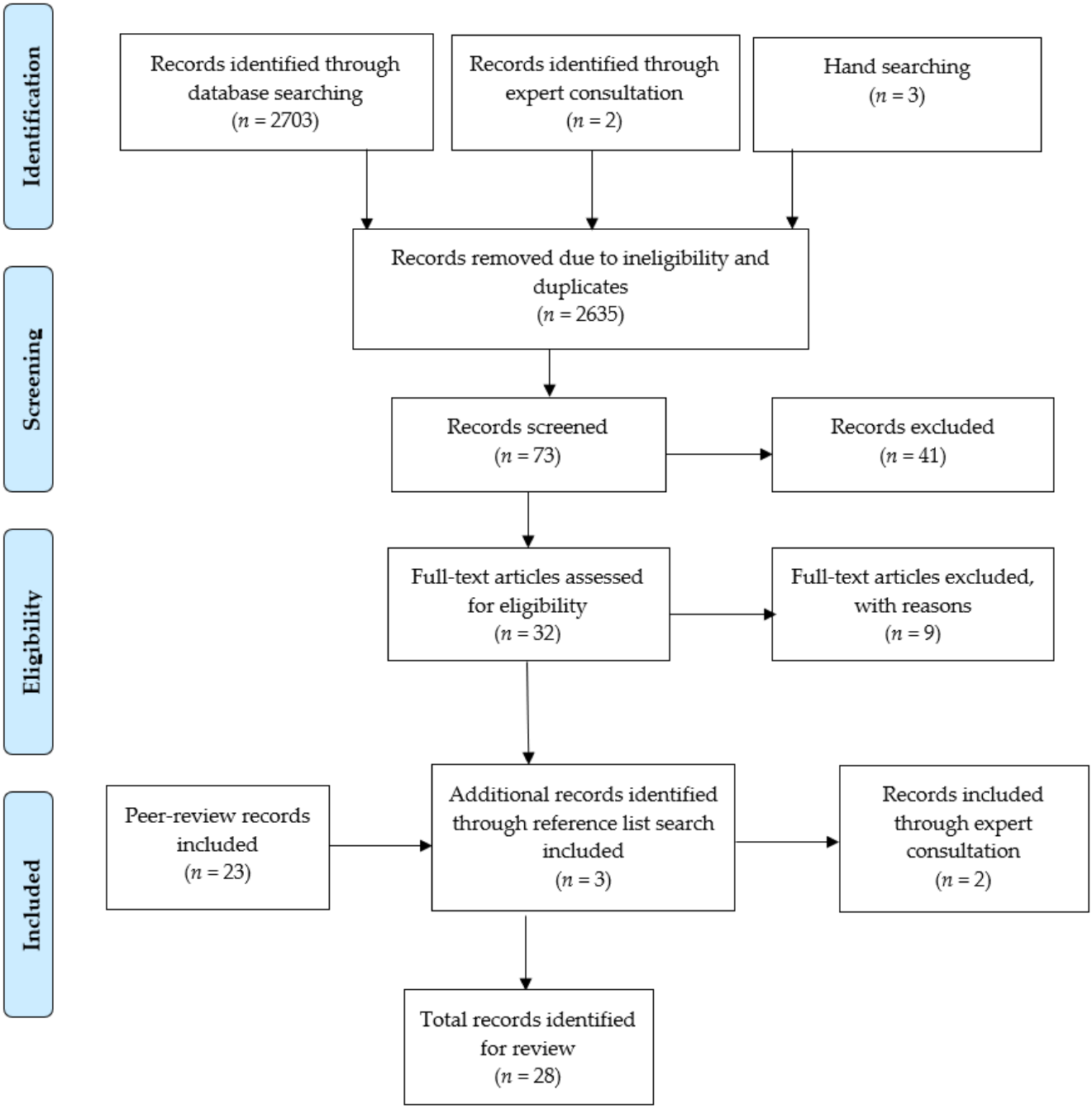
3.4 Results Regarding Parents

3.4.1 Search Results Regarding Parents

A total of 2,708 records were identified for screening (*n* = 2,703 from database searches, *n* = 2 from expert consultations, *n* = 3 from hand searching reference lists). Following removal of duplicates and records that did not meet inclusion criteria (*n* = 2,635), 73 studies remained. After reviewing these records according to inclusion criteria, twenty-eight studies were included regarding the primary purpose of the review (See Figure 1).

Figure 1.

PRISMA Study Selection Flow Chart Regarding Parents



3.4.2 Evidence Characteristics

Of the 28 studies included for review, 25 were empirical and included nine experimental studies (five pre-post, two post-test only, one between groups, one single time point) and 16 non-

experimental studies (10 qualitative, four cross-sectional, and two descriptive studies). The 25 empirical studies took place in the following locations: Canada (*n* = 12), United States (*n* = 7), Australia (*n* = 5), and UK (*n* = 1). Three studies were non-empirical descriptive studies and took place in the United States (*n* = 2) and Chile (*n* = 1). Participants in these studies were mostly mothers with children between the ages of two and 17 years old.

3.4.3 Summary of Main Findings: Development of Physical Activity Messages Targeting Parents

Three themes and six subthemes emerged regarding the development of PA messages targeting all parents. Relevant findings are presented in Table 2.

Table 2.

Literature Regarding The Development of Physical Activity Messages Targeting Parents

Theme	Subtheme	Articles Identified	Main Relevant Findings	Recommendation for PA Message Development
1) Message persuasion	(a) Message framing	[30,33]	Gain-framed PA messages targeting parents were more effective in promoting message engagement, believability, positive attitudes, and overall favourability compared to loss-framed messages [33]. Gain- and loss-framed PA messages were equally effective [30].	Messages targeting parents should be gain-framed to promote motivation and encouragement to provide support for PA.
2) Messages that consider barriers to parent support for PA	(a) Common barriers to parent support for PA	[34–37]	Common barriers to providing parent support for PA include time [34–37], safety concerns [35], money [34,35] weather [35–37], lack of facilities [35], and parents' motivation to provide support for PA [37].	Messages targeting parents should address common barriers they experience (e.g., time, money, safety, and weather). Such messages can boost parents' perceived control over providing support for PA by enhancing their self-efficacy.
	(b) Information	[34,37,38]	Many parents are unaware of PA guidelines, or exhibit low knowledge of PA guidelines [38].	Messages targeting parents should provide parents with

	regarding PA guidelines		To enhance understanding, parents desire clarity around definitions of PA [38], classifications of PA intensities (e.g., light, moderate, vigorous) [34] and examples of different types of PA to alleviate some confusion surrounding PA guidelines [37].	practical information regarding PA guidelines. For example, providing parents with examples of different types of PA (e.g., light, moderate and vigorous), providing clear definitions of what qualifies as PA, and strategies to assess their child's PA.
	(c) Guilt and stress	[34,37–39]	Persuasive PA messages can evoke feelings of stress among parents [38] as PA guidelines are perceived as something else to worry about by parents [34,37]. Parents were not motivated by messages that evoked feelings of guilt and rather these messages were negatively associated with parents' perceived behavioural control and intentions to provide support for PA [39].	Messages targeting parents should remain supportive, positive and pragmatic in order to provide parents with feelings of motivation and achievement rather than promoting feelings of guilt and stress.
3) Messages that target parents' attitudes	(a) Attitudes toward child PA	[14,15,35,36,38,40–42]	The existing research suggests that parents generally hold positive attitudes and perceptions toward child PA [14,35,36,38]. Parents who felt motivated after viewing a PA message had more positive attitudes toward child PA [40]. Positive effects of messages on parents' attitudes toward child PA have been observed [15,42]. A common disconnect between parents' attitudes toward child PA in general and their *own* child's PA [14,38,41] was identified.	Messages targeting parents should focus on the presenting the benefits of child PA and present strategies to help increase their own child's PA. Such messages may serve as a booster to parent support for PA.
	(b) Attitudes toward parent support for PA	[42,43]	The current literature suggests that targeting parents' affective attitudes toward support for PA can be an effective strategy to motivate parents to provide support [43]. PA campaigns	Messages targeting parents should target parents affective and instrumental attitudes toward parent support for PA and focus on

	targeting parents have had success in motivating parents to provide support by providing them with information about the benefits of providing their child with support for PA [42].	presenting the benefits of providing support for PA.

3.4.4 Theme 1: Message Persuasion

(a) Message Framing. Two studies discussed framing as a strategy for developing PA messages [15,30]. The first study found that gain-framed messages were more effective compared to loss-framed messages among parents [15]. Alternatively, the second study found no differences in effectiveness between gain- and loss-framed messages among parents [30].

3.4.5 Theme 2: Messages that Consider Barriers to Parent Support for Physical Activity

(a) Common Barriers to Parent Support for PA. Four studies discussed common barriers to parent support for PA. These included time [34–37], safety concerns and lack of facilities [35], money [34,35], weather [35–37], and parents' motivation [36].

(b) Information Regarding PA Guidelines. Three studies focused on messages regarding PA guidelines as something to consider when developing PA messages targeting parents [34,37,38]. Parents' lack of awareness or poor understanding of PA guidelines was highlighted [38]. All three studies emphasized that PA guidelines are a source of confusion for some parents [34,37,38]. Parents' need for clarification surrounding the various types of PA (i.e., light, moderate, or vigorous) and their confusion regarding how to monitor their children's PA [34] were discussed. However, when parents were aware of PA guidelines and had a good understanding, the guidelines were positively accepted [37].

(c) Guilt and Stress. Four studies identified that PA messages can evoke feelings of guilt and stress among parents [34,37–39]. Feelings of guilt and stress should be considered since PA

can be perceived as ‘something else to worry about’ by parents [34,37]. Feelings of guilt and stress regarding monitoring children’s PA behaviour were common among parents [34,37–39] and were not perceived as motivating [39].

3.4.6 Theme 3: Messages that Target Parents’ Attitudes

(a) Attitudes Toward Child PA. Eight studies discussed targeting attitudes toward child PA as a message development strategy [14,33,35,36,38,40,42]. Parents generally hold positive attitudes toward child PA [14,35,36,38] and PA messages targeting parents were found to have positive effects on attitudes toward child PA [33,40,42]. However, many parents expressed that increasing PA for their own children was not an issue and believed that their own children were meeting PA guidelines [14,38,41]. This perception has been observed among parents of children who are not meeting PA recommendations [14,38].

(b) Attitudes Toward Parent Support for PA. Two studies discussed targeting attitudes toward parent support for PA as a message development strategy [42,43]. These studies suggest that targeting parents’ affective attitudes through providing information about the benefits of parent support for PA can be an effective strategy to motivate parents [42,43].

3.4.7 Dissemination of Physical Activity Messages Targeting Parents

Three themes and six subthemes emerged regarding the dissemination of PA messages targeting parents. Main relevant findings are presented in Table 3.

Table 3.

Literature Regarding the Dissemination of Physical Activity Messages Targeting Parents

Theme	Subtheme	Articles Identified	Main Relevant Findings	Recommendation for PA Message and Information Dissemination

1) Dissemination to enhance cognitive processing	(a) Awareness	[10,42,44]	Message awareness is positively associated with favourable attitudes toward child PA among parents [42]. Compared to parents with low PA message awareness, parents with greater awareness were more likely to believe that PA offered benefits to their children [44]. Parents with greater PA campaign message awareness were more likely to believe their children needed to engage in more PA, had stronger intentions to provide parent support for PA, and exhibited greater support for PA compared to parents with low campaign awareness.[10] It is important to garner awareness to promote changes in beliefs and intentions toward child PA and parent support for PA [10,42,44].	Messages targeting parents should focus on dissemination strategies such as repeated exposure to promote campaign and message awareness which can positively impact pre-intentional factors.
	(b) Recall	[42,44–46]	PA message recall among parents is positively associated with attitudes, beliefs, and support for PA behaviours [42], as well as greater knowledge regarding child PA and increased family PA [45]. However, PA message recall is generally low among parents [44] unless it is prompted [46].	Messages targeting parents should focus on dissemination strategies that promote recall such as repeated exposure. Such strategies have the potential to positively impact pre-intentional factors.
2) Social marketing strategies to enhance dissemination	(a) Marketing strategies	[47–49]	The success of a PA campaign in the United States called VERB is thought to be the result of the marketing professionals who developed the campaign based on extensive consumer research [47,48]. The VERB	Messages targeting parents should utilize marketing strategies for optimal dissemination such as audience research, channel placement and outcome evaluation.

			campaign was branded as cool and fun, and ensured that the PA messages reflected core attributes of the brand [48]. The VERB campaign employed social marketing tactics such as developing a brand affinity (i.e., messaging that aligned with the parents' values) [49], using paid media advertising, contests and community-based events, as well as collaborating with popular celebrities or athletes [49].	
	(b) Tailoring dissemin-ation for subgroups of parents	[48,49]	The VERB campaign successfully targeted parents of Asian, Indian, Latino, and African American backgrounds by tailoring PA messages to reflect dissemination needs and preferences of various subgroups (e.g., delivered in various languages, disseminated through preferred radio television stations [48,49].	Messages targeting parents should tailor messages to subgroups of parents to enhance message dissemination to improve the uptake of PA messages.
	(c) Brand equity	[15,47]	To enhance brand equity, the VERB campaign's use of popular television characters and airing messages during popular television times for parents and children [47]. Within this campaign, brand equity increased steadily over a two-year period [47]. Brand equity also increased among parents after six months of PA message exposure and parents who reported higher brand equity also reported higher levels of parent support for PA [15].	Messages targeting parents should utilize strategies to enhance brand equity (e.g., celebrity endorsement or credible messengers). Higher brand equity can lead to increases in parent support for PA or factors related to parent support for PA.

3) Messages that target the dissemination preferences and suggestions of parents	(a) Preferred message dissemin-ation approaches	[34,50–55]	Multi-platform approaches were highlighted in the current literature [34,50,52]. Parents preferred both digital and traditional forms of dissemination [34,53]. One study suggested the use of a mass media approach to reach a large population [53]. Two studies found text messages are both feasible and efficacious for disseminating information to parents [54,55]. Unique forms of PA message and information dissemination through storybooks or "parent nights" within the community may be novel and creative methods to motivate parent support for PA [50,51].	Messages targeting parents should utilize dissemination strategies that parents prefer. Such dissemination strategies should utilize a combination of both digital and traditional forms. Unique forms of dissemination can be used (e.g., text messages or parent nights) but in combination with other dissemination strategies.

3.4.8 Theme 1: Dissemination to Enhance Cognitive Processing

(a) Awareness. Three studies discussed message dissemination strategies to enhance awareness which was considered as an important factor in evaluating PA message dissemination effectiveness among parents [10,42,44]. Further, all three studies highlighted the importance of garnering awareness to promote changes in beliefs and intentions toward child PA and parent support for PA [10,42,44]. In these studies, message awareness was positively associated with parents' favourable attitudes toward child PA [42], believing the benefits of child PA [44], believing their child needs to engage in more PA, having stronger intentions, and demonstrating more support for PA [10].

(b) Recall. Four studies discussed message dissemination strategies to enhance recall as a strategy to strengthen dissemination effectiveness among parents [42,44–46]. PA message recall

among parents was positively associated with attitudes, beliefs, and support for PA behaviours [42], as well as greater knowledge regarding child PA and increased family PA [45]. However, PA message recall was generally low among parents [44] unless it was prompted [46].

3.4.9 Theme 2: Social Marketing Strategies to Enhance Dissemination

(a) Marketing Strategies. Three studies highlighted the success of PA campaigns that targeted parents through various social marketing strategies such as [47–49] extensive consumer research [47,48], appealing branding [48] and brand affinity (i.e., messaging that aligned with the parents' values). Some marketing strategies related to dissemination included paid media advertising, contests and community events, and collaborations to promote parent support for PA [49].

(b) Tailoring Dissemination for Subgroups of Parents. Two studies discussed the use of tailoring to optimize dissemination of messages to subgroups of parents [48,49]. Tailored dissemination approaches such as messages in different languages or disseminated by ethnic organizations enhanced parents' attention to messages, perceptions of relevance and subsequent motivation [48] which was successful in promoting parent support for PA [48,49].

(c) Brand Equity. Two studies discussed the use of brand equity as dissemination strategy [15,47]. The first study used popular television characters as a strategy to disseminate PA messages. The strategy led to increased brand equity over a two-year period [47]. The second study highlighted the importance of promoting feelings of credibility and loyalty which increased parents' brand equity after six months and parent support for PA [15].

3.4.10 Theme 3: Messages That Target the Dissemination Preferences and Suggestions of Parents

(a) Preferred Message Dissemination Approaches. Seven studies discussed parents' preferred PA message dissemination approaches which included: multi-platform dissemination approaches [34,50,52] including both digital (i.e., social media, apps, websites) and traditional (i.e., brochures, magazines, television, or radio) forms of dissemination [34,53], text messaging [54,55], and unique forms dissemination (e.g., storybooks, community "parent nights") [50,51]. Regardless of dissemination method, parents prefer to receive messages from credible sources such as community centres, public health institutions, schools, doctors, or government agencies [34].

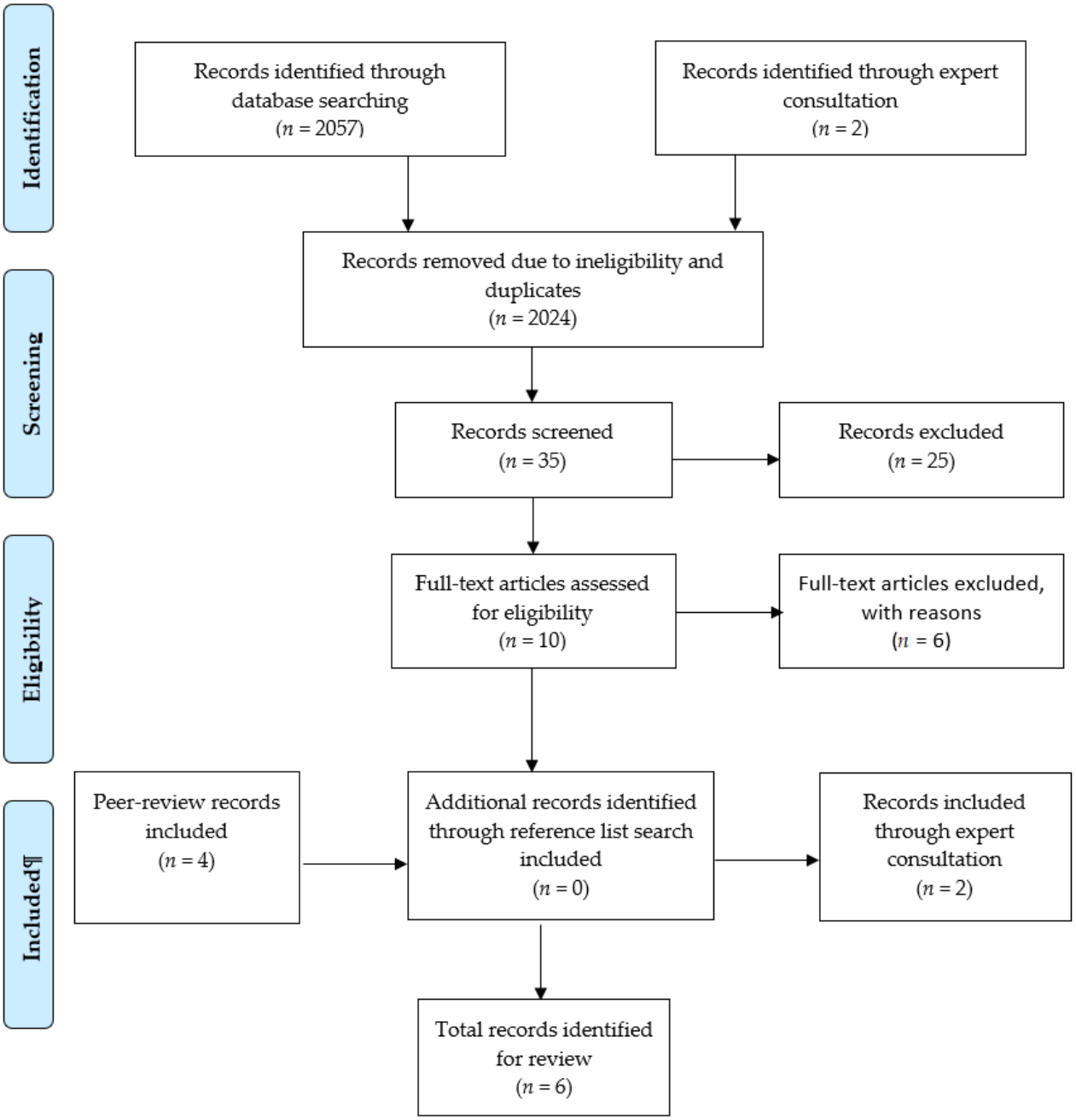
3.5 Results Regarding Parents of Children with Disabilities

3.5.1 Search Results Regarding Parents of Children with Disabilities

A total of 2,059 records were identified for screening (*n* = 2,057 from database searches, *n* = 2 from expert consultations, *n* = 0 from hand searching). Following removal of duplicates and records that did not meet inclusion criteria (*n* = 20,24), 35 studies remained. After reviewing these records according to inclusion criteria, six studies were included regarding the secondary purpose of the review (See Figure 2).

Figure 2.

PRISMA Study Selection Flow Chart Regarding Parents of Children with Disabilities


Identification
Screening
Eligibility
Included¶
Records identified through database searching (n = 2057)
Records identified through expert consultation (n = 2)
Records removed due to ineligibility and duplicates (n = 2024)
Records screened (n = 35)
Records excluded (n = 25)
Full-text articles assessed for eligibility (n = 10)
Full-text articles excluded, with reasons (n = 6)
Peer-review records included (n = 4)
Additional records identified through reference list search included (n = 0)
Records included through expert consultation (n = 2)
Total records identified for review (n = 6)

3.5.2 Evidence Characteristics

All six studies were empirical and were non-experimental designs (five qualitative and one content analysis) and took place in Canada (n = 5) and the UK (n = 1). Participants were parents with at least one CWD (age 5–21 years).

3.5.3 Summary of Main Findings: Development of Physical Activity Messages Targeting Parents of Children with Disabilities

Two themes and three subthemes emerged regarding the development of PA messages targeting parents of CWD. Main relevant findings are presented in Table 4.

Table 4.

Literature Regarding the Development of Physical Activity Messages Targeting Parents of Children with Disabilities

Theme	Subtheme	Articles Identified	Main Relevant Findings	Recommendation for PA Message and Information Development
1) Common barriers to parent support for pa among parents of CWD	(a) Lack of information	[17,56–60]	One content analyses of PA websites for CWD found that less than 25% of the websites provided accurate information or appropriate knowledge-based information (e.g., PA recommendations, definitions of PA, and barriers) [60]. A lack of access to accurate and disability-specific PA information can create feelings of frustration among parents of CWD [17,56–59] which can negatively influence motivation to provide support for PA. For example, mothers assessing the Canadian movement guidelines described them as "incompatible with the abilities, experiences, and needs of CWD" [57]. Parents of CWD have also	Messages targeting parents of CWD should focus on addressing the lack of disability specific information available to parents. Such messages can include information regarding clear and concise PA definitions and types of programming available, details regarding accessibility, inclusivity and support available, information regarding safety, and ideas for facilitating PA at home.

			expressed concern regarding the lack of clarity around the use of terms such as “inclusive” or “accessible” with PA messages [17,59]. Parents have expressed a need for inclusive images and modifications for certain behaviours within PA messages [57].	
	(b) PA barriers salient to parents of CWD	[17,56–59]	Commonly reported barriers included high costs of program participation [57], transportation coordination [57], lack of disability-specific PA opportunities [58], lack of targeted PA information [17,58,59] and social inclusion [56]. The literature discussed the extraordinary efforts that are required for parents of CWD to support their child’s PA while overcoming barriers and balancing safety concerns with independence [17,56,59]. Heightened concerns regarding their children’s safety during PA participation is a prevalent issue for parents of CWD [56,59]. Parents have directly expressed a desire for information regarding the safety of PA opportunities and specific guidelines for children with varying disabilities [17,56,57].	Messages targeting parents of CWD should address common barriers that they experience (e.g., transportation coordination, cost of programs, safety, and social inclusion). Some suggestions include providing information regarding program staff, using inclusive images and providing safety information. Such messages can help parents feel prepared to overcome certain barriers they experience.
2) Messages that target psychosocial antecedents of parent support for PA among parents of CWD	(a) Theoretical predictors of behaviour change	[60]	Literature highlights a lack of theory or evidence-based information with the PA website content targeting CWD [60]. Messages targeting self-efficacy were the most common source of messaging targeting a theoretical predictor of behaviour change, while less than 10% of web-content included messages targeting self-regulation, self-monitoring, and planning [60].	Messages targeting parents of CWD should target theory-based constructs such as pre-intentional factors (e.g., attitudes, perceived behavioural control and subjective norms) and post-intentional factors (e.g., behavioural regulation and planning) to enhance

	message effectiveness. Messages should facilitate planning and self-regulation regarding support for PA as such information is significantly lacking for parents of CWD specifically.

3.5.4 Theme 1: Common Barriers to Parent Support for Physical Activity Among Parents of Children with Disabilities

(a) Lack of Information. Six studies discussed a lack of PA messages targeted toward parents of CWD as a barrier to providing parent support for PA as well as an important consideration for message development targeting these parents [17,56–60]. The lack of targeted PA information resulted in feelings of frustration among parents of CWD [56,57,59]. The following types of PA information were identified as specifically lacking and desired by parents of CWD: (a) clear and consistent definitions of terms used to describe PA programming (e.g., accessible, inclusive, adapted) [34,59], (b) details regarding the accessibility and inclusivity of PA activities [57,59], (c) information regarding safety considerations for specific PA activities [17], d) information regarding support options available with programs [58,59], and e) ideas for facilitating PA at home through tools such as checklists or choice boards [17].

(b) PA Barriers Salient to Parents of CWD. Five studies discussed common barriers salient to parents of CWD as important to consider such as PA costs, time constraints, lack of accessibility or support [57], lack of disability-specific PA opportunities [58], lack of targeted PA information [17,57,59], social inclusion [56], and safety [56,57,59]. Three studies highlighted the extraordinary efforts that parents of CWD reported to overcome barriers to supporting their children's PA [17,56,59]. The following messaging approaches were suggested: (a) provide

information regarding coaches or program staff training [59], (b) use inclusive images [17,57], and (c) include information regarding the safety of PA programs and opportunities [56,57,59].

3.5.5 Theme 2: Messages That Target Psychosocial Antecedents of Parent Support for Physical Activity Among Parents of Children with Disabilities

(a) Theoretical Predictors of Behaviour Change. One study discussed the need for theoretically based PA messages targeting parents of CWD as a consideration for message development targeting parents of CWD [60]. For example, less than 10% of the PA website content targeting parents of CWD included messages targeting self-regulation, self-monitoring, and planning [60].

3.5.6 Dissemination of Physical Activity Messages Targeting Parents of Children With Disabilities

One theme and one subtheme emerged regarding the dissemination of PA messages targeting parents of CWD. Main relevant findings are presented in Table 5.

Table 5.

Literature Regarding the Dissemination of Physical Activity Messages Targeting Parents of Children with Disabilities

Theme	Subtheme	Articles Identified	Main Relevant Findings	Recommendation for PA Message and Information Dissemination
1) Dissemination Preferences and Suggestions of Parents of CWD	(a) Preferred dissemination approaches	[17,58,59]	Parents of CWD can benefit from a multi-platform approach to message and information dissemination [17,58]. Parents of CWD expressed desire for information that is easily accessible and disseminated through credible and reliable sources [17,58,59]. Parents desire a "central hub" for	Messages targeting parents should utilize dissemination strategies that parents of CWD prefer. Some suggestions include a "central hub" for information, information disseminated by credible sources, and a multi-platform approach.

	finding targeted PA messages [17]. Many parents of CWD seek PA information and learn from other parents of CWD [17,58]. As such, communication spaces such as blogs, chat rooms, and message boards are of value to support parents in finding and sharing PA information [17].	

3.5.7 Theme 1: Dissemination Preferences and Suggestions of Parents of Children with Disabilities

(a) Preferred Dissemination Approaches. Three studies discussed the PA message dissemination preferences of parents of CWD which include [17,58,59]: a multi-platform approach to PA message dissemination from credible and reliable sources [17,58,59] that includes a "central hub" for PA information [17]. Preferred dissemination channels include blogs, chat rooms and message boards to find and share PA information with other parents of CWD [17].

3.6 Discussion

This is the first known systematic scoping review to identify peer-reviewed literature regarding the development and dissemination of PA messages for parents, while also identifying additional consideration for targeting parents of CWD.

3.6.1 Strategies Regarding the Development of Physical Activity Messages

The framework for knowledge transfer [24] suggests that organizations should develop information from a breadth of research to provide enhanced validity and justification for message content development. Therefore, when developing PA messages for parents, it is important to

consider the results of multiple studies to make an evidence-informed decision regarding the development of PA message content. Despite the mixed findings regarding message framing [17,33], it is cautiously recommended that PA messages targeting parents should be gain-framed. Gain-framed messages have been considered optimal for promoting health prevention behaviours such as PA among varying populations [61] and among parents [22] as well as proxy behaviours to support PA (e.g., parent support) [61]. Gain-framed PA messages are often rated more favourably than loss-framed [11,62] and should maintain focus on what parents can do to encourage and support PA for their child [38,63,64].

Although parents generally rank PA as a high priority for their children [5], they often encounter barriers to providing support for PA [34–37]. Taking identified barriers into consideration [34–37], providing information regarding common barriers may serve to enhance parents' self-efficacy or perceived behavioural control regarding their abilities to provide support for PA. Previous messaging campaigns targeting parents have been effective in addressing common barriers to support for PA [36,47,49]. While some barriers (e.g., financial limitations, weather) may be difficult to address via messages alone, providing parents with informational tools or examples may help to manage barriers [30] (e.g., ideas for free, indoor, or low-cost PA).

Another barrier identified for this review was information regarding PA guidelines. Although many parents value PA guidelines [37], unclear guidelines can act as a source of confusion [34,37,38]. Parents desire clear PA guidelines, consistent definitions, examples of different types of PA at various intensities, and suggestions for assessing and monitoring a child's PA levels [34]. Organizations wishing to target parents should take these needs into consideration and include some of this desired information when developing PA messages. PA messages should be supportive, positive and pragmatic to evoke feelings of motivation and

achievement [34,38] rather than messages that make parents feel guilty for their child's inactivity, which are demotivating [39]. Similar findings have been observed among parents regarding other behaviour guidelines (e.g., sedentary behaviour) [64]. Using messages to address barriers to supporting child PA can boost parents' motivation through enhanced perceived behavioural control, which has been identified as the strongest predictor of child PA [5,65]. Messaging strategies that target parents' attitudes may help parents recognize the crucial role that PA plays in child development and well-being [52] and these messages can serve as a booster to motivate parent support for PA [30]. Messages should also specifically target attitudes toward parent support for PA as it is the strongest predictor of parents' motivation [5]. Given that affective attitudes impact parents' intentions to provide support for PA over time, PA messages should pay particular attention to the affective benefits of parent support for PA in addition to its instrumental benefits [5].

3.6.2 Unique Message Development Considerations for Parents of Children with Disabilities

Although many message development strategies may be universal to all parents, barriers that are salient to parents of CWD should be considered. A lack of targeted PA messages is a significant barrier to parent support for PA among parents of CWD [17,56–60]. There has been a call for inclusive and targeted approaches to PA message development targeting those within the disability community [23]. Effective PA messages must meet the needs of a target audience (i.e., parents of CWD) [17] and targeted PA messages are desired by parents of CWD [17,57,59]. There is great value in providing disability-specific PA information to parents of CWD [66] as it can help reduce their perceptions of barriers and enhance self-efficacy to provide support for PA [17].

PA messages targeting people with disabilities tend to lack theory-based content [66] and it is recommended that PA messages targeting parents of CWD include content regarding theoretical predictors of behaviour change to further enhance message effectiveness [11]. For example, there may be value in developing messages that target the important predictors of parent support for PA among parents of CWD such as perceived behavioural control, subjective norms, attitudes toward parent support for PA, motivation, behavioural regulation and planning [67–70]. Parents of CWD have specifically expressed a desire for messages regarding tools and strategies to support their own planning and self-regulatory behaviours [17].

3.6.3 Strategies Regarding the Dissemination of Physical Activity Messages

The framework for knowledge transfer [24] highlights the importance of using evidence-informed message dissemination efforts as well as engaging researchers and community-based organizations to identify optimally effective message dissemination strategies. PA messages targeting parents should be disseminated in a way that maximizes cognitive processing pathways (i.e., awareness and recall). While awareness and recall do not necessarily directly translate into changes in parent support for PA [10,42,45], PA messages that utilize dissemination strategies to effectively evoke awareness and recall may positively affect antecedents of behaviour such as attitudes and perceived behavioural control [13,22,71]. While more research is needed to understand practices to garner awareness and recall, one suggested dissemination strategy is the use of consistent and repeated exposure of PA messages [14].

Social marketing strategies such as message tailoring, brand equity, channel placement, and outcome evaluations [71–73] may optimize dissemination efforts [74,75]. While these marketing strategies have only been used within a small number of PA campaigns and among varying populations, they hold promise as an effective strategy to enhance the dissemination of

PA messages to parents. One social marketing strategy includes tailoring dissemination strategies to subgroups of parents to meet individual-level needs and preferences [76]. Some examples include using media channels that are preferred by the target audience (e.g., mothers versus fathers, various age groups and city of residence) [76] or targeting parents of CWD [17]. Tailored dissemination strategies are thought to be more effective compared to generic or non-tailored messages [76] as they can improve parents' overall uptake of PA messages by enhancing attention, perceptions of relevance and subsequent motivation to provide support for PA [48]. Brand equity is another social marketing strategy which refers to the perceived value that a brand brings to a consumer [33]. Brand equity is an important component of PA message dissemination [77,78] and has been linked to increased parent support for PA [42,47]. PA message campaigns targeting parents may benefit from investing resources to build brand equity [41] which can be done by disseminating messages through sources that assure credibility and loyalty.

Parents prefer a combination of digital and traditional means of dissemination [34,53] to enhance message effectiveness [24]. Credible sources such as community centres, public health institutions, schools, doctors, or government agencies should disseminate PA messages [22,34] through various channels and times [79]. A multi-phase and integrated social marketing campaign is beneficial when disseminating PA messages to a target audience [80].

3.6.4 Unique Message Dissemination Considerations for Parents of Children with Disabilities

Many dissemination strategies may be universally effective. However, parents of CWD have expressed a need to feel understood as an audience [58]. Dissemination strategies that meet the needs and preferences of parents of CWD as an audience can optimize information seeking behaviours [81] and message effectiveness [24] while also enhancing important antecedents to behaviour change such as awareness and recall [13,70]. Consideration for the unique preferences

identified in this review (e.g., multi-platform approach, “central hub” for information, blogs, and chatrooms) are recommended when disseminating PA messages targeting parents of CWD via credible sources.

3.7 Strength and Limitations

This systematic scoping review is the first of its kind aimed at identifying strategies to inform the development and dissemination of PA messages targeting parents, while also identifying unique considerations for targeting parents of CWD. The results of this review contribute to the general PA messaging literature as well as informing PA message development and dissemination strategies that are inclusive of the needs of parents of CWD. Although the methodological rigor [25,26] is a strength of the review, there are several limitations that must be acknowledged. First, there was no assessment of the quality of the articles selected for the review which could lead to a risk of bias but this approach allowed for a breadth of the research to be included. Further, the purpose of this review was to identify literature regarding the development and dissemination of PA messages targeting parents. However, the message and dissemination strategies incorporated in the literature were not evaluated for effectiveness in this study. Evaluating the effectiveness of PA messages among parents and parents of CWD is an important next step to understand how to best develop and disseminate messages to these populations. Further, to improve the quality of future reviews on this topic, a criterion for the number of cited references should be considered when developing the results. Second, the inclusion criteria resulted in the selection of a relatively small number of articles. A broader inclusion criteria could retrieve articles from a multi-disciplinary perspective (e.g., broader fields of messaging, social marketing, other health behaviour promotion) that highlight other strategies and considerations that could be applied to the development and dissemination of PA messages

targeting parents. For example, research regarding the use of messages to promote other health behaviours may be useful in informing the development and dissemination of messages targeting parent support for PA. This may also help with yielding more studies to meet criterion for the number of cited references.

3.8 Conclusion

The results of this systematic scoping review have pragmatic implications in informing PA message development and dissemination in practical settings, and can inform the development of practice guidelines for creating and disseminating PA messages targeting all parents and parents of CWD. Future research is encouraged to explore message development and dissemination strategies from other areas of health promotion and social marketing to further inform how to optimally develop and disseminate PA messages to parents. Further, it is suggested that future research also consider various mechanisms of health behaviour change in order to move messaging research forward and understand which mechanisms might be best to target through the use of persuasive PA messages. The information synthesized within this review can be used to guide future research as well as PA organizations wishing to develop and disseminate messages to parents to motivate parent support for PA. This review provides unique considerations for the development and dissemination of PA messages targeting parents of CWD, which are important in addressing the call for inclusive PA messaging [23]. The development and dissemination of evidence-informed PA messages targeting parents can optimize their impact in motivating parent support for PA and ultimately PA participation among all children.

3.9 References

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CHAPTER 4 – Preface to Phase 3

4.1 Preface

The systematic scoping review from Phase 2 of this dissertation was used to inform a two-day meeting hosted in Toronto, Ontario, Canada in December 2019. An expert panel of researchers and stakeholders from community-based organizations (CBOs) that promote PA met and participated in a consensus process. The goal of this meeting was to gain consensus on a set of recommendations for the development and dissemination of PA messages targeting parents of CWD. The content of the systematic scoping review from Phase 2 guided the meeting and consensus process. Discussion and consolidation throughout the two-day meeting occurred and a set of seven recommendations were established. Upon several rounds of revisions amongst stakeholders, a final set of five recommendations were established (See Table 1). Full methodology for the establishment of the recommendations is in preparation for publication outside of this dissertation.

Table 1.

The final recommendations regarding physical activity message development and dissemination

It is recommended that community-based organizations provide families of children and youth with disabilities with:	
1.	Clear and consistent definitions of terms such as physical activity, adapted, accessible, integrated, and inclusive.
2.	Clear and detailed information about your physical activity programs, staff and facilities.
3.	Information about the specific benefits of supporting physical activity for children and youth with disabilities.
4.	Ideas, tools and resources to support physical activity participation, goal setting, planning, and progress.
5.	Information regarding strategies to help address barriers to physical activity participation among children and youth with disabilities.

The purpose of developing a set of recommendations was to guide CBOs in creating effective PA information strategies to promote PA for CWD. CBOs can use the recommendations to guide the development and dissemination of PA messages to target parents of CWD to motivate them to support their children's PA. Recommendation *#4. Provide ideas, tools and resources to support physical activity participation, goal setting, planning and progress* specifically addresses the lack of evidence-based resources such as planning tools that parents can use to plan to support their children's PA. Phase 3 of this dissertation was developed in response to Recommendation #4 as well as parents' desire for digitally-formatted informational resources to support their planning. In partnership with a software company, an evidence-based mHealth program called Plan to Move Your Kids, was developed to motivate parents of CWD to plan to support their children's PA. Phase 3 of this dissertation utilized the PRACTIS guide and focused on identifying facilitators and barriers to implementation of the mHealth program among parents of CWD.

The content within the PTMYK program was informed by the TPB and M-PAC model (Rhodes, 2017; Ajzen, 1991). The modules within the program targeted pre- and post-intentional factors such as attitudes and PBC from the TPB and planning and behavioural regulation from the M-PAC model. The post-intentional factors within the M-PAC model were the main focus of the PTMYK program as it aimed to enhance parents of CWD's planning related to parent support for PA. The program was designed to target a broad range of CWD rather than targeting specific disabilities and age groups. Therefore, the program content was inclusive of parents who had a child with *any* type of disability at *any* age. The program took place completely online over 12 weeks and was comprised of three self-directed learning modules. It is important to note that parents of CWD who joined the program have access to all 12 weeks of content meaning they

could move at their own pace throughout the program. Parents of CWD joined the program and became part of a "community" with access to daily content, learning modules, chat options with other parents, and a community "coach" who provided guidance and support to parents.

4.2 References

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Chapter 5: Phase 3 – Examining implementation facilitators and barriers of a mHealth program for parents of children with disabilities

5.1 Abstract

Children with disabilities (CWD) engage in less physical activity (PA) compared to children without disabilities. Strategies aimed at increasing PA among CWD should target parent support as it is one of the strongest correlates of PA among CWD. Planning is one strategy to enhance PA support behaviours among parents of CWD. Therefore, an evidence-based 12-week mHealth PA planning program was created that delivered PA messages aimed at helping parents of CWD plan to support their children's PA. Guided by the PRACTical Planning for Implementation and Scale-up (PRACTIS) guide, this study aimed to examine facilitators and barriers to the implementation of this mHealth program. Three parents of CWD engaged with the program and participated in an individual interview. Four themes were created using thematic analysis: (a) facilitators to program implementation (e.g., user-friendly interface, notifications to prompt program engagement and motivation to support PA), (b) barriers to program implementation (e.g., practicality issues, too much information and lack of community engagement, (c) suggestions for improvement (e.g., quick reminders, condensed information, tailored information and increased practicality, and (d) credible sources to support implementation (e.g., organizations and professionals). This is the first mHealth program aimed at motivating planning for parent support for PA among parents of CWD. These findings provide an understanding of the facilitators and barriers to implementation of an mHealth program targeting parents of CWD, which can inform the development and dissemination of future mHealth programs for this population. This study was funded by the Canadian Disability Participation Project.

5.2 Introduction

5.2.1 Mobile Health as a Strategy to Promote Parent Support for Physical Activity

Parent support for physical activity (PA) is one of the strongest correlates of PA among children with disabilities (CWD; Ku & Rhodes, 2020; Siebert et al., 2017; Kowalchuk & Crompton, 2009). However, parents of CWD often experience barriers to providing support for PA and have expressed an ongoing need for inclusive and accessible mobile PA information (Luymes et al., 2021; Bassett-Gunter et al., 2017a). For example, parents of CWD have expressed the need for "on-the-go" PA messages that can be accessed through mobile devices (Bassett-Gunter et al., 2017a). Mobile health (mHealth) interventions use mobile communications to deliver health information (Nacinovich, 2011). In recent years, mHealth has grown in popularity because it offers a convenient and low-cost option for delivering health behaviour interventions (Aranda-Jan et al., 2018). There may be value in promoting parent support for PA through the use of online and technology-based information (Tristani et al., 2017). Parents of CWD (i.e., autism spectrum disorder) who participated in a mHealth PA intervention reported the program to be a useful and feasible tool to help increase their children's PA (Esentürk et al., 2021). mHealth interventions may be an effective strategy to promote parent support for PA among parents of CWD which may lead to increased PA among CWD. However, there are no known mHealth programs that directly target planning to provide support for PA among parents of CWD.

5.2.2 Planning to Promote Parent Support for Physical Activity

Parents of CWD have suggested a need for PA informational resources that support self-regulatory strategies such as planning (Bassett-Gunter et al., 2017a) because planning can help facilitate good intentions into actual support for PA behaviours (Jaarsma & Smith, 2018; Tanna

et al., 2017; Schwarzer et al., 2011). However, there is a lack of available tools to help parents in their self-regulatory efforts to support their children's PA. A content analysis of online PA information targeting parents of CWD found that less than 10% of PA website content included information about self-regulatory strategies like planning and self-monitoring (Tristani et al., 2017). There is currently only one known study that examined a PA support planning tool that provided PA messages targeting parents of CWD (Tanna et al., 2017). In this study, parents of CWD were randomized to an experimental group through which they participated in a telephone-assisted informational intervention to guide planning for supporting their children's PA or a control group. Self-reported parent support for PA did not differ between groups suggesting that the planning intervention ultimately did not work to change parent support behaviours (Tanna et al., 2017). This could be in part due to the pen and paper format of intervention which may not have been a facilitator to the implementation of the planning tools among parents of CWD. Still, in the Tanna and colleagues (2017) study, behavioural regulation was the strongest predictor of parent support for PA post-intervention suggesting that self-regulatory tools and strategies can be useful for motivating parent support. Therefore, it may be valuable to examine a mHealth program which meets the need to engage with digital PA interventions among parents of CWD to help planning to provide support for PA.

5.2.3 The Plan to Move Your Kids mHealth Program

In an effort to develop and deliver a digital PA intervention targeting planning to support PA among parents of CWD, the researchers partnered with a software company to create a mHealth program called Plan to Move Your Kids (PTMYK). The PTMYK program was evidence-informed and targeted key theoretical constructs from the theory of planned behaviour (TPB; Ajzen 1991) and multi-process action control (M-PAC; Rhodes, 2017) model such as

attitudes, self-efficacy and planning. The PTMYK program delivered PA messages aimed at motivating parents of children with *any* type of disability of *any* age to plan to support their child's PA. The PTMYK program was unique in that parents of CWD were able to engage with weekly content and activities at their own pace while learning about the benefits of PA and supporting PA for their children, as well as how to create and self-monitor a plan to support PA. Parents also had the opportunity to engage with other parents of CWD within the program and had access to a community coach for support.

5.2.4 Implementation and The PRACTical Planning for Implementation and Scale-up (PRACTIS) Guide

Implementation (i.e., "what an intervention consists of when it is delivered in a particular setting"; Durlak & DuPre, 2008, p. 329) is an important factor to consider when developing an intervention. Durlak and DuPre (2008) identify the components of implementation such as: (a) the target audience of the intervention and their responsiveness, (b) how well the intervention is delivered, (c) intervention reach (i.e., use of the intervention), and (d) changes made in the original intervention for future implementation. It is also important to consider sources or providers (i.e., organizations or people) who can disseminate the intervention to the intended audience in order to facilitate implementation by the end-user. To understand implementation of the mHealth program in this study, the PRACTical planning for Implementation and Scale-up (PRACTIS) guide was used (Koorts et al., 2018). The PRACTIS guide acts as an outline for researchers and stakeholders to translate evidence-based interventions into practice (Koorts et al., 2018). The PRACTIS guide asks researchers and stakeholders to consider implementation facilitators (i.e., factors that promote implementation) and barriers (i.e., factors that hinder implementation) such that these factors can be prioritized and addressed in the development and

refinement of interventions. The PRACTIS guide is useful for informing implementation of PA interventions among a variety of populations (Wong et al., 2022; Teychenne et al., 2021; Hunt et al., 2020) and the model highlights the need to identify and contextualize implementation facilitators and barriers from the perspective of key stakeholders. In the current study, key stakeholders were considered as the end-users of the mHealth program (i.e., parents of CWD).

5.2.5 Facilitators and Barriers to the Implementation of mHealth Physical Activity Interventions

One way to understand strategies to optimize implementation is to identify facilitators and barriers (Koorts et al., 2018). There is limited research regarding facilitators and barriers to the implementation of mHealth interventions targeting parents of CWD. However, when examining a mHealth PA intervention for inactive cancer patients, facilitators to implementation included end-users' attitudes toward PA, motivation, social factors and organizational factors while barriers to implementation included lack of familiarity with the intervention along with lack of motivation and time (Martin et al., 2021). Other facilitators to implementation of mHealth interventions included acceptability among end-users and stakeholder collaboration (Aranda-Jan et al., 2014) while barriers included technology-related factors (van Olmen et al., 2020) and individual-level factors such as ability (Engelsma et al., 2021). It is important to understand implementation facilitators and barriers of mHealth interventions from an end-user perspective to optimize uptake of the program as well as the development of the program. The purpose of this study was to identify facilitators and barriers to the implementation of a mHealth program targeting planning for parent support for PA among parents of CWD which can inform program development. A secondary purpose of this study was to identify sources that may support implementation of mHealth programs for parents of CWD.

5.3 Methods

Qualitative methodologies were employed to identify perceived facilitators and barriers to the implementation of a mHealth program. An interpretivist paradigm was used which acknowledges that the interpretations of reality are constructed subjectively by participants and researchers through the meanings and understandings drawn from their experiences. The researchers' aim is to interpret participants' experiences in the most meaningful way and derive meaning from those experiences through the exploration of themes (Perski et al., 2017; Crotty, 1998). The interpretivist paradigm leans heavily on the dialogue between participants and researchers to expose truths to a phenomenon (Angen, 2000). The interpretivist paradigm has been used in research involving evaluations of PA messages among CWD (Larocca et al., 2020) and research examining the experiences of parents of CWD when searching for PA information (Natkunam et al., 2020). Thematic analysis was used to identify themes based on significant patterns within the data (Braun & Clarke, 2019; Braun et al., 2016).

5.3.1 Participants

Participants were recruited through social media, a local community-based organization CBO), and existing participant databases. Eligibility criteria included: (a) being a parent of at least one CWD (disability was broadly conceptualized via self-report in order to favour inclusion) of any age, (b) having access to a smartphone and (c) having the ability to read and write in English. Participants gave informed consent and received an honorarium of $25.00 for their participation.

5.3.2 Procedure

Parents of CWD participated in a mHealth program (i.e., PTMYK program) over a 12-week period. At the end of the 12-week program, participants were sent a link to complete a

short demographic questionnaire and schedule a one-on-one interview to further discuss their perceptions of facilitators and barriers to implementation of the program. In the demographic questionnaire, participants self-reported sex, age, number of children, ethnicity, marital status, education and household income. Participants also reported the following information about their CWD: type of disability, age, sex, whether the disability was acquired or congenital, as well as their child's PA and screen time behaviours over the past week. The one-on-one interviews took place via Zoom and lasted between 28-36 minutes (mean=32 minutes).

5.4 Qualitative Interview Guide

An interview guide comprised of 12 questions was developed to identify facilitators and barriers to the implementation of the mHealth program. Example questions included: *What aspects of the mHealth program acted as/could act as a facilitator for your use of the app?* or *what made this program easy to use? What aspects of the mHealth program acted as/could act as a barrier for your use of the app?* or *what made this program difficult to use? What suggestions do you have for how the program could be improved to address barriers and facilitate more use of the program?* and *Are there certain organizations you think would be credible to deliver this program?*

5.5 Data Analysis

Data analysis was informed by a six-phase thematic analysis methodology (Braun et al., 2016): (a) Phase 1: familiarizing, (b) Phase 2: coding, (c) Phases 3: theme development, (d) Phase 4: refinement, (e) Phase 5: naming, and (f) Phase 6: write up. Thematic analysis highlights an iterative, reflexive and natural process (Braun et al., 2016). Audio-recorded interviews were transcribed verbatim and all participants were given pseudonyms. Prior to coding, all transcripts were compared with the audio recording to ensure they were transcribed with accuracy. Once

accurate transcription was confirmed, the thematic analysis process began. During Phases 1 and 2 of data analysis (familiarizing and coding), the first author read each transcript at least twice and looked for patterns in the data while also keeping notes about reflexive thoughts related to the interviews, previous literature, and initial coding idea (Braun & Clarke, 2019). Next the first author manually coded each transcript line by line based on initial codes related to previous literature about facilitators and barriers to implementation and the PRACTIS guide (Koorts et al., 2018). A final round of coding using an inductive approach was performed to consider additional codes that may not have been directly related to the PRACTIS guide to determine if there was a necessity for the development of new codes. No further codes emerged. Digital spreadsheets were kept to create a coding manual, organize codes, descriptions and data excerpts (Braun & Clarke, 2019). In Phases 3-5 (theme development, refinement and naming), the first author grouped similar codes together and developed overarching themes and subthemes. The first author consulted with other authors who are researchers in the field of in parent support for PA and health promotion among families of CWD. Once the team agreed on themes and subthemes as well as their definitions and content, the final phase (i.e., producing the report) was completed.

5.5.1 Trustworthiness

The following measures were taken to support the trustworthiness of the data. First, the interviews were transcribed within two days of the interview taking place to allow for easier recall and reflection during the transcription process. The first author transcribed all the interview data which allowed for cross-reference with notes taken during the interviews. During the coding process, the first author consulted the other authors on the codes and themes created to ensure as little bias as possible. To ensure dependability, the first author clearly documented

the entire coding and analysis process. Once a complete draft of the manuscript was available, it was emailed to the participants to ensure that they felt their voices were accurately captured.

5.6 Results

5.6.1 Participant Demographics

Self-reported demographics for participants (i.e., parents) and their CWD are described in Table 1 and Table 2, respectively.

Table 1.

Demographics - Participants

Demographic Variable	Participant 1 (Mary)	Participant 2 (Eileen)	Participant 3 (Patrick)
Sex	Female	Female	Male
Age range (years)	35-44	55-64	45-54
Number of children	4	4	2
Education	Some college (no degree)	College degree	University – Bachelor-level
Household income	$35,000-49,000	$35,000 or less	$150,000 or more
Ethnicity	Caucasian	Indigenous	Caucasian
Marital status	Divorced	Married	Common-law

Table 2.

Demographics – Children with Disabilities

Demographic Variable	Participant 1 (Mary)	Participant 2 (Eileen)	Participant 3 (Patrick)
Sex	Male	Male	Male
Age (years)	14	28	23
Disability	Autism Spectrum Disorder, Attention Deficit Hyperactivity Disorder, learning disability	Down Syndrome, impaired vision	Down Syndrome
Congenital/Acquired	Congenital	Congenital	Congenital
# of days engaging in PA/week	2	2	5
Weekly screen time (minutes)	1,260	480	900

5.6.2 Qualitative Interviews

Four main themes were established: (a) facilitators to program implementation, (b) barriers to program implementation, (c) suggestions for improvement, and (d) credible organizations to support implementation. Table 3 describes the subthemes and each main theme.

Table 3. *Themes and Subthemes*

Main Theme	Subthemes
1. Facilitators to Program Implementation	a. Notifications to prompt program engagement
	b. User-friendly interface
	c. Motivation to support PA
2. Barriers to Program Implementation	a. Practicality issues
	b. Too much information
	c. Lack of community engagement
3. Suggestions for Improvement	a. Quick reminders
	b. Condensed information
	c. Increased practicality
	d. Content tailored to their child's specific needs
4. Credible Sources to Support Implementation	a. Local organizations
	b. Professionals

5.6.3 Theme 1: Facilitators to Program Implementation

a. Notifications to prompt program engagement. Parents received mobile phone notifications to engage with the mHealth program when daily content was posted by the community coach or when activity within the program was detected from other parents (i.e., posts, comments, likes and messages). This facilitated program implementation among parents as Patrick explained that the notifications "did sort of jog me to, oh, I gotta make sure [to log on]" and "it was also a reminder that, 'oh yeah, you know how are we doing on that?'" This suggests that the notifications acted as a reminder for parents to engage with the mHealth program as well as helping some engage in planning to support their child's PA which facilitated more use of the program. Similarly, Mary explained that the notifications prompted her to think about planning for her child's PA by stating:

> I get the daily notifications or whatnot even though I possibly didn't log in on a daily basis like it was there. It's at the back of my mind and I have to say that like since starting [the program], even though I wasn't fully immersed, we got YMCA passes, we bought a treadmill, that sort of thing. So it definitely made me like think more and plan around how I can make it easier.

b. User-friendly interface. Parents commented on the mobile interface of the program and how the program was displayed in a digital format which facilitated implementation of the program. Mary liked the use of visuals and images in the form of infographics commenting "the full charts or like that kind of stuff was good." Eileen appreciated how the program was easy to use explaining "you know, go here, press that, next...it flowed well." Eileen also explained that the program was "pleasing to look at, so aesthetically it looked nice." These comments suggest that aesthetics, clarity and overall user-friendliness are important facilitators to the implementation of a mHealth program for parents of CWD.

c. Motivation to support PA. Two parents noted that the reason they decided to sign up for the mHealth program was their motivation to get their child involved in PA suggesting that motivation facilitated the implementation of the mHealth program. For example, Mary explained that "one of the biggest issues I have right now, or struggles I should say, is trying to get my kids active. So that was the main reason. So I thought why not give it a try." Eileen stated that "It's always trying to forward...you know...making sure our child has the best and the most advantages. So if there's something out there that could help, always worth looking into." Overall, parents suggested that their motivation to support their children's PA participation facilitated their implementation of the mHealth program.

5.6.4 Theme 2: Barriers to Program Implementation

a. Practicality issues. All three parents highlighted issues regarding the mHealth program's practicality as barriers to implementation. All parents suggested that some of the content and activities were not practical to implement on their mobile devices. For example, Mary explained that "for an app, it wasn't great for me to learn from right? So I printed it out" highlighting that the format of the content acted as a barrier to learning and ultimately to implementation. Similarly, Eileen explained that she usually accessed the program late at night and found the weekly activities difficult to complete on her phone as the PDFs were not fillable. Eileen explained "yeah, if [the activities] were on the computer, I would do it. I'm not going to sit down for the evening and then you know, fire up the printer and do this and you know, write stuff down...I think the concept was a good idea but to practically do it, it really didn't work as a parent." The way in which the content was formatted acted as a barrier to implementation for Patrick as well as he explained he does not like "typing anything of length on [his] phone." These practicality issues raised by parents of CWD suggested that format of the content within the mHealth program acted as a barrier for them to fully engage in features of the mHealth program, especially the content and weekly activities.

b. Too much information. One parent highlighted that the mHealth program included too much information which acted as a barrier to daily implementation. Mary explained:

> Like so when I'm using an app like I want it quick, like a notification or like a quick reminder or like a quick plan like you know versus as much as information. Do you know? I don't know if I'm making myself clear but I like the information as a learning component, but as an app that I would be using on a daily basis, I would need that to be

more a lesson, I guess. More compact, right? Something I can do quicker. Then I would be more inclined to use it on a daily basis.

c. Lack of engagement from other parents. One unique element of the mHealth program was the opportunity for parents to network with each other through messages, discussion posts and comments. However, two parents noted that the lack of engagement from other parents of CWD was a barrier to implementation. Eileen expressed that she had expected to have the opportunity to communicate with other parents: "I know there was obviously other parents or caregivers involved, I didn't feel like there was a lot of interaction. I felt like I was talking to you all the time, which is fine. But I didn't get the kind of community thing that I was looking for." Similarly, Patrick was also looking for a sense of community as he explained "maybe this was just the people that we had or whatever, there didn't seem to be like it, it didn't feel like a real community because ...there just weren't a lot of respondents, people answering and engaging with the community posts." These findings suggest that a lack of engagement can impact responsiveness to a mHealth program and act as a barrier to implementation when it is regarding use of the program.

5.6.5 Theme 3: Suggestions for Improvement

a. Quick reminders. Two parents suggested that the inclusion of quick reminders would improve the implementation of the program. For example, Carol desired reminders even if no activity was detected in the mHealth program, suggesting "like...this is a nice quick activity you can do after dinner" while Eileen desired emails outside of the app "like a push out of some type of trigger email. I don't know that we want to see them every single day, but just maybe every couple of days."

b. Co*ndensed information*. One parent suggested the information be condensed to facilitate program implementation. For example, Mary's suggestion for an improvement would be the use of a "one-pager" where information is condensed for parents to read quickly.

c. *Increased practicality.* Although the mHealth program was delivered through mobile phones, most of the activities required parents to print PDFs to complete with a pen and paper which acted as a source of frustration and ultimately a barrier to implementation for parents. Two parents, Mary and Eileen, suggested the need for the mobile software of the mHealth program to support fillable PDFs. For example, Mary suggested that she would rather "fill it out on your phone and then print it and put it on your fridge" while Eileen echoed this sentiment and explained "if everything could be compacted, I would do it...because I didn't do any of the print off and scan it back...it didn't work for me." One parent was also frustrated because the mHealth program did not track their progress over the 12 weeks of content. Eileen remarked that she was confused as to what module she was working on and how much she had already completed as she explained "I don't know if there's a way to attach my profile with the length of the program and say you are now in week four, this is February 1st. You're now in week six, so when I go in, it's like 'oh yeah, I'm this far in the program'. It just seems better than 'where am I? How many weeks have I been doing this?'" Addressing the suggestion to track progress throughout the program along with other barriers could improve implementation.

d. *Content tailored to their child's specific needs*. Parents explained that while the information in the mHealth program was helpful, one improvement would be the inclusion of more content regarding the needs related to their child's specific disability. For example, Eileen suggested that the information within the mHealth program be tailored to a variety of ability levels and types of disabilities to improve the program's implementation among parents of

CWD. She explained “I don’t know how you would kind of segregate it into maybe ability level...but I think maybe a little bit more segregated to not make it quite so broad would be more interesting and relevant.” To exemplify this, Eileen drew on her own experiences and explained:

> Yeah, so resources and discounts and where you can go. And who can help. You know, help you plan the activity? I don’t know if you can break it down to regions or areas. You know [blinded for peer review], there’s this this and this available. Did you know about accessed entertainment card? [Local organization that promotes PA for CWD] will help you with some paying for activities. So if you could kind of incorporate that into the besides tracking it, here’s some help. To make sure it happens.

Similarly, Patrick explained that he desired a component within the program that allows parents to discuss with each other about “tips and tricks and ideas and stuff” where parents can share different ideas to get their child active to improve implementation of the mHealth program.

5.5.6 Theme 4: Credible Sources to Support Implementation

a. Local organizations. Parents of CWD stated that local organizations such as recreation centres, camps and non-profit organizations were credible and reputable to support the implementation of the mHealth program. Mary identified local organizations in her geographical area such as “the [local organization that promotes PA for CWD]. They’re really good and I would trust the information from them.” Similarly, Patrick identified a local organization called [local organization that promotes PA for CWD], while Eileen explained that camps and non-profit organizations were credible organizations to support implementation as well.

b. Professionals. Parents of CWD identified a number of professionals to support the implementation of the mHealth program such as doctors, pediatricians, physical therapists, and school professionals. For example, Patrick explained:

> If I'd received information about the program through, you know, through our family doctor and then you know absolutely through the school, you know that's a great one 'cause they do have resources for all sorts of other things...But nothing like this, right? And it's like, well, it fits right in. You're giving me all of these other resources. Why not something about health?

5.7 Discussion

5.7.1 Facilitators to Program Implementation

Parents of CWD highlighted several factors that acted as facilitators to the implementation of the mHealth program including: (a) notifications to prompt program engagement, (b) user-friendly interface and (c) motivation to support PA. Understanding facilitators to implementation from the user perspective can help intervention developers create mHealth programs that are targeted to user needs. Technology-based factors such as user-centred design and content have been identified as facilitators to the use of mHealth interventions (Shabir et al., 2022). In the current study, parents of CWD identified two technology-based facilitators of implementation: notifications and a user-friendly interface. A user-centred design is important to ensure implementation is optimized. This can include tailoring information to meet the needs of users (i.e., preferences and expectations) and their goals (Shabir et al., 2022). Parents of CWD have expressed their needs regarding tools and resources to support PA participation for their CWD (Bassett-Gunter et al., 2017a) including the desire for quick messages and information that helps them plan for their child's PA. When developing mHealth programs targeting parents of CWD, it may be important to take these needs and preferences into consideration. Providing parents with information that is relevant to them can help facilitate implementation which can in turn help parents feel more equipped and prepared to support their children's PA. For example, parents

desired more information that was tailored to their children's needs which may have facilitated more use of the mHealth program.

Motivation to support PA was identified as a facilitator to implementation of the mHealth program. This finding corroborates previous literature that identifies motivation as a facilitator to using mHealth intervention programs (Shabir et al., 2022; Martin et al., 2021; Ali et al., 2018). Motivation is as an important component to ensure continued use of a mHealth program because motivation is a significant predictor of behaviour change (Ajzen, 1991) and it has been suggested that PA interventions targeting parents of CWD should target theoretical predictors of behaviour change (Larocca et al., 2021; Bassett-Gunter et al., 2017a; Latimer et al., 2010). Considering that parent support for PA is one of the strongest correlates of PA among CWD (Siebert et al., 2017; Kowalchuk & Crompton, 2009), targeting psychosocial antecedents to parent support for PA (i.e., motivation) is necessary to facilitate implementation of interventions. Providing PA messages in a mHealth intervention that are relevant and target the needs of parents of CWD (Bassett-Gunter et al., 2017a) can motivate them to plan to support their children's PA which can then facilitate implementation of the mHealth program. Future research is strongly encouraged to examine the pre- and post-program effects of a mHealth program on psychosocial antecedents of behaviour change (e.g., motivation) and planning to support PA behaviours among parents of CWD.

5.7.2 Barriers to Program Implementation and Suggestions for Improvement

Parents of CWD highlighted several factors that acted as barriers to the implementation of the mHealth program including: (a) practicality issues, (b) too much information and (c) lack of community engagement. Parents of CWD also provided suggestions for improvement including: (a) quick reminders, (b) condensed information, (c) increased practicality, and (d)

content tailored to their child's specific needs. Identifying and addressing practicality issues may help facilitate implementation of a mHealth program. Parents of CWD already report encountering several barriers to supporting their children's PA (Stanley et al., 2020; Bassett-Gunter et al., 2017b; Faulkner et al., 2016) so addressing such barriers can facilitate use of messaging interventions like mHealth programs. One barrier to implementation identified in this study was parents' inability to track their progress within the mHealth program. Technology-based factors such as software design has been identified in studies examining mHealth program implementation (Shabir et al., 2022; Ali et al., 2018). The inability to track process is an important software design factor that can impact parents' self-regulatory behaviours which is important to facilitate motivation to plan to support their children's PA and continued engagement with the mHealth program. Engagement and monitoring are both important components in the PRACTIS guide when understanding how to promote the sustainability of interventions (Koorts et al., 2018). Efforts to implement mHealth program in a sustainable manner must ensure that technology-based barriers are considered to optimize implementation.

Another barrier to implementation of the mHealth program parents of CWD identified was that the program had too much information for use on a mobile phone. A suggestion to address this barrier was the inclusion of quick reminders to engage with the mHealth program content (i.e., check their plan) and the inclusion of condensed information. Strategies such as brief messages have been shown to prompt health promoting behaviours such as taking medications or appointment check-ins (Arambepola et al., 2016; Boksmati et al., 2016) as well as self-care and self-monitoring of chronic illnesses such as diabetes (Agboola et al., 2016; Connelly et al., 2013; Fanning et al., 2012). Rather than inundating parents with long messages and too much information, the inclusion of short messages in a mHealth program can be used to

remind parents of CWD to engage with the program, adjust their plan or self-monitor their planning behaviours. Considering the positive outcomes of brief messages among other populations and health-related behaviours, future research should aim to understand how to incorporate the use of brief messages in a mHealth intervention targeting parents of CWD because they are a low-cost characteristic to implement.

A lack of community engagement among other parents was a barrier to implementation in the current study and has been highlighted as a priority by parents of CWD (Jaarsma et al., 2019; Bassett-Gunter et al., 2017a). Despite the community feature integrated into the mHealth program, the lack of community engagement (i.e., uptake) still acted as a barrier to implementation among the parents of CWD. The context of the COVID-19 global pandemic may have impacted the level of community engagement experienced by participants in this study. Due to the many barriers experienced by parents of CWD during the pandemic when trying to support their children's PA (Esenturk, 2021), parents of CWD may not have had the resources to engage. Nonetheless, it is important to consider the needs of parents of CWD when developing mHealth programs targeting planning to provide support for support PA. Parents in the current study identified a number of unique needs including feelings of community and accountability, as well as targeted information regarding disabilities and resources that are relevant to parents of CWD and their child's specific disability needs. It is worth investigating how mHealth programs can evoke a sense of community to optimize engagement and uptake of the program. Previous research has highlighted the importance of considering the unique needs and preferences of parents of CWD when developing and disseminating PA information (Larocca et al., 2021) such as a "central hub" of information related to PA for their children (Bassett-Gunter et al., 2017a). Similarly, parents of CWD in this study expressed a need for the mHealth program to have more

information pertinent to PA for their child and desired for the app to have resources that they can use to support their children's PA. For implementation of a mHealth program to become sustainable, it must ultimately meet the needs of the end-users. Therefore, it may be useful to create a mHealth program that begins to develop the "central hub" that is so desired among parents of CWD.

5.7.3 Credible Sources to Support Implementation

Parents identified two sources they perceived to be credible to support the implementation of mHealth programs targeting parents of CWD: (a) local organizations and (b) professionals. When understanding implementation strategies for PA interventions targeting disability communities, credibility is critical. Parents of CWD have expressed the need for PA information to be disseminated by credible sources (Natkunam et al., 2020; Jaarsma et al., 2019; Bassett-Gunter et al., 2017a). Parents of CWD have identified schools, community centres, local organizations and doctors as sources of credibility (Williamson et al., 2020; Faulkner et al., 2016). Credibility of organizations or professionals providing information is important because it can elicit feelings of trust among the target audience making them feel like the information they are receiving is valid (Williamson et al., 2020). When considering implementation of a mHealth program it is important to consider sources to support dissemination of the program early on in order to facilitate implementation and sustainability. The PRACTIS guide suggests partnering with organizations to disseminate an intervention to reach a target audience and facilitate implementation (Koorts et al., 2018). The current study examined implementation facilitators and barriers among parents of CWD which is important. However, future research is encouraged to examine the perspective of organizations or professionals that promote PA for CWD regarding the implementation and sustainability of a mHealth program targeting parents of CWD because

ultimately, these are sources from which parents of CWD seek PA information and can be effective implementation facilitators for mHealth programs.

5.8 Limitations and Future Directions

This study is the first of its kind to identify facilitators and barriers to the implementation of a mHealth program targeting parent support for PA among parents of CWD from their perspective (i.e., user-perspective). The small sample size is a limitation of the study and makes it difficult to generalize the results to a larger group of parents of CWD. It was difficult to engage parents during the COVID-19 pandemic. However, the qualitative study design allowed for the collection of rich and meaningful data from these parents and it is important to share their perspectives. Further, there was interesting diversity in the sample despite its small size. For example, one participant identified as Indigenous and there was substantial variability in the household incomes across the parents. Future research is strongly encouraged to examine mHealth programs among a larger sample of parents of CWD to further unpack their perspectives around implementation. Secondly, given the context of the mHealth program taking place during the COVID-19 pandemic, engagement within the mHealth program was difficult to maintain. This could have influenced or even emphasized parents of CWD's perceptions of facilitators and barriers to the implementation of the mHealth program. It would be interesting to understand facilitators and barriers of a mHealth program post-pandemic especially when in-person PA programs and opportunities are available again. Third, it is important to recognize that there are no Canadian PA guidelines developed specifically for CWD and the current Canadian PA guidelines do not consider evidence regarding CWD. Therefore, the guidelines may not be suitable for all CWD and it may not be appropriate to use the current PA guidelines as a target in an intervention for parents of CWD. Lastly, while this study identified facilitators and barriers to

implementation, it was beyond the scope of the study to examine the impact of the mHealth program on parents' planning or PA support behaviours. The PRACTIS guide places emphasis on considering implementation during the development stages of an intervention (Koorts et al., 2018) which can be a focus of future research on mHealth programs targeting parents of CWD to optimize implementation.

5.9 Conclusion

This study is the first to identify implementation facilitators and barriers of a mHealth program among parents of CWD. Informed by the PRACTIS guide (Koorts et al., 2018), qualitative semi-structured interviews were conducted and four main themes emerged: (a) facilitators to using the program, (b) barriers to using the program, (c) suggestions for improvement, and (d) credible organizations for implementation. The results of this study can inform the development and implementation of future mHealth programs targeting planning to support PA among parents of CWD. Stakeholders within health promotion for CWD can consider the results of this study for the implementation of similar mHealth intervention programs targeting parents of CWD. Future research is encouraged to examine the effectiveness of mHealth planning interventions that deliver PA messages to inform mHealth program development and implementation as well as examine implementation from the perspective of dissemination sources like PA organizations or professionals.

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Chapter 6: General Discussion

Collectively, this dissertation advances the understanding of practices informing the development and dissemination of PA messages targeting parents of CWD to motivate them to provide support for PA for their children. Through conducting pre- and post-message exposure analyses (Phase 1), a systematic scoping review (Phase 2), creating a mHealth intervention, and a qualitative analysis on the use of the mHealth intervention that delivers PA messages to promote planning to support PA (Phase 3), this dissertation contributes novel findings to the field of PA messaging targeting disability populations.

6.1 The Use of Theory in This Dissertation

PA messages are more effective if they are based on behaviour change theory (Gainforth et al., 2016; Latimer-Cheung et al., 2014; Huhman et al., 2010). As such, the TPB (Ajzen, 1991) and M-PAC model (Rhodes, 2017) were used to guide the methodology, measures and analysis of Phase 1. Changes in parent support for PA and its theory-based psychosocial antecedents were observed. These results highlight the feasibility of using messages to motivate parents of CWD to provide support for PA. Although there is further work to be done to understand optimal strategies to target key theoretical predictors, this study was important in demonstrating the value in PA messages targeting parents of CWD. The findings from Phase 1 substantiate the literature assessing psychosocial antecedents to behaviour change examined using the TPB (Ajzen, 1991) and M-PAC model (Rhodes, 2017) suggesting that attitudes, subjective norms and planning may play a role in contributing to behaviour change. Importantly, in Phase 1 parents of CWD have highlighted a preference for targeted messages that are inclusive and meet their specific needs around providing support for PA for CWD. In order to better understand how to develop and disseminate optimal targeted message, the TPB (Ajzen, 1991) and M-PAC model (Rhodes,

2017) were used to guide the implications of the systematic scoping review in Phase 2. The strategies identified in the Phase 2 scoping review can guide the development and dissemination of effective messages to target pre- and post-intentional factors within the TPB (Ajzen, 1991) and M-PAC model (Rhodes, 2017) to promote parent support for PA. Within the context of the TPB (Ajzen, 1991) and M-PAC model (Rhodes, 2017), one important finding from Phase 2 was the identified need for targeted PA messages that facilitate planning among parents of CWD for parents of CWD. As such, the post-intentional factor of planning became the focus of Phase 3. Specifically, a mHealth program was developed to deliver PA messages aimed at promoting planning for support for PA among parents of CWD. Phase 3 worked to identify facilitators and barriers of implementation of the mHealth program from the perspective of parents.

The findings within this dissertation contribute to the broader literature examining PA messages using the TPB (Ajzen, 1991) and M-PAC model (Rhodes, 2017). Findings from this dissertation demonstrate that PA messages have the ability to impact both pre- and post-intentional constructs related to parent support for PA implying that the TPB and M-PAC can be suitable theories to measure the messaging effects. However, from these findings, it is unknown whether these theories have the ability to examine changes in the effects of PA messages longitudinally (i.e., longer than two weeks). Findings from the systematic scoping review also suggest that it is valuable to target the TPB and M-PAC variables when developing and disseminating PA messages. Specifically, the findings that suggest targeting psychosocial antecedents, developing tools and resources that promote planning and using marketing strategies to promote awareness and recall which can enhance predictors of behaviour change are related to the theories used in this dissertation. The TPB (Ajzen, 1991) and M-PAC model (Rhodes, 2017) can also provide a logical reasoning for examining PA interventions like a

mHealth program aimed at promoting planning to provide support for PA. These theories can be used to measure the effects of mHealth programs among a larger sample and would be worth examining, especially to understand longitudinal effects. While it is viable to use the TPB (Ajzen, 1991) and M-PAC model (Rhodes, 2017) to examine PA message interventions, these theories do not examine why people pay attention to messages in the first place which in turn affect pre- and post-intentional factors related to behaviour change. A model that does consider aspects of social marketing is the social issue advertising believability model (SIABM; O'Cass & Griffin, 2006) which proposes that one's intentions to comply with a message is related to one's social issue involvement, attention, message believability, and attitudes toward the issue. Understanding how PA messages affect these variables could possibly begin to explain why changes are or are not observed in variables within the TPB and M-PAC model. Future research is encouraged to understand the bigger picture by considering models such as the SIABM and social marketing in the development and dissemination of PA messages targeting parents of CWD.

6.2 Practical Implications for the Development and Dissemination of Physical Activity Messages Targeting Parents of Children with Disabilities

The findings from the studies within this dissertation can be used to inform the development and dissemination of PA messages targeting parents of CWD. The purpose of Phase 1 was to examine the effects of PA messages on parent support for PA and its psychosocial antecedents. Existing PA messages can have an effect on the pre- and post-intentional factors related to parent support for PA as well as parent support for PA behaviours. Specifically, changes in attitudes toward child PA, subjective norms toward child PA, subjective norms toward parent support for PA, and planning were observed. Importantly, baseline parent

support acted as a moderator on the effects of PA message given that these changes varied for parents with high and low baseline parent support for PA. PA messages may not affect all parents equally and it may be important to consider motivational or behavioural factors related to parents in order to tailor messages appropriate. For example, when developing PA messages, parents of CWD may require different messages based on their level of baseline parent support for PA or motivational orientation. Parents of CWD with low baseline parent support for PA may benefit from messages that target pre-intentional factors like attitudes, subjective norms and PBC, whereas parents of CWD with high baseline parent support for PA may benefit from messages that target post-intention factors like planning to positively reinforce behavioural regulation.

Another major finding from Phase 1 was that the effects of PA messages did not differ between message conditions. Given that the messages were taken from pre-existing messaging campaigns, it was impossible to control the specific content of each message. Perhaps the messages used within each condition included core content that had a shared influence on the outcome variables. The inclusive message was clearly preferred which suggests that parents of CWD *do* pay attention and care about the types of messages they are viewing. Indeed, parents of CWD prefer and desire targeted PA messages (Bassett-Gunter et al., 2017), so when developing PA messages for parents of CWD, it is important to take these preferences into consideration in order to maximize message uptake. Phase 1 findings contribute to the broader PA messaging literature by demonstrating that PA messages have value for a distinct subgroup of people within the disability community. These findings provide an improved understanding regarding how persuasive messages might impact parent support for PA among parents of CWD and

demonstrate that PA messages have the potential to impact pre- and post-intentional factors related to parent support for PA.

Although Phase 1 was important in demonstrating the value of using PA messages to influence parent PA support behaviour and its psychosocial antecedents, there is a need for further understanding around the development of *optimally* effective targeted messages. Phase 2 aimed to consolidate the extant literature using a systematic scoping review to identify strategies regarding the development and dissemination of PA messages targeting parents in general and parents of CWD specifically. Findings from Phase 2 highlighted a number of strategies regarding the development of PA messages including developing messages that are gain-framed, address common barriers to parent support for PA, provide parents with information regarding PA guidelines, avoid feelings of guilt and stress, and target parents' attitudes toward child PA and parent support for PA. The systematic scoping review from Phase 2 is unique in that it also identified strategies regarding the development of PA messages targeting parents of CWD specifically. In combination with the aforementioned strategies, PA messages that are developed for parents of CWD should target the lack of disability-focused information and more specifically the lack of behavioural regulation tools (e.g., planning tools), PA barriers that are salient to parents of CWD and theoretical predictors of behaviour change. Developing messages that take into consideration the specific needs and preferences of parents of CWD can enhance message relevance, attention and ultimately uptake.

The development of optimal PA messages targeting parents of CWD is only half of the equation when promoting parent support for PA. Dissemination strategies that have potential to effectively reach parents of CWD must be taken into consideration as well. Phase 2 of this dissertation also identified strategies that can inform the dissemination of PA messaging

interventions targeting parents of CWD. PA messages should be disseminated in a way that maximizes awareness and recall which can lead to positive changes in variables related to parent support for PA (Ray et al., 2019; Belanger-Gravel, 2017; Price et al., 2008). Using social marketing strategies such as message tailoring and brand equity may be useful to optimize dissemination efforts (Asbury et al., 2008; Huhman et al., 2008). Lastly, utilizing dissemination strategies that parents prefer (e.g., digital and traditional) can also enhance message effectiveness (Bassett-Gunter et al., 2017; Borra et al., 2003). Additional strategies for disseminating PA messages targeting parents of CWD specifically include use of salient blogs and chatrooms, as well as generating a "central hub" of information and engaging credible messengers (Bassett-Gunter et al., 2017). Phase 2 of this dissertation contributes to the greater field of PA message research as it is the first systematic scoping review to explore and analyze the existing PA message literature targeting both parents in general and parents of CWD. The findings from Phase 2 have been used to inform the creation of PA message development and dissemination recommendations for organizations wishing to promote PA for CWD.

One major finding from Phase 2 was the lack of targeted PA information interventions to support behavioural regulation among parents of CWD. Parents of CWD desire tools and strategies in digital formats to facilitate planning to support PA. In an effort to address this gap, a mHealth program (i.e., planning tool) targeting parents of CWD was developed. Specifically, Phase 3 worked to identify facilitators and barriers to implementation. mHealth programs like the PTMYK program can useful for parents of CWD during instances where barriers to PA participation may be exaggerated such as: during inclement weather (Stanley et al., 2020; Hardy et al., 2016; Slater et al., 2010), lack of facilities, transportation issues, or government mandated lockdowns as experienced during the COVID-19 pandemic (Esentürk, 2021). Phase 3

demonstrates that a mHealth program can be used among parents of CWD by equipping parents with skills and tools to promote planning and self-regulation but more work needs to be done in order to improve implementation and continued use. Future research is encouraged to understand how implementation of a mHealth program for parents of CWD can be facilitated by credible sources for dissemination such as PA organizations or healthcare professionals.

6.3 Strengths, Limitations and Future Directions for Research

The studies within this dissertation have some notable strengths. Phase 1 is the first to examine the effects of PA messages on the psychosocial antecedents of parent support for PA and parent support for PA behaviours among parents of CWD. The systematic scoping review in Phase 2 utilized a rigorous systematic approach to consolidate the existing research regarding both parents in general and parents of CWD to identify strategies for the development and dissemination of PA messages targeting parents of CWD in a way that is both methodologically and pragmatically meaningful. Finally, Phase 3 utilized findings from Phase 2 to develop an evidence-informed, theory-based mHealth program and identified facilitators and barriers to implementation of the mHealth program among parents of CWD. However, this compilation of studies does not go without limitations. Some clear limitations include the lack of a control group and single message exposure in Phase 1. The inclusion of a control group in future research can help ensure that observed changes in parent support for PA and its antecedents were the result of message exposure. Future research is also encouraged to simulate real-world message strategies and examine the effects of repeated exposure of PA messages. Another suggestion for future research would be to consider balancing real-world strategies (e.g., repeated exposure and existing well-developed PA messages) with control conditions to evaluate message effects. Although parents preferred the inclusive message in Phase 1, it is unknown what aspects of an

inclusive message are optimal for parents of CWD. Therefore, future research is encouraged to conduct qualitative focus groups or interviews to understand PA message needs and what contributes to an appealing PA message to this population. Future research is also encouraged to unpack the challenges associated with the heterogeneity of disability when developing PA messages. For example, how the inclusion or exclusion of varying disabilities can post challenges when creating targeted messages.

The systematic scoping review conducted in Phase 2 did not include an assessment of the quality of the articles selected which would have enhanced the confidence in review findings. Future research is encouraged to continue to examine the needs regarding PA message development and dissemination among parents of CWD as research in this field gains popularity with some sort of quality assessment. Drawing on literature from other health messaging fields, social marketing or other target populations may also be valuable to inform the development and dissemination of PA messages targeting parents of CWD. Nonetheless, Phase 2 played an important role in consolidating the available evidence regarding PA message development and dissemination targeting parents of CWD.

Phase 3 is unique as it is the first of its kind to examine the facilitators and barriers to the implementation of a mHealth program targeting planning for support for PA among parents of CWD. However, the small sample size in this study limited the generalizability of the findings. A study that involves a much larger sample would be valuable to examine changes in planning to provide parent support for PA and perhaps even parent support for PA behaviours. Understanding facilitators and barriers to implementation from the perspective of parents of CWD is undoubtedly important as they are the end-users of the intervention, but future research is encouraged to understand facilitators and barriers to implementation from the perspective of

sources like community-based organizations (CBOs). CBOs are a critical part in intervention implementation especially for the disability community (Gorter et al., 2016). A study involving CBOs as a partner in the process of developing a planning intervention for parents of CWD can help make the bridge from research to practice more seamless. Nonetheless, the findings from Phase 3 can be used as a "lessons learned" to be taken into consideration when developing and disseminating future mHealth interventions targeting parents of CWD. For example the findings from Phase 3 can be used to inform future iterations of the PTMYK program or other mHealth programs for parents of CWD to improve implementation by condensing information, providing quick reminders, increasing the practicality of the program (e.g., activities that require only in-app interaction), and tailoring information to the child's specific needs.

6.4 Conclusion

Overall, the works within this dissertation provide a comprehensive assessment and review of PA message development and dissemination strategies targeting parents of CWD. This dissertation demonstrates that PA message have potential to influence theoretical predictors of behaviour change related to the TPB and M-PAC. Further, this dissertation emphasizes the nuances in the PA message needs and preferences among parents of CWD and highlights the importance of considering these needs when developing and disseminating PA messages or PA message interventions targeting this population. The number of CWD in Canada and the low PA rates among this population highlight the need to for strategies to promote PA among CWD. PA message interventions are one strategy that can be used to promote parent support for PA among CWD and it is important to identify contributing mechanisms to enhance the effects of PA messages. Therefore, it is critical that strategies for the development and dissemination of

optimally effective PA messages targeting parents of CWD be the focus for future research in this field.

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APPENDIX A – Phase 1 Consent Form

Study Name: Parents' Evaluation of Inclusive Physical Activity Messaging for Children and Youth With Disabilities

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Purpose of the Research: The purpose of this research project is to evaluate various physical activity commercials targeting parents. We are interested in understanding how various commercials impact the thoughts and feelings of parents of children with disabilities.

What You Will Be Asked to Do in the Research: You will be asked to complete a series of questions regarding yourself and your child's involvement in physical activity. Next, you will be asked to view a short commercial targeting children's physical activity. After viewing the commercial, you will be asked to complete another series of questions regarding the commercial and your thoughts and feelings. Your participation today will take approximately 20-30 minutes. In two weeks, you will receive and email with a link to a follow-up questionnaire. It will take you approximately 30 minutes to complete the follow up questionnaire. You will receive a $40.00 honorarium for your participation.

Risks and Discomforts: We do not foresee any risks or discomfort from your participation in the research.

Benefits of the Research and Benefits to You: This research will aid in the development of future commercials targeting sport and physical activity for children and youth with disabilities. However, there are no direct benefits to you as the participant.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer will not influence the nature of your relationship with York University either now, or in the future.

Withdrawal from the Study: You can stop participating in the study at any time, for any reason, if you so decide. If you decide to stop participating, you will still be eligible to receive the promised pay for agreeing to be in the project. Your decision to stop participating, or to refuse to answer particular questions, will not affect your relationship with the researchers, York

University, or any other group associated with this project. In the event you withdraw from the study, all associated data collected will be immediately destroyed wherever possible.

Confidentiality: All information you supply during the research will be held in confidence. Your name or any information that can be identified with you will not appear in any report or publication of the research. Data will be collected using a secure online data collection system. Your data will be safely stored on a password protected computer in Dr. Bassett-Gunter's locked research laboratory. Only the researchers and research assistants will have access to this information. Any personal identifying information will be stripped from the data once downloaded from the online system. The data will be stored for a minimum of 7 years after data publication and then will be destroyed. Confidentiality will be provided to the fullest extent possible by law.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Dr. Bassett-Gunter either by telephone at (416) 736-2100, extension 22072 or by e-mail rgunter@yorku.ca. This research has been reviewed and approved by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, York Research Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:
I consent to participate in Parents' Evaluation of Inclusive Physical Activity Messaging for Children and Youth With Disabilities conducted by Rebecca Bassett-Gunter. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. By clicking the "I consent" below, I indicate my consent.

_____

Online Signature

APPENDIX B – Phase 1 Recruitment Material

PARENTS OF CHILDREN WITH DISABILITIES NEEDED FOR RESEARCH STUDY

The School of Kinesiology and Health Science at York University is conducting a study to examine parents of children with disabilities' response to commercials about physical activity. We are looking for parents of children with disabilities to participate in an online study consisting of two one-hour sessions.

Participants will receive $40.00 GIFT CARD of their choice

Eligible Participants Must:

- Be a parent with one child with any disability

For more information, please email: rbglab@yorku.ca

To be contacted for this study please fill out the quick 3 question survey at:
https://www.surveymonkey.com/r/VYXYW75

OR

Scan the QR code:

APPENDIX C – Phase 1 Materials and Measures

Measures

For pre-intentional constructs such as attitudes, subjective norms and PBC, beliefs regarding parent support for PA ***and*** child PA were measured because salient beliefs regarding both behaviours predict parents' intentions to provide parent support for PA (Rhodes et al., 2013).

Demographics. Sex, age, education level, income, ethnicity (e.g. Black, Chinese, Aboriginal, Non-White Latin-American) language, and marital status will be self-reported. Parents will also be asked to provide information regarding their CWD's sex, age, type of disability, and whether the disability is congenital or acquired.

Parent support for PA will be measured with 11 items employed in previous research among parents of children without disabilities (Wilson et al., 2010) and CWD (Tanna et al., 2017). Participants will report how often they engaged in various parent support for PA (1= not at all to 7= very often). For example, "*Over the past two weeks, how often have you participated in physical activity so that your child could see you doing physical activity?"*

Behavioural regulation for parent support for PA will be measured with four items (Rhodes et al. 2016). Participants will report how often they engaged strategies to regulate their own parent support for PA behaviour (1=never/rarely to 4=daily). For example, "*Over the past two weeks, how often have you looked for information or opportunities to get active with your child most days of the week?"*

Attitudes toward child PA will be measured on a nine item scale (Francis, et al., 2004; Tanna et al., 2017). Participants will report their affective and instrumental attitudes toward their children's PA by indicating their agreement with the items (1= strongly disagree to 5= strongly

agree). For example, "*If my child were to engage in 60 minutes of physical activity daily, it would benefit my child's physical health*."

Attitudes toward parent support for PA will be measured on a 10 item scale (Francis et al., 2004; Tanna et al., 2017). Participants will report their affective and instrumental beliefs toward parent support for PA by indicating their agreement with the items (1= strongly disagree to 5= strongly agree). For example, "*Supporting my child to engage in 60 minutes of physical activity each day over the next two weeks would help me bond with my child.*"

Subjective norms toward child PA will be measured on a five item scale (Francis et al., 2004; Tanna et al., 2017). Participants will report their beliefs about important others by indicating their agreement with the items (1= strongly disagree to 5= strongly agree). For example, "*The following people think my child should engage in 60 minutes of physical activity each day: medical professionals*."

Subjective norms toward parent support for PA will be measured on a five item scale (Francis et al., 2004; Tanna et al., 2017). Participants will report their beliefs about important others by indicating their agreement with the items (1= strongly disagree to 5= strongly agree). For example, "*The following people think I should support my child to engage in 60 minutes of physical activity each day: medical professionals*."

Perceived behavioural control for child PA will be measured on a 10 item scale (Francis et al., 2004). Participants will report their beliefs about their children engaging in regular PA despite possible barriers (1= strongly disagree to 5= strongly agree). For example, "*If my child really wanted to and was very motivated to engage in 60 minutes of physical activity each day, he or she could participate even if staff and/or coaches at activities/sports were not accommodating.*"

Perceived behavioural control for parent support for PA will be measured on 10 item scale (Francis et al., 2004). Participants will report their beliefs about supporting their children's regular PA despite possible barriers (1= strongly disagree to 5= strongly agree). For example, "*If you were really motivated and fully committed to support your child to participate in 60 minutes of physical activity each day, how confident are you that you could provide support even if the cost of enrolling your child in organized sport and/or physical activity was high*."

Planning will be measured using a four item scale that has been adapted from previous research involving individuals with disabilities (Arbour & Martin Ginis, 2004; Latimer et al., 2006; Arbour-Nicitopoulos et al., 2009) and parents of CWD (Tanna, et al., 2017). Parents will report their plans for supporting their children's PA (1= strongly disagree to 5= strongly agree). For example, "*Thinking ahead over the next two weeks, I have a plan for…" how my child will be physically active.*"

Intention to provide parent support for PA will be measured using two items from previous research involving parents of CWD (Tanna, et al., 2017). Parent will report their intentions to support their children's regular PA (1= strongly disagree to 5= strongly agree). For example, "*I intend to provide support to help my child participate in physical activity 60-minutes each day in the next two weeks*."

Message preferences. Participants will be asked to rank the PA messages (one best to 4 worst) to indicate messages preference.

While completing this questionnaire, please keep the following in mind:
Physical Activity includes both structured (swimming lessons, soccer practice) and unstructured (walking/wheeling to school, playing at the park) activities. Please keep both structured and unstructured activities in mind when answering the questions. Please think only of your son or daughter with a disability while answering the questions. If you have multiple children with disabilities then please answer considering the child who will celebrate his or her birthday next.

Baseline Children's Physical Activity and Screen Time Behaviour

1. Over the past week, on how many days was your child physically activity for a total of at least 60 minutes per day?
   [Drop down options of 0 to 7 days]
2. On an average **weekday**, how much time does your child spend watching TV (or watching shows on an iPad) or DVD/videos??
   _____hours_____mins

3. On an average **weekend** day, how much time does your child spend watching TV (or watching shows on an ipad) or DVD/videos?
   ____hours_____mins

Parent Support for PA

Over the past two weeks, how often have you...

	Not at all						Very Often
Participated in physical activity so that your child could see you doing physical activity	1	2	3	4	5	6	7
Say to your child that physical activity is good for him/her	1	2	3	4	5	6	7
Offer to be active with your child	1	2	3	4	5	6	7
Order your child to be active	1	2	3	4	5	6	7
Provided financial support (e.g. pay for equipment, the program, etc.) so your child can be active	1	2	3	4	5	6	7
Helped your child to learn/improve the skills that he/she would use in being active	1	2	3	4	5	6	7
Gave your child encouragement to stick with his/her physical activities	1	2	3	4	5	6	7
Talked to your child about how much fun physical activity is	1	2	3	4	5	6	7
Nag your child to be active	1	2	3	4	5	6	7
Plan activities or enrolled your child in physical activity	1	2	3	4	5	6	7
Rewarded your child for being physically active	1	2	3	4	5	6	7

Behavioural Regulation for Parent Support for PA

Over the past two weeks, how often have you…

	Never /Rarely	About 1-2 times a weeks	Most days	Daily
Looked for information or opportunities to get active with your child most days of the week	1	2	3	4
Made a plan to ensure that your child engages in physical activity on most days of the week	1	2	3	4
Kept track of the amount of physical activity your child is getting	1	2	3	4
Made plans regarding what to do if something interfered with your support of your child's physical activity	1	2	3	4

Attitudes Toward Child PA

If my child were to engage in 60- minutes of physical activity daily, it would:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Benefit my child's physical health	1	2	3	4	5
Help my child be social	1	2	3	4	5
Be fun for my child	1	2	3	4	5
Benefit my child's mental health	1	2	3	4	5
Be unenjoyable for my child	1	2	3	4	5
Contribute positively to my child's mental health	1	2	3	4	5
Help my child feel a sense of normalcy	1	2	3	4	5
Help my child develop various skills	1	2	3	4	5
Put my child at risk for injury and pain	1	2	3	4	5

Attitudes Toward Parent Support for Child PA

Supporting my child to engage in 60-minutes of physical activity each day, would:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Help me bond with my child	1	2	3	4	5
Allow me to watch my child improve and achieve success	1	2	3	4	5
Allow me to watch my child experience happiness, fun, and feelings of normalcy	1	2	3	4	5
Allow me to be physically active while participating with my child	1	2	3	4	5
Allow me to act as a role model and mentor for my child	1	2	3	4	5
Cause me to worry about my child (e.g. safety, well-being)	1	2	3	4	5
Be unenjoyable for me	1	2	3	4	5
Depends on my child's mood and emotions	1	2	3	4	5
Take time away from my other commitments such as family and work	1	2	3	4	5
Be frustrating for me	1	2	3	4	5

Subjective Norms Toward Child PA

The following people think my child should engage in 60-minutes of physical activity each day:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Medical Professionals	1	2	3	4	5
School (e.g. teachers)	1	2	3	4	
Recreation/sports team leaders (e.g. staff, coaches)	1	2	3	4	5
Disability organizations/programs	1	2	3	4	5
Family (e.g. immediate, extended, spouse)	1	2	3	4	5

Subjective Norms for Parent Support

The following people think I should support my child engage in 60-minutes of physical activity each day:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Medical Professionals	1	2	3	4	5
School (e.g. teachers)	1	2	3	4	
Recreation/sports team leaders (e.g. staff, coaches)	1	2	3	4	5
Disability organizations/programs	1	2	3	4	5
Family (e.g. immediate, extended, spouse)	1	2	3	4	5

Perceived Behavioural Control Toward Child PA

If my child really wanted to and was very motivated to engage in 60-minutes of physical activity each day, he or she could participate even if:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Staff and/or coaches at activities/sports were not accommodating	1	2	3	4	5
Activities/Sports were not accessible	1	2	3	4	5
My child did not have extra support	1	2	3	4	5
My child was physically restricted (e.g. pain, injured, tired)	1	2	3	4	5
The variety of activities available were limited	1	2	3	4	5
There was a lack of proper staffing, support, and supervision at the organized sport or physical activity	1	2	3	4	5
My child did not have the proper equipment to participate	1	2	3	4	5
The weather and temperature conditions were not ideal	1	2	3	4	5
My child had limited time due to school and other commitments (e.g. medical appointments and therapy)	1	2	3	4	5
The activities were not necessarily safe for my child	1	2	3	4	5

Perceived Behavioural Control Toward Parent Support for PA

If you were really motivated and fully committed to support your child to participate in 60-minutes of physical activity each day, how confident are you that you could provide support even if:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The cost of enrolling your child in organized sport and/or physical activity was high	1	2	3	4	5
You have limited time	1	2	3	4	5
You experience challenges with accessibility of the sport/physical activity	1	2	3	4	5
You have challenges finding a preferred physical activity/sport	1	2	3	4	5
You have to find extra support for your child	1	2	3	4	5

You have to travel a far distance to participate	1	2	3	4	5
The weather conditions are poor	1	2	3	4	5
Your child is in a bad mood	1	2	3	4	5
You are concerned about your child's safety	1	2	3	4	5
You are feelings tired, frustrated, or in a bad mood	1	2	3	4	5

Planning to Provide Parent Support for PA

Thinking ahead over the next two weeks I have a plan for...

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
How my child will be physically active	1	2	3	4	5
When my child will be physically active	1	2	3	4	5
What my child will be doing to be physically active	1	2	3	4	5
Where my child will be physically active	1	2	3	4	5

Intention for Parent Support for PA

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I intend to provide support to help my child participate in physical activity or sport 60-minutes each day in the next two weeks	1	2	3	4	5
In the next two weeks, I will try to provide support to help my child participate in physical activity for 60-minutes each day	1	2	3	4	5

EACH PARENT WILL BE RANDOMIZED TO VIEW ONE OF THE FOLLOWING MESSAGES:

1) Targeted disability/parasport commercial: It's more than sport (:30s): A Canadian Paralympic Committee commercial

   https://www.youtube.com/watch?v=eWRAkWl9mLw

2) Neutral Video (no children): ParticipACTION's Make Room For Play commercial

   https://www.youtube.com/watch?v=RrI8ktR9zBw

3) **L**et's Move Park Ad

   https://www.youtube.com/watch?v=1BN5GaqtmRc

4) Inclusive: Canadian Tire "Wheels"

   https://www.youtube.com/watch?v=pFuwUiHo-WI

Immediately Post-Viewing Questionnaire:

I have viewed the commercial/information. There were no technical difficulties.

- Yes
- No

Dose Check

Have you seen this video before?

- Yes
- No
- Unsure

Immediately Post-Viewing – Message Involvement

Please answer the questions using the scale given below.

1	2	3	4	5	6	7
Not at all						Extremely

While you were watching the commercial…

1. How much did you think about the content of the commercial?

1	2	3	4	5	6	7
Not at all						Extremely

2. How deeply did you think about the content of the commercial?

1	2	3	4	5	6	7
Not at all						Extremely

3. How much attention did you pay to the content of the commercial?

1	2	3	4	5	6	7
Not at all						Extremely

4. How personally relevant was it for you to think about the content of the commercial?

1	2	3	4	5	6	7
Not at all						Extremely

Immediately Post-Viewing – Message Believability

To what extent do you believe the commercial was…

1	2	3	4	5
Not Informative				Informative

1	2	3	4	5
Untrustworthy				Trustworthy

1	2	3	4	5
Inaccurate				Accurate

1	2	3	4	5
Unconvincing				Convincing

1	2	3	4	5
Not Believable				Believable

Immediately Post-Viewing – Attitudes Towards the Message

I would describe the information in the commercial as …

1	2	3	4	5
Bad				Good

1	2	3	4	5
Unpleasant				Pleasant

1	2	3	4	5
Low-Quality				High-Quality

1	2	3	4	5

Do Not Like It				Liked It

1	2	3	4	5
Undesirable				Desirable

1	2	3	4	5
Unfavourable				Favourable

Message Evaluation

Please rank the commercials from 1 to 4 with 1 being your favourite and 4 being your least favourite.

APPENDIX D – Phase 3 Consent Form

Participant Information and Consent Form Plan to Move Your Kids Community

Date: July 2021

Study Name: Examining implementation facilitators and barriers of a mHealth program for parents of children with disabilities using the PRACTIS guide

Researcher Name:

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Kathleen Martin-Ginis, PhD
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Purpose of the Research: The purpose of the research is to understand parents' experiences participating in the Plan to Move Your Kids program. You will be asked to complete one pre-program survey and two post-program surveys. You will also be invited to participate in a one-on-one interview with Victoria Larocca (co-investigator) to speak about your experiences and perceptions of the program. Results from this study will be published in an academic journal with potential of it being presented at a conference. Results of this study are also part of Victoria Larocca's dissertation.

What You Will Be Asked to Do in the Research: If you agree to take part in this study, you can expect that your participation will include participating in a one-on-one interview about your experiences with participating in the Plan to Move Your Kids program. The interview should last approximately 45 minutes. By participating in this research study, you will receive a renumeration of $25.00.

Risks and Discomforts: We do not foresee any risks or discomfort from your participation in the research.

Benefits of the Research and Benefits to You: There may not be direct benefit to you from taking part in the components of the research project (i.e., surveys and interview). However, you may benefit from the Plan to Move Your Kids program in various ways (e.g., learning new planning skills to support your child's physical activity, experiencing increases in your child's physical activity). We hope that the information learned from research project can increase our understanding of factors that influence acceptance and satisfaction of the Plan to Move your Kids program and will be used in the future to help benefit other families of children with disabilities.

The researchers involved in this project may benefit from increased visibility, sharing and use of their original knowledge. Curatio may benefit from this project by way of an increased program portfolio. In turn this could lead to increased funding opportunities and/or financial rewards at a later date for Curatio.

Voluntary Participation and Withdrawal: Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer, to stop participating, or to refuse to answer particular questions will not influence the nature of the ongoing relationship you may have with the researchers or study staff, or the nature of your relationship with York University either now, or in the future.

In the event you withdraw from the study, all associated data collected will be immediately destroyed wherever possible. Should you wish to withdraw after the study, you will have the option to also withdraw your data up until the analysis is complete.

If you decide to stop participating, you may withdraw without penalty, financial or otherwise, and you will still receive the promised inducement.

Confidentiality: Unless you choose otherwise, all information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research. Data from the online survey will be collected through an online survey platform called REDCap and the one-on-one interview will be audio recorded and transcribed. Your data will be safely stored on a password protected laptop and only research staff will have access to this information. The information will be kept while the study is taking place; when the study is over, the information will be destroyed. The data will be kept for 7 years until July 2028. Confidentiality will be provided to the fullest extent possible by law.

The researchers acknowledge that the host of the online survey (REDCap) may automatically collect participant data without their knowledge (e.g., IP addresses). Although this information may be provided or made accessible to the researchers, it will not be used or saved without participant's consent on the researchers' system. Because this project employs electronic-based collection techniques, data may be subject to access by third parties as a result of various security legislation now in place in many countries and thus the confidentiality and privacy of data cannot be guaranteed during web-based transmission.

This study will use Zoom to collect data, which is an externally hosted cloud-based service. When information is transmitted over the internet privacy cannot be guaranteed. There is always a risk your responses may be intercepted by a third party (e.g., government agencies, hackers). Further, while York University researchers will not collect or use IP address or other information which could link your participant to your computer or electronic devices without informing you, there is a small risk with any platform such as this of data that is collected on external servers falling outside the control of the research team. If you are concerned about this, we would be happy to make alternative arrangements (where possible) for you to participate, perhaps via telephone. Please contact vlarocca@yorku.ca for further information.
Recordings (audio) will be saved in a password protected file to research team members' local computer, not the cloud based service

Please note that it is the expectation that participants agree not to make any unauthorized recordings of the content of a meeting / data collection session.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Victoria Larocca at vlarocca@yorku.ca or my supervisor, Dr. Rebecca Bassett-Gunter at rgunter@yorku.ca. This research has received ethics review and approval by the Delegated Ethics Review Committee, which is delegated authority to review research ethics protocols by the Human Participants Review Sub-Committee, York University's Ethics Review Board, and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Kaneff Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca.

Legal Rights and Signatures:

I consent to participate in *Examining implementation facilitators and barriers of a mHealth program for parents of children with disabilities using the PRACTIS guide* conducted by Dr. Rebecca Bassett-Gutner. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by consenting and clicking to consent to this form. I consent to the participation in this study.

_____
Online Signature

APPENDIX E – Phase 3 Recruitment Material

APPENDIX F – Phase 3 Measures

Demographics Questionnaire

1. What is your sex at birth?
    - Male
    - Female
    - Other
    - Do not wish to report

2. What is your age?
    - Under 18
    - 18 to 24
    - 25-34
    - 35-44
    - 45-54
    - 55-64
    - 65 or above
    - Do not wish to report

3. How many children do you have? _____

4. Is English your first language?
    - Yes
    - No

5. What is your current level of education?
    - Less than high school
    - High school
    - Some college (no degree)
    - College degree
    - Some university
    - University – Bachelor-level Degree (BA, BSc, etc.)
    - University – Master-level Degree (MA, MSc, etc.)
    - University – Doctorate-level Degree (Ph.D.)
    - University – Professional Post-Graduate (M.D., etc.)
    - Do not wish to report

6. What is your household income?
    - $35,000 or less
    - $35,000-$49,999
    - $50,000-$64,999
    - $65,000-$74,999
    - $75,000-$99,999
    - $100,000-$149,999

- $150,000 or more
- Do not wish to report

A member of a visible minority/racialized group in Canada is someone (other than an Aboriginal Person) who self-identifies as a non-white in colour or non-Caucasian in racial origin, regardless of birthplace or citizenship. Members of ethnic or national groups (such as Portuguese, Italian, Greek, etc.) are not considered to be racially visible unless they also meet the criteria above.

7. Are you a member of a visible minority?
    - Yes
    - No
    - Do not wish to report

8. If YES, please check all the responses that apply:
    - Black (e.g., African American, Canadian, Caribbean)
    - Filipino
    - Japanese
    - Korean
    - Indigenous person from outside North American
    - South Asian/East Indian
    - South East Asian
    - Non-White West Asian (e.g., Iranian, Lebanese, Afghan)
    - Non-White North African (e.g., Egyptian, Libyan)
    - Arab
    - Non-White Latin American
    - Other (please specify): _____

An Aboriginal Person is a North American Indian, Metis, or Inuit, or a member of a North American First Nation. An Aboriginal Person may be a treaty status or a non-status, registered or non-registered Indian.

9. Are you an Aboriginal Person
    - Yes
    - No

10. What is your current marital status?
    - Single
    - Common-law
    - Married
    - Divorced
    - Other
    - Do not wish to report

The following questions are about your child with a disability. If you have more than one child with a disability, please answer these questions thinking about your child with a disability who will celebrate his/her/their birthday next.

11. Please describe the nature of your child's disability: _____

12. What is your child's sex at birth?
    - Male
    - Female
    - Other
    - Do not wish to report

13. What is your child's age? _____

14. Please classify your child's disability. You may check all that apply.
    - Physical disability
    - Cerebral Palsy
    - Spina Bifida
    - Amputation
    - Development Coordination Disorder
    - Autism
    - Sensory processing disorders
    - Down Syndrome
    - ADHD
    - Learning disability
    - Visual Impairment
    - Hearing Impairment
    - Other

15. Is your child's disability congenital or acquired?
    - Congenital
    - Acquired

16. Does your child use a mobility device?
    - Yes
    - No

17. If you answered YES to the previous question, please choose any aids or devices that your child typically uses (check all that apply).
    - Cane
    - Walker/leg braces
    - Crutches
    - Wheelchair
    - Other: _____

18. Does your child need assistance communicating?
    - Yes
    - No

19. If you answered YES to the previous question, please tell us how your child primarily communicates.
    - Verbally
    - With gestures
    - With pictures
    - Other: _____

Child Physical Activity and Screen Time Behaviours Questionnaire

4. Over the past week, on how many days was your child physically activity for a total of at least 60 minutes per day?
   [Drop down options of 0 to 7 days]

5. Over the past week,, how much time does your child spend watching TV (or watching shows on an iPad) or DVD/videos?
   _____hours_____mins

One-on-One Qualitative Interview Guide

The purpose of the Plan to Move Your Kids program was to help parents and/or caregivers plan to support their child's physical activity.

Whether you engaged with the program for the full 12 weeks or just engaged here and there, we appreciate your feedback on the program. We based the program content off of research regarding strategies to help parents plan to support their child's physical activity, but we are trying to figure out the best ways to put the research about strategies into practice.

1. How did you hear about the program?

2. Why did you sign up?

3. How much did you engage with the program?

4. What aspects of the program do you think contributed/can contribute to helping you plan to support your child's physical activity?
   Probes: Community coach, peer support, activities, content.

5. What aspects of the PTMYK program acted as/could act as a facilitator for your use of the app? OR what made this program easy to use?
Probes: Time commitments, being an app, experiencing community, specific thing that achieved change

6. What aspects of the PTMYK program acted as/could act as a barrier for your use of the app? OR what made this program difficult to use?
Probes: Time commitments, being an app, experiencing community, specific thing that achieved change

7. What suggestions do you have for how the program could be improved to address barriers and facilitate more use of the program?

8. Can you think of times when the information and activities in the Plan to Move Your Kids Program be useful in the event that your child's physical activity was interrupted (e.g., weather, facilities closing or having participants capped, pandemics)?

9. Do you think the Plan to Move Your Kids program can help you overcome some of the barriers you experience relating to planning to support your child's physical activity? Can you explain some aspects of the program further?

10. How do you see an organization implementing this program? For example, if a community centre or disability organization (e.g., Abilities Centre) incorporated the PTMYK program into their programming. Do you see this program being a stand-alone or a supplement to already existing programs?
Probes: time commitment? prompts from a community coach? expectation of engagement?

11. Are there certain organizations you think would be credible to deliver this program? Could you name a few?

12. Is there anything else about this program that you would like to share?
Probes: Remind them that we are trying to figure out ways to support parents and want to hear from parents regarding what works and what doesn't.