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# The Impact of the COVID-19 Pandemic on the Physical Activity of Families Managing Attention-Deficit Hyperactivity Disorder

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A thesis submitted in partial fulfillment of the requirements for the Master of Arts degree in Education

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## **Abstract**

Regular physical activity supports symptom management in children with Attention-Deficit Hyperactivity Disorder (ADHD). This study aimed to explore the ways in which the Novel Coronavirus Disease (COVID-19) impacted the physical activity behaviours and wellbeing of families managing ADHD. Researchers implemented a qualitative approach positioned within a socioecological framework to further understand how the COVID-19 pandemic impacted the physical activity of children with ADHD and their caregivers, identify potential barriers to their participation in physical activity, and recognize potential areas of support. Archival data including interviews from thirty-three participants were examined. Inductive content analysis deduced that physical activity declined for both children and their caregivers. Barriers included social isolation, increased screen-time, and heightened intrapersonal difficulties. Participants suggested supports including community support programs and psycho-emotional support groups. The study focused to facilitate and aid in establishing ways in which researchers and communities can better support physical activity engagement within this population.

*Keywords:* Attention-Deficit Hyperactivity Disorder (ADHD), physical activity, COVID-19, barriers, supports, pandemic, physical health

## **Summary for Lay Audience**

The Novel Coronavirus Disease (COVID-19) pandemic uprooted regular routines of families and children and caused widespread psychological, emotional, and physical distress across generations. Many children and adults were made to learn and work from home while being cut off from community supports. Existing research suggests children with Attention-Deficit Hyperactivity Disorder (ADHD) are more likely to experience multiple mental health issues than their peers. Children with attentional difficulties are also at greater risk for experiencing higher levels of distress when required to remain indoors. Furthermore, families with children who have ADHD have an increased likelihood of experiencing more stress within the household due to challenges with managing ADHD behavioural symptoms, higher rates of divorce, and greater financial difficulties compared to other families. Previous research has found that children with ADHD were shown to struggle with the maintenance of their physical activity levels compared to their peers. However, children with ADHD who engage in regular physical activity are better able to manage their emotional and physical health while experiencing less psychological difficulties. This study focused on examining how the COVID-19 pandemic has impacted the physical health participation and wellbeing of families with children who have ADHD. Researchers sought to understand how the COVID-19 pandemic impacted the physical activity of children with ADHD and their caregivers, identify potential barriers to their participation in physical activity, and recognize potential areas of support. A total of thirty-three participants from Ontario, Canada, representing fifteen independent caregiver-child units, engaged in virtual interviews conducted from October 2020 to January 2021. Participants identified the barriers to participating in physical activity as being related to social isolation, increased screen-time, and increased mental health difficulties. Identified supports included community support programs

and emotional support groups. The primary goal of this study was to examine the existing barriers to participating in physical activity, as well as maintaining mental and physical health during a time of uncertainty. By focusing on these barriers among families with children with ADHD, researchers aimed to determine the supports needed to help families better incorporate physical activity in the household following the pandemic.

## Statement of Co-Authorship

I certify that, to the best of my knowledge, my thesis does not infringe upon anyone's copyright nor violate any proprietary rights and that any ideas, techniques, quotations, or any other material from the work of other individuals included in my thesis, published or otherwise, are fully acknowledged in accordance with the standard referencing practices. I declare that this is a true copy of my thesis, including any final revisions, as approved by my thesis committee and the Graduate Studies office, and that this thesis has not been submitted for a higher degree to any other University or Institution.

This integrative thesis includes one manuscript which was published in *Brain Sciences*. I am the first author on this paper and was involved in conducting the literature review, data analysis, and manuscript preparation for submission. Findings from this manuscript were presented at the Child Health Symposium (2023).

- 1. Seal, E., Vu, J., Winfield, A., & Fenesi, B. (2023). Impact of COVID-19 on physical activity in families managing ADHD and the cyclical effect on worsening mental health. *Brain Sciences*, 13(6), 887.**

The study was proposed by Dr. Barbara Fenesi, who also created its research questions. This study utilized an archival dataset which was conceived by Alexis Winfield, MA; Carly Sugar, MA; and Dr. Fenesi. Data collection was conducted by Alexis Winfield, Carly Sugar, and Dr. Fenesi. The archival data was coded by myself and Julie Vu (undergraduate research assistant). I wrote this thesis independently and received feedback from Dr. Fenesi. Information from the published article included was written by myself, Dr. Fenesi, and Julie Vu, and included information previously contributed by Alexis Winfield.

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### **List of Abbreviations**

ADHD	Attention-Deficit Hyperactivity Disorder
COVID-19	The Novel Coronavirus Disease
REB	Research Ethics Board
SEM	Socio-Ecological Model
VR	Virtual Reality
WEBB	Working to Enhance Brain and Body Research

## CHAPTER 1.

### INTRODUCTION AND LITERATURE REVIEW

#### **1.1 Introduction**

Attention-Deficit Hyperactivity Disorder (ADHD) is one of the most common childhood disorders (Polanczyk et al., 2014; Sayal et al., 2018). An estimated 6.4 million school-aged children (11%) have a lifetime diagnosis worldwide (Visser et al., 2014). ADHD is characterized by developmentally excessive levels of inattention, hyperactivity, and impulsivity that interferes with daily functioning (Epstein & Loren, 2013; Sayal et al., 2018). Eighty percent of children with ADHD also have co-occurring disorders, such as anxiety and depression (Gordon-Lipkin et al., 2018), and often struggle with interpersonal relationships and academic learning (Tandon et al., 2019; Lecendreux et al., 2011). A common misconception surrounding children with ADHD is that they are highly physically active, given the hyperactive tendencies of many (Tandon et al., 2019; Cook et al., 2015). In reality, children with ADHD are typically less physically fit and active than their neurotypical peers, engage in more sedentary behaviours, and are twice as likely to engage in other unhealthy behaviours (Holton & Nigg, 2020; Kirov & Brand, 2004; Mercurio et al., 2021; Pontifex et al., 2014; Tandon et al., 2019). During the COVID-19 pandemic, children with ADHD experienced an even further decline in their physical activity participation (Davoody et al., 2022; Kharel et al., 2022; Korpa et al., 2021; Swansburg et al., 2021) as public health restrictions limited access to school-based activities, extracurriculars, and outdoor play (Panchal et al., 2021; Spitzer, 2021). While most children experienced a decline in physical activity participation during the pandemic (Neville et al., 2022; Dunton et al., 2020; Rossi et al., 2021) children with ADHD were already less active than their peers and thus experienced further disadvantage.

## 1.2 Childhood Physical Activity Participation

Participation in regular physical activity is essential for all children's physical, psychological, social, and cognitive development (Sothorn et al., 1999; Harsha & Berenson, 1995; Fedewa & Ahn, 2011; Calcaterra et al., 2022) with added benefits observed for children with ADHD (Cornelius et al., 2017; Gapin et al., 2011; Zhang et al., 2023). In general, physical activity in childhood is associated with healthier body composition (Tremblay et al., 2016), lower blood pressure (Carson et al., 2017), better physical fitness (Poitras et al., 2016), improved bone strength (Janssen & LeBlanc 2010), cardiometabolic health (Timmons et al., 2012), and motor skill development (Poitras et al., 2016; Zeng et al., 2017). Psychosocially, physical activity in childhood is associated with improved mental wellbeing (Taylor et al., 2021), social skills (Lees & Hopkins, 2013), increased self-esteem (Lees & Hopkins, 2013), quality of life (Tremblay et al., 2016), resilience (Kamini, 2019), and less psychological distress (Poitras et al., 2016). Among children with ADHD, engaging in physical activity is associated with better symptom management in both cognitive and psycho-emotional domains (Gapin et al., 2011; Hoza et al., 2016; Jensen & Kenny, 2004). Children with ADHD have functional and structural differences in neural anatomy; functionally, they are observed to have frontal and cingulate hypoactivation, and structurally they present with differences in corpus callosum, cerebellum, and basal nuclei structures (Vieira de Melo et al., 2018). The frontal cortex, and especially the prefrontal regions, are essential in higher-order cognition such as distraction inhibition, sustaining attention, and working memory (Frith & Dolan, 1996). Critically, previous research has shown that engaging in regular physical activity may help modify and regulate the structure and functions of the brain that underlie cognition and behavior, as well as the underlying physiology present in ADHD (Pontifex et al., 2014; Cerrilo-Urbina et al., 2015).

A recent meta-analysis found that physical activity was a major contributing factor to improving anxiety, depression, aggressive behaviours, and social problems often experienced in ADHD (Zang, 2019). In contrast, inadequate physical activity participation among children with ADHD is associated with poorer executive functioning (e.g., attention, working memory, inhibitory control), increased symptoms of anxiety and depression, emotional dysregulation, defiant behaviour, and reduced motivation to learn (Becker et al., 2017; Lissak, 2018; Swansburg et al., 2021; Shuai et al., 2021; Tandon et al., 2019). During the pandemic, children with ADHD who engaged in more physical activity and less screen time had fewer externalizing symptoms (e.g., inattention, hyperactivity, oppositionality) as well as fewer internalizing symptoms (e.g., anxiety, depression). This is especially important as research indicates that both externalizing and internalizing behaviours were significantly greater during the pandemic among children with ADHD (McGowan et al., 2020), impairing their quality of life and hampering caregiver-child interactions.

### **1.3 Caregiver Physical Activity Participation**

Caregivers of children with ADHD also benefit from physical activity. The duties associated with caring for children with developmental disorders often provoke increased stress, anxiety, depression, and poorer quality of life (Johnston & Mash, 2001; Margari et al., 2013; Zhang et al., 2023). However, caregivers who engage in more physical activity are better able to manage the psycho-emotional challenges of caregiving. Physical activity interventions have been shown to reduce stress, depression, and burden in caregivers (Balbim et al., 2019; Etkin et al., 2008; Loi et al., 2014). Unfortunately, recent work has demonstrated that the physical activity levels of caregivers were also negatively impacted during the pandemic (Muldrew et al., 2022). Caregivers of children with ADHD had to adopt additional roles of teacher and full-time home

keeper, on top of existing roles and stressors such as a lack of access to therapeutic resources, greater financial hardship and uncertainty compared to other families, and compounding mental health issues (Merrill et al., 2023; Winfield et al., 2023). It is unsurprising that caregivers could not participate in regular physical activity under such high-stress circumstances, moving these vulnerable individuals even further away from the benefits of self-care behaviours.

The dynamic developmental theory of ADHD emphasizes that ADHD symptomology reflects an interplay between individual predispositions and environmental influences (Sagvolden et al., 2005). The particular expression of ADHD symptoms at any given time in life will vary depending on the environmental influences at that time. Thus, during high-stress situations, ADHD symptoms tend to worsen, creating a paradox whereby it becomes increasingly more difficult to engage in health-promoting behaviours such as physical activity but also progressively more important to engage in those behaviours to reap the cognitive, psychological, and mental health benefits that help manage ADHD symptoms. Intervening with health-promoting behaviours during times of high stress will also support caregivers and the family system, as worsening ADHD symptoms are linked to deteriorating parent–child interactions and further decline in familial wellbeing.

Importantly, families function as symbiotic ecosystems, with the physical activity of caregivers directly influencing their children’s physical activity (Rhodes et al., 2019). In other words, more active caregivers yield more active children. Indeed, every additional 20 minutes of physical activity completed by a caregiver has been shown to produce an additional 5 minutes of daily physical activity among their child(ren) (Garriguet et al., 2017). Caregivers of children with ADHD who are physically active for at least three hours per week are more than four times as likely to have children who are physically active compared to caregivers who are less physically

active (Yazdani et al., 2013). The influence of caregiver physical activity perception and behaviour is even more prominent when children are younger, given their reliance on caregiver financial and transportation support to engage in many kinds of physical activity. Given how interrelated children and caregivers are when it comes to physical activity participation, it is important to capture how the pandemic has impacted both caregivers and their children.

#### **1.4 The Socio-Ecological Model**

The socio-ecological model (SEM) (Biddle et al., 2004; Bronfenbrenner, 1999; Martínez-Andrés et al., 2020) supports examining interrelated and dynamic factors to accurately reflect determinants of physical activity behaviour. Specifically, the SEM recognizes that intrapersonal, interpersonal, organizational, community and policy level factors all play a role in physical activity participation (Biddle et al., 2004; Bronfenbrenner, 1999; Martínez-Andrés et al., 2020). It is imperative to understand how children, caregivers and their broader environment were impacted during the pandemic to accurately appreciate their physical activity behaviours. Furthermore, while previous research has characterized changes in physical activity participation during the pandemic, minimal work has directly identified the barriers to and supports for physical activity participation among families with children who have ADHD. In alignment with the SEM, families with children who have ADHD are a distinct ecosystem with unique challenges, thus requiring a targeted approach to accurately reflect specific barriers and potential supports.

#### **1.5 Theoretical Framework**

Previous research has consistently identified and outlined the relationship between the physical health and activity of caregivers with that of their children (Molborn et al., 2018). The Systems Theory (Winfield et al., 2022) views environmental factors and conditions as an



integrated system. This approach can be used to understand the impact of the COVID-19 pandemic on families with children with ADHD and the interdependent relationship between their physical health and activity. The Systems Theory is comprised of six reciprocal parts including the system itself. When applied to the current study, the system of interest was children with ADHD and their families. The remaining parts included the larger complex system that the family is integrated in (i.e., classmates, colleagues, peers, etc.); the ecological system that influences behaviour, which includes government agencies, school boards, and media; homeostasis, which is the optimal and stable conditions the family would be attempting to maintain; adaptation, which is the process used by a system to adapt to environmental changes for the purpose of maintaining homeostasis; and feedback loop, which outlines how the outcomes of a system impact its inputs, resulting in a continual feedback loop.

Children with ADHD do not exist in isolation, and in order to comprehend their experiences, it is imperative that one take into account the broader conditions and environmental factors that may impact them, such as their caregivers and families. Additionally, it is important to consider the ecological systems that affect them, as well as familial factors, in order to understand the experiences of families managing ADHD. The COVID-19 pandemic has significantly disrupted these ecological systems, which has resulted in social isolation, inadequate support, and a disruption in their ability to maintain homeostasis. Families with children with ADHD may be inherently more vulnerable to dysfunctionality in the maintenance of homeostasis and positive feedback loops. The pandemic has perpetuated these challenges through systemic disruptions, which has contributed to their difficulties in maintaining systemic stability.

## **1.6 Current Study**

### ***1.6.1 Thesis Objectives***

Previous research has shown that the physical health and activity of children with ADHD, as well as their families, has concomitantly decreased during the COVID-19 pandemic, resulting in indisputable consequences and worsening of overall health and wellbeing. Although this body of research is extensive, little to no research has been conducted that specifically focuses on the experiences of families with children with ADHD and potential barriers to participating in regular physical activity during the pandemic. Current research has also failed to include the physical activity behaviours of caregivers and the resulting impact this has on the physical activity behaviours of their children.

The primary goal of this study was to better understand the existing barriers to participating in physical activity, as well as maintaining mental and physical health during a time of uncertainty and unfamiliarity. Children with ADHD are at greater risk for experiencing comorbidity of mental health-related disorders, such as anxiety, depression, and obsessive-compulsive disorder (Elia et al., 2008). This greatly impacts the quality of life experienced by these individuals in social, educational, and personal contexts. As a result, there is a decreased likelihood of engaging in and maintaining physical activity (Pontifex et al., 2014). Physical activity within this population is extremely important in supporting ADHD symptoms and mental health (Tandon et al., 2019). By focusing on these effects among a vulnerable population, such as families with ADHD, the study aimed to facilitate and aid in establishing ways in which researchers and communities can better support physical activity engagement among families with children who have ADHD, especially during times of social isolation and crisis.

### ***1.6.2 Research Questions***

The study posed three main research questions: 1) How has COVID-19 impacted the physical activity behaviours of families with children who have ADHD; 2) What are the barriers to physical activity participation during COVID-19 for families with children who have ADHD; and 3) What supports would help families better incorporate physical activity into their lives during COVID?

### ***1.6.3 Hypotheses***

Based on previous research, it was hypothesized that the most salient effect of the pandemic on physical activity participation among families with children who have ADHD will be a decline in engagement (Kharel et al., 2022; Korpa et al., 2021; Swansburg et al., 2021). Barriers to engaging in physical activity for caregivers of children with ADHD are hypothesized as being related to a lack of energy and decreased socio-emotional supports. For the physical activity behaviours of children, specifically, it is hypothesized that the lack of modeling provided by their caregivers, as well as a lack of interest in engaging in physical activity will present as significant barriers. Furthermore, it is hypothesized that social distancing mandates (Farah et al., 2021) and declining mental wellbeing (Marashi et al., 2021) will be significant barriers to physical activity participation for both caregivers and their children with ADHD. Additionally, although identifying the supports needed by families was exploratory in nature, based on previous research with neurotypical children (Vandoni et al., 2022) and older adults (Gao et al., 2020), it is hypothesized that greater access to socially distanced physical activities through community resources and programs will be noted as helpful for both caregivers and their children.

## CHAPTER 2.

### METHODS

#### **2.1 Participants**

The current study applied archival data collected from a previous study conducted within the Working to Enhance Brain and Body Research (WEBB) lab at Western University. Ethics approval was granted by Western University's Non-Medical Research Ethics Board (see Appendix H). Recruitment occurred between October 2020 and January 2021. Caregivers of children with ADHD were contacted based on previous affiliation with lab research. The institution's Cognitive Neuroscience Research Registry was also utilized to recruit participants. Furthermore, snowball sampling – a sampling technique where current participants recruit individuals they know personally – was used by asking existing participants if they knew of any other families with a child with ADHD who would be interested in participating.

A total of 33 participants from Ontario, Canada, representative of 15 independent caregiver-child dyads (15 caregivers and 18 children), took part in the study. A total of 25 family units were contacted, with a response rate of 60%. Thematic saturation was used to decide when to discontinue data collection (Lowe et al., 2018). Saturation was met when no additional new information, as pertaining to the specific research questions, was being raised during participant interviews. Consultation on this decision was performed throughout the data collection process among researchers. To be eligible to participate in the study, caregiver participants must have had at least one child between the ages of seven to 12 years old with an ADHD diagnosis who was living with them for at least some time during the COVID-19 pandemic. The distinction of the caregiver having lived with the child during the pandemic was necessary to increase inclusivity for families with shared custody living arrangements. Participation in the semi-

structured interview was mandatory for caregivers but was optional for children. Demographic information can be found in Table 1.

**Table 1**

*Demographic Characteristics*

Demographic Characteristic	Frequency
Sex of caregiver	
Male	2
Female	13
Sex of child	
Male	12
Female	6
Age of child (y) (Mean/SD)	10.16/2.2 (range 7-12)
Race of caregiver	
Caucasian	14
Black	1
Education	
Some post-secondary	1
Post-secondary	4
University/professional degree	7
Household income	
20,000-30,000	1
80,000-90,000	1
90,000-100,000	2
100,000+	5
Prefer not to say	6
Comorbid neurological diagnosis (child)	3
Comorbid mental disorder diagnosis (child)	3
Comorbid physical/auditory/visual disorder diagnosis	4

## 2.2 Procedure

Participants were contacted via email using a recruitment script (see Appendix A). Prior to engaging in the virtual interviews, all participants completed both consent and assent forms via email (see Appendices B, C, and D). Additionally, parents also completed an online

demographics survey through software approved by the university (see Appendix E). Following the completion of these forms and survey, participants engaged in semi-structured virtual interviews with a researcher conducted via Zoom (see Appendix F). Each interview lasted approximately one hour for the parent(s) portion and 30 minutes for the child portion. All participants, both parent and child, were compensated for their time in the form of a \$10 Amazon gift card.

### ***2.2.1 Materials***

**Online Survey.** Caregiver participants completed an online demographics questionnaire through Qualtrics XM, an institutionally approved survey tool. The questionnaire included items about age, gender, income, race, and education. Specific questions were also asked about the child participant's ADHD diagnosis. These questions inquired about comorbid neurological diagnoses, comorbid mental disorder diagnoses, and comorbid physical, auditory, and visual disorder diagnoses (see Table 1).

**Semi-structured Interviews.** The socioecological model (SEM) was used to create the interview questions. As noted previously, the SEM is often used to identify barriers to behaviour by highlighting the relation between intrapersonal, interpersonal, institutional, community, and policy factors influencing behaviour (Bronfenbrenner, 1979). The term "barriers" was used throughout the interview, with specific questions aimed at the interrelated levels (e.g., references to intrapersonal, interpersonal, and community factors impacting physical activity for both children and caregivers). All interviews occurred via Zoom and were recorded.

**Caregiver interview.** The caregiver interview was comprised of two parts. The first part asked caregivers about the barriers experienced by their children during the pandemic, specifically due to their ADHD diagnosis, and whether there had been changes in the presenting

symptoms associated with their child's ADHD. The subsequent part of the interview focused on questions related to physical activity; the questions probed about the caregivers' physical activity and their child's physical activity before and during the pandemic and sought to gain insight into the barriers they experienced to maintaining physical activity engagement (see Appendix F).

***Child Interview.*** The child interview was also comprised of two parts. The first part asked for demographic information of age and gender. The second part asked two questions: (1) What type of physical activity did you do before the COVID-19 pandemic? How often? (2) Have you been able to participate in physical activity during the COVID-19 pandemic? If yes, what activities do you do? If no, do you wish you could do more? Follow-up questions (prompts) were used if children had difficulty understanding the initial questions, including "What has helped you keep doing those activities?" and "What has gotten in the way of you participating in physical activity?". Children were interviewed separately from their caregivers to offer them full freedom of expression. Children and caregivers were asked age-appropriate questions that were different, but related, to account for possible differences in communication or self-reflection ability.

### ***2.2.2 Qualitative Data Analysis***

A post-positivist paradigm was used in data collection and analysis (Henderson, 2011). Given that the current study aimed to understand experiences related to the COVID-19 pandemic, which the researchers were also experiencing, a post-positive approach was most appropriate to account for researcher bias and potential influences of personal experience and background knowledge related to the pandemic (Ryan, 2006). Inductive content analysis was used to analyze interview responses (Elo & Kyngäs, 2008). Content analysis compresses texts into content categories based on explicit codes and was used to examine trends and patterns in

transcribed audio-recorded interviews (Mayring, 2014; Mayring, 2019). The technique was inductive as content categories were derived from the data. The content analysis aimed to identify, analyze, and report common themes from both parent and child interview transcripts. Specifically, the analysis aimed to identify the effects that the pandemic had on the physical activity participation of families with children with ADHD, the barriers they faced to engaging in physical activity, and the supports they would need to better engage in physical activity during a pandemic.

In the first step of data analysis, digital recordings of interviews were transcribed verbatim using Trint, a professional transcription service. The transcribed interviews were then read over independently by two researchers to help them become familiar with the data. Following a familiarization phase, the two researchers collaboratively generated a preliminary codebook to categorize interview content into meaningful groups based on emerging themes. The preliminary codebook was then applied to all transcripts. Following this, researchers consulted on the success of the codebook in capturing key themes in the data. Any coding discrepancies were reviewed and discussed, and final coding decisions were made. A final codebook was generated and reapplied to all transcripts (see Appendix G). All transcriptions were then inputted into MAXQDA (V23), a qualitative computer software program, and the finalized coding protocols were applied. All themes and subthemes are reported in tables below. Excerpts from participants are provided to illustrate key findings.

**Trustworthiness.** Multiple measures were implemented to ensure trustworthiness by considering credibility, dependability, and transparency. To ensure credibility, investigator triangulation was used. Multiple investigators took part in the research process, particularly in the data analysis stage, with investigators working together throughout data analysis to ensure



consistency in coding. This contributed to credibility by confirming findings across multiple investigators and by minimizing any research bias (Archibald, 2016; Flick, 2022). Dependability was promoted by creating explicit and repeatable methods through the use of recruitment scripts and interview guides. Detailed methodology and research processes were recorded throughout the research process. The institution's Research Ethics Board (REB) approved the study (protocol #116190) (see Appendix H).

## CHAPTER 3.

## RESULTS

The results are divided into three sections, each representing its corresponding research question. All three research questions are represented as a topic theme, with subthemes generated from data analysis. Themes and subthemes are presented in the order of highest frequency of occurrence, which is defined by the number of times the theme was cited by the participants in their interviews. Representative quotations from the interviews are provided. Any themes and subthemes that have both caregiver and child quotes indicate that both sets provided data.

### **3.1 Research Question 1: How Did the COVID-19 Pandemic Impact Physical Activity Participation among Families with Children Who Have ADHD?**

Table 2 provides a summary of the ways in which the COVID-19 pandemic affected the physical activity of families with children who have ADHD. The most salient theme was a reduction in physical activity, with social distancing restrictions and decreased motivation as the major contributing factors. Interestingly, some families noted an increase in physical activity, with an increase in leisurely physical activity opportunities and at-home workouts.

**Table 2**

*Frequency Summary of Main Themes and Subthemes of How COVID-19 Affected Physical Activity Participation Among Families with Children who Have ADHD.*

Theme	Frequency
Decrease in Physical Activity	91
Social Distancing Mandate	34
Decreased Motivation	33
Facility Closures	8
Decrease in Overall Health	6
Increase in Physical Activity	19
Increase in Leisurely Physical Activity	9
Increase in At-Home Workouts	3

### ***3.1.1 Theme 1: Decrease in Physical Activity***

Both caregivers and children expressed that there was a significant reduction in their physical activity participation during the COVID-19 pandemic. The major contributing factors to these reductions (subthemes) were social distancing requirements, decreased motivation, facility closures, and an overall decrease in physical and mental health.

**Subtheme 1a: Social Distancing Mandate.** Caregivers expressed that the social distancing requirements shut down their children's extracurricular activities that would have otherwise kept them physically active. Children also expressed school closures as interfering with their ability to play at recess, attend physical education class, and play school sports. Several caregivers noted: "Prior to the pandemic, he was doing gymnastics, and swimming and he was signed up for soccer. And then that dropped to zero. And physical activity is huge for him. For focus and getting outside." (Participant 11, caregiver); "She [could no longer participate] in horseback riding and dance. She missed all her recitals." (Participant 3, caregiver); "[They] couldn't go to a playground, or even go outside sometimes. Their hockey, all their programs, had stopped." (Participant 5, caregiver). Another caregiver described their loss of access to gym facilities and its impact, "I miss my gym. I used to go three to four times a week because I had a personal trainer. Now I have nothing." (Participant 5, caregiver). One child also expressed:

"[Before the pandemic], I liked running around, walking, just going outside with my friends at recess, and biking. But now, because of COVID, I've kind of shut myself down. I spend less time outside and I've been doing a bunch of art, playing video games, and just staying inside". (Participant 2, child)

**Subtheme 1b: Decreased Motivation.** Caregivers described how they themselves and their children were experiencing a significant decline in their motivation to be physically active. The following excerpts illustrate the decline in motivation: “It’s been really hard to personally engage in physical activity and really hard to get my child to engage as well.” (Participant 11, caregiver); “I thought for so long, just do the exercises in the house, but I just can’t find the motivation.” (Participant 14, caregiver); “Unless the exercise was fun, they did not want to participate. It was a lot of ‘Mom, why would I do that?’” They didn’t want to just exercise for the sake of it.” (Participant 8, caregiver). Another caregiver noted:

“[My children] used to enjoy going for hikes in the woods. I could not pay them to leave the house [now]. Personally, I thought for so long, just do the exercises in the house, but no, I just don’t find the motivation to do that”. (Participant 14, caregiver)

**Subtheme 1c: Decrease in Overall Health.** Caregivers expressed that their children’s overall physical health was negatively affected by the pandemic, with many referencing an increase in poor sleep habits due to an increase in sedentary behaviour during the day. Several caregivers also indicated an increase in poor eating habits, prolonged screentime use, and weight gain. “[My children] are getting less sleep as a result of being more sedentary and burning off less energy. Their nighttime routines have been challenging.” (Participant 6, caregiver); “Screentime is an everyday fight . . . he has also gained a lot of weight.” (Participant 8, caregiver).

### ***3.1.2 Theme 2: Increase in Physical Activity***

Some caregivers and children expressed a greater ability to participate in physical activity. Participants noted that they had more opportunities to engage in leisurely physical

activity (outdoor walks, biking, hiking) and they were able to leverage the stay-at-home orders and engage in at-home workouts.

**Subtheme 2a: Increase in Leisurely Physical Activity.** Several participants noted that because their daily routines were less structured, it allowed them to engage in physical activity more casually and conveniently. In addition, because there were few public places to attend, many families took advantage of walking as a form of physical activity and were able to engage in it more regularly. Several caregivers noted: “We went out with our masks for a daily walk. Twice a day, three times a day, just to get out of the house. That was positive.” (Participant 3, caregiver).

“We had a lot more fun because there were less pressures, which probably allowed my children to be themselves more. Everything takes them so much longer [to do] because they [struggle to] focus and they were often unable to move and [be active]. The pandemic gave them more downtime and time to move around”. (Participant 8, caregiver)

**Subtheme 2b: Increase in at-Home Workouts.** Caregivers specifically expressed finding at-home workouts using online videos or self-directed exercises with basic equipment or body weight only, and that the stay-at-home orders forced them to engage in more activity at home given the limited external options. Several noted: “I’ve started to try to work out from home.” (Participant 10, caregiver); “I used to work out three times a week, but now I’m up to five because I [can do it at home] and I just need it”. (Participant 12, caregiver).

### **3.2 Research Question 2: What Were the Barriers to Physical Activity Participation during the COVID-19 Pandemic among Families with Children Who Have ADHD?**

Table 3 provides a summary of the barriers to physical activity during the COVID-19 pandemic among families with children who have ADHD. The most significant barriers to

physical activity participation noted by both caregivers and children were increased social isolation, intrapersonal difficulties, and screen time use. Caregivers also noted a decrease in available time to participate in physical activity due to increased caregiver responsibilities and a decrease in respite. Caregivers also mentioned that their child(ren)'s routines were severely disrupted (e.g., sleep, school, therapy, friends), leaving little to no room to consider physical activity.

**Table 3**

*Frequency Summary of Main Themes and Subthemes of the Barriers to Physical Activity Participation During COVID-19 Among Families with Children who Have ADHD.*

Theme	Frequency
Increased Social Isolation	39
Increased Intrapersonal Difficulties	32
Decreased Self-Efficacy	17
Decreased Energy Levels	6
Increased Mental Health Difficulties	6
Increased Screen time	28
Decrease in Available Time	14
Increase in Caregiver Responsibilities	6
Decrease in Respite	5
Dysregulated Routine	13

### ***3.2.1 Theme 1: Increased Social Isolation***

Caregivers expressed that social isolation was the most significant barrier to physical activity participation for their children. Many caregivers noted that their children's primary way of being physically active prior to the pandemic was through peer play and socializing, and that social distancing limited these options: "A huge challenge and barrier for [my son] has been the lack of peer play, and a lack of being able to socialize." (Participant 10, caregiver); "For my son,

[physical activity] only happens if it's social. He's not a kid who's going to go out and run around by himself." (Participant 2, caregiver).

### **3.2.2 Theme 2: Increased Intrapersonal Difficulties**

Caregivers expressed an increase in intrapersonal difficulties both within themselves and within their children that interfered with physical activity participation. Most significantly, caregivers noted a decrease in self-efficacy with new ways of being active, increased mental health difficulties that overrode physical activity priorities, and increased fatigue and lethargy.

**Subtheme 2a: Decreased Self-Efficacy.** Many caregivers described a reduction in self-belief that they could participate in new ways of being physically active, and that their children were shellshocked and unsure how to navigate such a novel routine and a less structured environment. Several caregivers noted: "I was great at doing structured activities [with my child], but I'm not good at playing. I'm a very poor playmate". (Participant 11, caregiver); "[My child] just doesn't know how to go about being physically active in this new way." (Participant 6, caregiver).

**Subtheme 2b: Increased Mental Health Difficulties.** Caregivers expressed their own mental health struggles, and the relation to diminished physical activity and health-promoting behaviours. They also described how their children were struggling emotionally and the consequences for how they engaged with physical activity. One caregiver noted, "I'm not active and I'm making poor food choices because I don't feel great". (Participant 11, caregiver).

Another caregiver described:

"You can tell that [my children] are hurting by the way they [speak and act]. They just aren't able to do what they used to, and their independence has been stripped. [My son] went for a bike ride two weeks ago and he froze [it was so cold]". (Participant 13, caregiver)

**Subtheme 2c: Decreased Energy Levels.** Caregivers noted that the increase in mental health issues due to a variety of factors (e.g., increased caregiver roles, greater uncertainty, and fear) depleted both their own and their children’s energy to engage in physical activity. Many noted that physical fatigue was not the reason for their low energy, but it was the mental fatigue that prevented them from being able to select health-promoting behaviours. Some caregivers expressed: “There is very little energy in the house right now invested in physical activity.” (Participant 14, caregiver); “My son and I are way less energetic, way more sedentary than we used to be. And that’s despite knowing how much physical activity helps him.” (Participant 11, caregiver). Another caregiver mentioned:

“At work, I used to do things like take the stairs instead of the elevator. But that’s disappeared because I’m just so tired. It’s not even physically tired, I’m mentally tired. I take the elevator now because [the pandemic] has made making those small choices really hard”. (Participant 11, caregiver)

### ***3.2.3 Theme 3: Increased Screen Time***

Caregivers described how the use of screen time not only increased but also often substituted for time that could have been spent participating in physical activity. Caregivers also emphasized that screen time was often a saving grace, allowing them to focus on other tasks while their children were occupied. However, they recognized the detrimental impact of increased screen time on other areas of their child’s life, such as less physical activity involvement. Several caregivers articulated: “My son’s screen time has doubled.” (Participant 12, caregiver); “As a parent you’re trying to manage everything, so you often default to screen time in order to get other stuff done, [and then they miss out on other things]”. (Participant 10, caregiver); “They’re sitting around all day watching TV or playing video games, or maybe they



build a Lego, but they're not as active as they used to be". (Participant 5, caregiver). A child participant expressed:

"There's not much left for me to do and there's not much that I want to do. I'm trying to take my mind off things [with video games]. It's also one of the ways I'm trying to interact with people". (Participant 2, child)

### **3.2.4 Theme 4: Decrease in Available Time**

Caregivers expressed that a significant barrier to physical activity participation during the pandemic was simply less available time. The major contributors to diminished available time were noted as an increase in caregiver responsibilities and an overall decrease in respite.

**Subtheme 4a: Increase in Caregiver Responsibilities.** Caregivers described being overwhelmed with additional caregiving responsibilities during the pandemic, with many becoming stay-at-home caregivers managing their children's educational, physical, and emotional needs, while also being fulltime employees. Many caregivers described not having "anything left" and could not devote physical energy to another task: "I just can't handle any more [responsibilities]. I'm so overwhelmed with my own emotions and work, and I'm just trying to get through the day." (Participant 9, caregiver). Another caregiver described:

"My [physical activity routine] went out the window because I was on practicum Monday, Wednesday, Friday, and I was in school from 8:30 a.m.–5:30 p.m. on Tuesdays and Thursdays, and then preparing dinner for my children and managing the rest of their schedule. I didn't have time to [be physically active] during the pandemic". (Participant 10, caregiver)

**Subtheme 4b: Decrease in Respite.** Many caregivers expressed that they were unable to take time away from their children or their household responsibilities to be physically active.

Limited options with daycares, babysitters, and an overall diminished social network due to social distancing mandates prevented opportunities for respite and self-care. Caregivers noted: “There has been nowhere to put my kids, and nobody to watch them for me to be able to go to workout or go to the gym.” (Participant 10, caregiver); “Even things like hiring a babysitter has become so complicated. You don’t know who is in their bubble. So the lack of child care has made it really challenging to be active.” (Participant 11, caregiver).

### ***3.2.5 Theme 5: Dysregulated Routine***

Caregivers and children expressed that the upheaval in their typical routines was a source of stress. Children discussed how their routines were a source of comfort and caregivers described how disordered routines were major contributors to poor focus, poor sleep, mood disturbances, and overall decreased quality of life for themselves and their children with ADHD. Caregivers articulated: “Before COVID, [my son] knew what was happening. As long as he had structure, for the most part, things weren’t a struggle for him”. (Participant 5, caregiver); “My daughter needs a very specific routine, a structured environment. With COVID there was so much unreliability, it made it really difficult.” (Participant 3, caregiver). A child participant expressed:

“[The hardest thing about dealing with the pandemic] is not having a schedule. I’m used to having to wake up, and within a 10-min period having to get ready, catch a bus, and school was also all the same thing. I want to get my old schedule back, so that I’m not doing random things each day”. (Participant 4, child)

## **3.3 Research Question 3: What Supports do Families with Children Who Have ADHD Need to Better Engage in Physical Activity during a Pandemic?**

Table 4 provides a summary of the supports identified by families with children who have ADHD to better engage in physical activity during a pandemic. Caregivers indicated that community supports in the form of physical activity programming and psycho-emotional support groups would help them become more involved in physical activity. Many also expressed a sense of hopelessness and were unable to suggest potential supports as they articulated that the circumstances felt too overwhelming.

**Table 4**

*Frequency Summary of Main Themes and Subthemes of Supports Identified by Families with Children who Have ADHD to Better Engage in Physical Activity During a Pandemic.*

Theme	Frequency
Community Supports	14
Physical Activity Community Supports	9
Psycho-Emotional Community Supports	5
Unsure of Supports Needed	11
Hopelessness	6
Sufficiently Supported	3

### ***3.3.1 Theme 1: Community Supports***

Caregivers expressed that they needed more support from community groups that could advocate and information-share on behalf of families raising children with ADHD to improve accessibility to helpful resources. They also emphasized the need for targeted physical activity supports for their children to participate in physical activity more easily and effectively, as well as community organizations to support the psycho-emotional wellbeing of themselves and their children. Some caregivers emphasized: “If there was an advocacy group that could advocate for parents [with children who have ADHD] . . . otherwise unless your doctor refers you to

somewhere, you don't know what resources are available to you". (Participant 9, caregiver); "We need more direct, one-on-one support." (Participant 3, caregiver).

**Subtheme 1a: Physical Activity Community Supports.** Caregivers emphasized that they would appreciate learning skills and techniques to support their children's physical activity participation at home, rather than needing to leave the home under pandemic conditions. They also expressed that online physical activity options were only effective if it involved a live instructor leading activity, otherwise their children would disengage from pre-recorded videos. Caregivers mentioned: "We would benefit from being taught strategies that we could implement at home . . . so that we could meet their needs at home." (Participant 8, caregiver); and

"Businesses and community centers need to think about how to bring physical activity into people's houses in a virtual format. Simply playing a YouTube video and asking my kids to dance along was not enough. My kids looked at me like I was nuts. If it's novel and there's a person live on screen, not just a recording of someone saying do this, do that, my kids would be much more likely to participate". (Participant 10, caregiver)

**Subtheme 1b: Psycho-Emotional Community Supports.** Caregivers discussed wanting community programming that offered a space to share challenges and resources with families also raising children with ADHD. They described how addressing the mental burden of the pandemic on the lives of both caregivers and children could potentially create greater mental space to then direct towards engaging in physical activity. Some mentioned: "I really wish there was a group of similarly struggling people that could come together and talk about their experiences and how they cope." (Participant 6, caregiver); "I wish there were groups for children with ADHD, so that they could go hear other kids with similar experiences and the challenges that they're having." (Participant 8, caregiver).

### ***3.3.2 Theme 2: Unsure of Supports Needed***

Many caregivers were unsure of what supports they would need to better engage in physical activity during the pandemic. Many were unable to consider how their daily tasks could shift or be supported to create space for more physical activity. In other words, there was a sense of unrelenting overwhelm that was impervious to support. One participant stated directly, “I don’t know what I need”. (Participant 12, caregiver). A smaller number of participants expressed being sufficiently supported.

**Subtheme 2a: Hopelessness.** Many caregivers described feeling hopeless in their current situation, and that there were no supports that could really help. Rather, the pandemic itself needed to shift for changes in their daily life to occur, which could offer more space for physical activity engagement. Caregivers described: “Unless your doctor refers you to somewhere you don’t know what resources are available to you. We feel helpless”. (Participant 9, caregiver); “I can’t think of anything that can help us be better supported. Trouble is, when everyone’s [stuck] inside doing nothing because you can’t do anything, there’s not much you can do.” (Participant 5, caregiver); and “I don’t know if there’s really anything that can help in this situation . . . you kind of just have to do with what you have”. (Participant 15, caregiver).

**Subtheme 2b: Sufficiently Supported.** Some caregivers expressed feeling sufficiently supported, and that their inability to engage in physical activity was more a reflection of diminished motivation due to overwhelm in other areas of their lives: “No supports needed. [We are just unmotivated].” (Participant 1, caregiver).

## CHAPTER 4.

### DISCUSSION

The current study examined how the COVID-19 pandemic affected the physical activity behaviours of families with children who have ADHD. The most frequently identified impact was a reduction in physical activity engagement due to social distancing requirements, decreased motivation, facility closures, and a decrease in overall health. A smaller proportion of families, however, noted an increase in physical activity behaviour, as they were able to engage in more leisurely physical activity throughout the day and many found solace in at-home workouts. The most frequently identified barriers to physical activity participation were social isolation, increased intrapersonal difficulties, increased screen time, decreased available time, and dysregulated routines. Additionally, worsening mental health due to inactivity and circumstance further distanced caregivers and children from physical activity. In turn, this undermined the potential for physical activity to support ADHD symptom management and child and caregiver mental wellbeing. While many families expressed a need for more community supports to facilitate physical activity involvement, several other families expressed feelings of hopelessness and were unable to identify ways they could be better supported. The following will discuss the major themes and subthemes and offer suggestions for future support.

#### **4.1 Research Question 1: How Did the COVID-19 Pandemic Impact Physical Activity Participation among Families with Children Who Have ADHD?**

##### ***4.1.1 Decrease in Physical Activity***

Both caregivers and children noted that their physical activity participation declined during the pandemic. This finding is supported by prior work that also found a decrease in physical activity among children with ADHD during the pandemic (Kharel et al., 2022; Korpa et

al., 2021; Swansburg et al., 2021), as well as among caregivers (Muldrew et al., 2022).

Participants attributed the decrease in physical activity to social distancing requirements, decreased motivation, facility closures, and a decrease in overall health.

**Social Distancing Mandate.** Caregivers and children cited that government-mandated social distancing measures were the most prominent contributors to reductions in physical activity during the pandemic. This was especially true for children as they lost the ability to participate in peer play, organized sports, physical education classes, indoor/outdoor playgrounds, and extracurriculars. Many caregivers noted exerting excessive effort to encourage physical activity participation among their children, which was often met with resistance. Children between 7–12 years of age often require heavy involvement from caregivers to engage in physical activity, and this becomes compounded when there is no support from school, extracurriculars, or organized sports. Unfortunately, children were not interested in or motivated to partake in activities organized by their caregivers, as they often found them unengaging and isolating. Instead, they opted for sedentary activities such as watching TV or playing video games, which were more entertaining and allowed them to connect with peers. Recent systematic reviews among youth aged 5–17 years similarly found that social distancing mandates and pandemic-related closures were the major contributors to hindered physical activity participation (Kharel et al., 2022; Do et al., 2022). Other studies also suggest that lack of adequate information surrounding COVID-19 may have contributed to increased fear and greater desire to socially distance (Erku et al., 2021; Lazaroiu & Adams, 2020; Murayama et al., 2021; Mortazavi et al., 2020).

**Decreased Motivation.** Caregivers shared that their children with ADHD experienced a significant decline in motivation to participate in physical activity. Caregivers expressed that

they appreciated the importance of physical activity for wellbeing, but that their children did not share a similar appreciation unless physical activity was offered in an enjoyable way. Many caregivers shared that it was a “battle” to motivate their children to engage in any physical activity, unless the activity was fun, engaging, or purposeful. Children resisted physical activity for the “sake of” physical activity, such as simply going for walks or participating in at-home exercises, despite caregiver encouragement and modeling. Although previous research has shown that direct caregiver support and behavioural modeling are strong predictors of children’s physical activity participation (Petersen et al., 2020), these were not sufficient qualities to promote physical activity among children with ADHD during the pandemic. Children and caregivers both shared that motivation was directed towards sedentary pastimes, especially screentime, displacing time that could be directed towards physical activity. These findings may be related to the documented increases in mood-related disturbances among caregivers and children with ADHD during the pandemic, including amplified depression and anxiety (Swansburg et al., 2021; Asbury et al., 2021; Behrmann et al., 2022; Breaux et al., 2021; Cortese et al., 2020; Stavridou et al., 2020; Thorell et al., 2022). Problematically, poor mental health is a barrier to engaging in physical activity despite the act of engaging in physical activity helping to reduce mental distress. The decrease in motivation is likely partially due to the impact of pandemic-related stressors on mental wellbeing, which may have then manifested as a lack of desire to engage in physical activity (Marashi et al., 2021). For children, the lack of enjoyment surrounding the types of physical activity options available was also a major deterrent; this coincides with previous work arguing that experiencing joy during physical activity is critical for voluntary and sustained participation (Eather et al., 2013; Kimiecik & Harris, 1996; O’Reilly et al., 2001; Richard et al., 1997).



**Facility Closures.** Several caregivers expressed that the closure of facilities (e.g., gyms, recreation centers) was a significant contributor to their decline in physical activity during the pandemic. Caregivers were emphatic that their pre-pandemic ability to leave their home and either attend the gym or attend other physical activity events (e.g., yoga, spin class) was imperative to staying active. Given social distancing requirements, many caregivers were left without the resources or knowledge on how to remain active in alternative ways. While previous research has also shown that facility closures contributed to a decline in physical activity participation among the general public (Farah et al., 2021), the current study elucidates that those facilities not only provided resources but also important social facilitation. Several caregivers indicated that their motivation to engage in physical activity was directly linked to being surrounded by others participating in physical activity (Kaur et al., 2020). Thus, the lack of environmental support contributed to poor motivation and declining physical activity. Caregivers also expressed that recreation center closures undermined their child(ren)'s physical activity participation, as many were involved in hockey, dance, swimming, and other sports.

**Decrease in Overall Health.** Caregivers spoke about how their children's overall physical and mental health declined, contributing to diminished physical activity. Specifically, caregivers noted that their children's sleep quality was negatively affected; they often went to sleep late and were unable to wake in the morning. As a result, children had less energy to engage in physical activity during the day. This resulted in a cyclical negative feedback loop wherein poor sleep routines undermined children's ability to participate in physical activity, which produced an excess of energy at the end of the day, and further disturbed sleep onset and quality. This is especially problematic among children with ADHD, as they already experience sleep difficulties (Sung et al., 2008; Thoma et al., 2020), which were further amplified by the

pandemic (Olive et al., 2022). Some caregivers mentioned that their children experienced an increase in general aches and pains, which they attributed to excessive sedentary behaviours; this further undermined children's desire to participate in physical activity. Unhealthy weight gain was also mentioned by caregivers as a contributor to their child(ren)'s lack of physical activity participation, which was again attributed to increased sedentary behaviour and screen time. Many caregivers spoke about their own decline in mental health, and how it interfered with their ability to practice self-care behaviours, such as engaging in physical activity. This mirrors previous research that similarly found that the pandemic negatively affected several elements of health among both caregivers and children with ADHD (Swansburg et al., 2021; Asbury et al., 2021; Behrmann et al., 2022; Breaux et al., 2021; Cortese et al., 2020; Stavridou et al., 2020). It is evident that the decline in physical activity was associated with a decline in other health-promoting behaviours, including sleep, diet, and routine, which are essential lifestyle factors that impact ADHD symptom management.

#### ***4.1.2 Increase in Physical Activity***

Interestingly, some caregivers and children expressed that they were able to participate in more physical activity during the pandemic, as they were able to engage in more leisurely and at-home activities. Participants noted that the lack of daily routine and structure had some positive benefits by allowing more opportunities to go outside for walks or bike rides at random, unscheduled times; previously, physical activity was often scheduled in the form of school, gym, or extracurriculars. Furthermore, a few caregivers noted that since at-home workouts became the only option at times, the accessibility of online videos was motivating and helped improve their engagement in physical activity compared to pre-pandemic (Petersen et al., 2021). These results are similar to work showing that the pandemic disproportionately negatively affected the activity

levels of youth, but not adults (18 years and older). In Canada, recent work found no change in physical activity participation among those between 18 and 49 years of age during the pandemic, while those 50 years of age and older experienced an increase in physical activity (Colley & Watt, 2022). Other work has also shown that among university students in parts of Spain, weekly physical activity participation also increased during the pandemic (Romero-Blanco et al., 2020). More nuanced research among university students also showed that students who were low to moderately physically active participated in more physical activity during the pandemic, whereas those who were highly active participated in less activity (Barkley et al., 2020).

## **4.2 Research Question 2: What Were the Barriers to Physical Activity Participation during the COVID-19 Pandemic among Families with Children Who Have ADHD?**

### ***4.2.1 Increased Social Isolation***

The most frequently expressed barrier to physical activity for both caregivers and children with ADHD was social isolation. Participants spoke at length about the difficulties of implementing physical activity into their routine when the social aspects were unavailable due to stay-at-home orders or social distancing mandates. This was especially salient for children with ADHD, as many caregivers discussed the resistance and disinterest their children had for physical activity when it no longer involved peers. Indeed, peer play and extracurriculars were the primary ways that these children engaged in physical activity prior to the pandemic. Social isolation not only removed these opportunities for activity, but it also created a significant gap in children's days that otherwise would have been spent playing with peers or participating in extracurricular activities. The SEM would characterize the decline in physical activity due to increased social isolation as reflecting fractures to all levels of the system, including the intrapersonal level (e.g., negative attitude towards caregiver-led activities), the interpersonal

level (e.g., lack of engagement with peers and coaches), the institutional level (e.g., lack of school-based physical activity opportunities, lack of organized sports), the community level (e.g., lack of community-organized activities), and the policy level (e.g., social distancing mandates preventing interpersonal interactions which were the bedrock of pre-pandemic physical activity participation). Previous research similarly found that social isolation was one of the most significant barriers to physical activity participation among diverse populations (Farah et al., 2021). Although social isolation was problematic for many families, those raising children with ADHD rely even more so on social elements to provide routine, structure, and predictability in daily life (Winfield et al., 2023).

#### ***4.2.2 Increased Intrapersonal Difficulties***

Participants frequently shared that increased intrapersonal difficulties were a significant barrier to participating in physical activity during the pandemic. Many internal factors—biological, personal, mental—interfered with caregivers’ and children’s ability to participate in physical activity. Participants expressed that intrapersonal factors related to decreased self-efficacy (i.e., belief in your ability to accomplish a task), decreased energy levels, and increased mental health difficulties interfered with physical activity involvement.

**Decreased Self-Efficacy.** Several caregivers expressed a hopelessness in their ability to motivate either themselves or their children to be physically active. As previously mentioned, these children were highly disinterested in the available options for physical activity (e.g., walking, hiking, video-based activities) and were unmotivated when it did not involve peers. Caregivers discussed how creating engaging, novel, and purposeful physical activity for their children required immense creativity and effort. This, in turn, left caregivers feeling burnt out and at a loss for new ideas, further diminishing their self-efficacy. Some caregivers expressed a

similar kind of hopelessness among their children; these caregivers shared that their children did not know how to be active during the pandemic, appearing lost and confused when trying to find ways to actively play without peers. Self-efficacy is a crucial component to the ongoing engagement in any behaviour, as noted by social cognitive theory (Bandura, 1991); Schunk & Usher, 2012). Importantly, self-efficacy only develops when tasks are successfully completed, and is often supported by a knowledgeable teacher or peer. Given the lack of access to knowledgeable models and peers beyond the caregivers, the decline in self-efficacy is not surprising. Perhaps older children (12+) could have been more capable of developing self-efficacy outside of caregiver influence, but child participants in the current study clearly struggled, with only their caregivers to support their self-efficacy development. Although a decrease in self-efficacy can be viewed as an intrapersonal barrier, it is a manifestation of misaligned interpersonal connections (e.g., lack of peer interactions, poor communication with caregivers), a lack of institutional support (e.g., school closures, no extracurricular options), a dearth of community support, and a direct reflection of the public health mandate of social distancing which minimized opportunities for physical activity participation.

**Decreased Energy Levels and Decline in Mental Health.** Some caregivers shared that both they and their children experienced a decline in energy levels and mental health during the pandemic. For caregivers, diminishing energy and mood were largely attributed to the overwhelming and expanding roles that they were required to take on during the pandemic. Their main goal was to conserve as much energy as possible to tackle the many tasks of the day. Some caregivers recognized the cyclical nature of worsening mood and physical inactivity and expressed that their inability to participate in physical activity was also contributing to low mood. For children with ADHD, lack of energy and lower mood were attributed to poor sleep,

lack of physical activity engagement, boredom, and excessive screen time. Unfortunately, low energy and low mood further contributes to physical inactivity and poor sleep, compounding the negative effects of lethargy and mental distress on lifestyle. This is especially problematic for children with ADHD as they are already more likely than their typically developing peers to be physically inactive, have poorer sleep quality, and experience comorbid mental health issues (Tandon et al., 2019; Holton & Nigg, 2020; Kirov & Brand, 2004; Mercurio et al., 2021; Pontifex et al., 2014; Swansburg et al., 2021; Winfield et al., 2023; Asbury et al., 2021; Sciberras et al., 2022). Even pre-pandemic, lethargy and mental health difficulties have been noted as common elements in the lives of children with ADHD (Breggin, 1999; Koriakin et al., 2015), interfering with their ability to focus during school and undermining their learning. This research shows that the pandemic led to further declines in energy and mood among children with ADHD, potentially setting them even further behind their typically developing peers in terms of physical activity engagement and possible learning outcomes. Importantly, engaging in physical activity has consistently been shown to help manage mental health disturbances among both children with ADHD and caregivers (Gapin et al., 2011; Zhang et al., 2023; Hoza et al., 2016; Jensen & Kenny, 2004; Balbim et al., 2019; Etkin et al., 2008; Muldrew et al., 2022). It is imperative that there are more opportunities available for vulnerable youth and their families during times of crises to participate in physical activity to protect their mental wellbeing and allow for further engagement in self-care practices.

#### ***4.2.3 Increased Screen Time***

Caregivers unanimously expressed an increase in screen time for their children. Many children also noted an increase in screen time during the pandemic. Both caregivers and children shared that the increase was associated with a mixture of boredom and lack of options to

participate in other activities but was also used as a way for children to connect with their peers. This is consistent with previous research among children with ADHD during the pandemic, showing an increase of 3–4 hours in recommended daily screen time (Olive et al., 2022). Since peer play, recess, extracurriculars, and organized sports were unavailable, playing online video games was an alternative way to stay connected. Indeed, a recent systematic review examining the effects of video gaming during the pandemic on children’s cognition and behaviour (Smirni et al., 2021) emphasized that context is essential to consider when determining the value or detriment of video gaming. In other words, in times of extreme social isolation, such as the pandemic, video gaming may have offered a healthy means of connection among youth. As previous themes have unpacked, children were uninterested in participating in physical activities that did not involve play, peers, or fun. Thus, while screen time may be viewed as a barrier to physical activity as it consumed time in a child’s day, from their perspective, the lack of viable physical activity options was the true barrier, and screen time was simply the compensatory activity. Many caregivers expressed feelings of guilt surrounding their child’s increase in screen time. However, many also conveyed that screen time was necessary (and welcome) at times to occupy their children’s attention so they could accomplish various work-related or household tasks. Several caregivers associated their child’s increased screen time with increased lethargy and attributed their declining physical activity to this diminishment in energy. Once again, this suggests a cyclical effect in which increased screen time increased lethargy, leading to physical inactivity, which in turn led to the selection of sedentary behaviours such as screen-based activities and further distanced children from the mental health benefits of physical activity.

#### ***4.2.4 Decrease in Available Time***

**Increase in Caregiver Responsibilities and Decrease in Respite.** Many caregivers expressed that their ever-expanding responsibilities made prioritizing physical activity extremely challenging in an already demanding schedule. Many conveyed feelings of exhaustion due to a heavy workload in multiple areas, and that physical activity was simply unfeasible. Related to the increase in caregiver responsibilities is a corresponding decrease in caregiver respite. Caregivers articulated that even if they wanted to participate in physical activity, unless it involved their children, it was not possible due to a lack of childcare options. Access to daycares, babysitters, and extended family was limited due to social distancing mandates. Thus, any available time to engage in physical activity was occupied by child-rearing. This theme represents significant institutional, community, and policy-level barriers, as caregivers had little to no options for participating in physical activity due to caretaking demands that could not be temporarily sourced out.

#### ***4.2.5 Dysregulated Routine***

Many caregivers and children with ADHD articulated that the breakdown in their regular schedules and the corresponding lack of predictability introduced tremendous psychological challenges, interfering with their ability to schedule physical activity into daily routine. Extensive research supports how structure and routine is essential for managing many ADHD symptoms (Bosmans et al., 2022; Howe, 1995; Rajkumar, 2020). Indeed, lack of routine was recently identified as the most significant barrier to positive mental health for caregivers and their children with ADHD (Winfield et al., 2023). In turn, poor mental health further contributes to diminishing physical activity. This pattern has also been found among Canadian adults (Marashi et al., 2021), with waning mental health impairing motivation to engage in physical activity during the pandemic. From a socioecological perspective, dysregulated routine is a



barrier borne out of issues stemming from institutional, community, and policy levels. Given the public health mandates of social distancing, schooling and extracurricular opportunities were vastly modified or altogether unavailable, creating significant ruptures in children's daily routines. Many caregivers also experienced notable changes to their work life, to their home life, and to their daily responsibilities, fracturing their predictable routines as well. As a result, both caregivers and children experienced a decline in their mental wellbeing (Winfield et al., 2023), undermining their ability to direct mental effort towards scheduling physical activity participation, and further removing the protective effects of physical activity on ADHD symptomology and caregiver wellbeing.

### **4.3 Research Question 3: What Supports Do Families with Children Who Have ADHD Need to Better Engage in Physical Activity during a Pandemic?**

#### ***4.3.1 Community Supports***

**Physical Activity Community Supports.** Caregivers expressed wanting support to learn how to engage their children in physical activity at home, as they felt ill-equipped to provide engaging, novel, and regular physical activity options for their children. Some caregivers attempted to play exercise videos that their children could follow along with, but the lack of a live person leading the activities was quickly deemed “boring” and their children disengaged. Some recommendations included community recreation centers providing virtual classes with a live coach or teacher, so that children could feel more connected and engaged during activity. In a study involving children with obesity, providing an online exercise program during the pandemic improved several health-related metrics, including physical fitness, waist circumference, body mass index, waist-to-height ratio, and improved physical activity levels in general (Vandoni et al., 2022). Among older adults, virtual reality (VR)-integrated exercise

during the pandemic was shown to promote motor ability, reduce obesity, and prevent falls (Gao et al., 2020). Other global communities also provided virtual physical activity options during the pandemic (Füzéki et al., 2022), but many community members were unaware of their availability, pointing to further issues with how resources are communicated. Taken together, there is evidence to suggest that providing virtual, live physical activity options can promote greater physical activity participation among diverse populations. Importantly, however, effective communication regarding resource availability is imperative to successful participation.

**Psycho-Emotional Community Supports.** Caregivers expressed that community programming targeted at both caregivers and children with ADHD that provided a space for resource-sharing and open communication could potentially reduce the emotional burden they were all carrying. Previous research has suggested several avenues to improve mental health support for families with children who have ADHD (Winfield et al., 2023). For children during times of online schooling, teachers could facilitate a supportive environment whereby children could share their experiences via virtual breakout rooms. Community centers and libraries could similarly organize social programming for families and children with exceptionalities to foster connection. For caregivers, prior work also demonstrates the importance of social connection to help buffer against the negative psychological impact of the pandemic (Winfield et al., 2023). Given the cyclical nature of mental health and physical activity engagement, the goal is to improve the psycho-emotional wellbeing of caregivers and children with ADHD to allow them the mental fortitude to be motivated to engage in physical activity. Promisingly, engaging in physical activity will further promote mental wellbeing and provide additional protection against the negative effects of high-stress conditions.

#### ***4.3.2 Unsure of Supports Needed***

**Hopelessness.** Some caregivers were unable to identify potential supports that could help improve their engagement with physical activity during a pandemic. Several expressed feeling hopeless in their situation, and simply needing to “get through it” as the only solution. They viewed the stressors imposed by the pandemic as situations to be endured and eventually overcome, and that physical activity would have to be deprioritized until the pandemic was over. Hopelessness is extremely common during times of high stress (Joiner et al., 2005; Panagioti et al., 2012) and can fuel mental health disturbances such as depression and anxiety. As previously uncovered, an unfortunate consequence of hopelessness is that it can exacerbate (or even elicit) poor mental health, which further removes individuals from engaging in physical activity behaviours and undermining the potential benefits it can have on reducing mental health issues and states of hopelessness. Extensive work has shown that engaging in physical activity can reduce feelings of hopelessness among suicidal young adults (Taliaferro et al., 2009), among men (Valtonen et al., 2009), among older adults (Stewart-Knox et al., 2012), and even among those in prison (Cashin et al., 2008), with researchers arguing that the benefit of physical activity on hopelessness is due to improvements to mental wellbeing (Joiner et al., 2005).

**Sufficiently Supported.** Similar in concept to the previous theme, a few caregivers noted feeling sufficiently supported, and that their lack of physical activity participation reflected the increased demands on their time and energy in other domains of life. One caregiver circled back to the theme of decreased motivation, and how that was the driving force in their lack of physical activity participation. Although at first glance this subtheme appears optimistic, it further highlights how caregivers felt unable to move beyond the constraints imposed upon them by public policy and social distancing mandates.

#### **4.4 Physical Activity Recommendations for Children with ADHD and Their Caregivers**

The current study underscores several key factors that are important for supporting physical activity among children with ADHD and their caregivers. First, fun and engaging physical activity is essential for children with ADHD. Community centers and schools should provide virtual, live physical activity options with as much interactivity as possible. Second, routine is imperative to help children with ADHD manage their symptomology and to afford parents their own opportunities for physical activity. Schools need to continue to provide daily physical activity options, whether they are virtual or onsite. Community centers could also offer daily, consistent physical activity classes to promote predictability and structure into daily routine. Both caregivers and children would be aware of their daily schedule and when and where certain activities would be taking place, offering much-needed routine. Third, because mental wellbeing is so intimately tied to the desire to engage in physical activity, providing opportunities for children and caregivers to socially interact with peers can lessen the mental burden of high-stress situations and increase the likelihood of pursuing physical activity behaviours. Again, this could be organized through community centers, libraries, and schools, helping generate the resilience to engage in physical activity.

#### **4.5 Limitations**

While this study contributes to our understanding of the effects of the pandemic on the physical activity behaviours of families with children who have ADHD, it is not without its limitations. First, the sample size was limited and mainly included Caucasian families with post-secondary education. Families from diverse racial, ethnic, and socioeconomic backgrounds may have experienced the pandemic's effect on physical activity differently and may have identified additional barriers to participation. Related to this limitation is the fact that virtual interviews

were used to gather data, which precluded participation of families who did not have access to the internet or a computer. Second, due to challenges with recruitment, interviews were conducted during different times of the pandemic. Some families interviewed later in the data collection process may have been able to attend the gym or may have been able to gather with friends and family, improving their mental wellbeing, sense of connection, and desire for physical activity. Relatedly, families interviewed in the winter months often shared that they were participating less in physical activity due to weather conditions more so than pandemic-related restrictions. Third, the themes identified in the study predominantly reflect the views of caregivers as it was challenging for children to discuss their views of the pandemic. The questions asked in caregiver interviews were more detailed, whereas the questions asked in child interviews were simpler and thus unveiled less information. This may have limited the study's ability to fully reflect how children with ADHD experienced the effect of the pandemic on their physical activity.

#### **4.6 Future Directions**

Future research should gather neuropsychological assessment data from child participants to better understand where on the ADHD spectrum they were positioned. This could have provided nuance to the study interpretations, such as perhaps that higher-functioning children with ADHD and their caregivers were less negatively impacted by the pandemic, as they may have had better compensatory strategies during times of high stress. Additionally, it would be informative to gather ADHD diagnostic information about caregivers to better understand how families with multigenerational diagnoses can be better supported, given the compounding challenges that are likely present in such environments. Lastly, it is important to expand this

research to more diverse ethnic, racial, and socioeconomic backgrounds, given the unique intersectional stressors that impact these marginalized groups.

#### **4.7 Conclusion**

This study aimed to answer how the COVID-19 pandemic impacted physical activity participation among families with children who have ADHD, to identify the barriers to physical activity participation among these families, and to elucidate potential supports that could help families engage in physical activity during a pandemic. As anticipated, the most significant consequence of the pandemic was reduced physical activity participation for both caregivers and their children with ADHD. Interestingly, some families noted an increase in their ability to engage in physical activity due to less rigid schedules and their ability to embrace more leisurely activity such as walking and hiking. The most significant barrier to physical activity participation was social isolation due to public health mandates. Other notable barriers included a decrease in available time due to increasing caregiver responsibilities and diminished respite, as well as dysregulated daily routines. Interestingly, several barriers to physical activity participation yielded a double bind. Specifically, physical activity participation was a viable solution to the same barriers preventing caregivers and their children from engaging in physical activity. These included barriers such as increased intrapersonal difficulties (decreased self-efficacy, decreased energy levels, increased mental health difficulties) and increased screen time. These barriers were a manifestation of varying interpersonal, institutional, community, and policy-level factors; problematically, their presence further distanced caregivers and their children from being able to engage in physical activity, which removed the protective effects of physical activity on ADHD symptom management and mental wellbeing. Families suggested that community supports offering online, live, physical activity opportunities would be beneficial for both themselves and,

especially, their children, who sorely missed social interaction and peer play during physical activity. They also suggested psycho-emotional support programming be offered to lessen the mental health burden on both them and their children; this could help create the necessary mental and energetic precursors to participate more regularly in physical activity, and thus allow children and caregivers to reap the cognitive, psychological, and emotional benefits of physical activity. In summary, this research helps elucidate how times of crisis impact health-promoting behaviours among families dealing with ADHD, and the corresponding consequences for ADHD symptom management and mental health, with the hope that more effective safeguards become available in times of need.

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## Appendix A

### Scripted Recruitment Email

My name is Carly Sugar and I am currently conducting a research study with Dr. Barbara Fenesi in the Webb Lab at Western University.

I received your contact email from OurBrainsCAN: Western University's Cognitive Neuroscience Research Registry. According to our records, you and your family are eligible to participate in a research study with the Webb Lab at Western University.

Our lab is currently recruiting participants for a study aimed at understanding how the Coronavirus Disease (COVID-19) Pandemic has affected children with and without ADHD and their families. We are particularly interested in the impact that the COVID-19 Pandemic has had on mental and physical health.

We are keenly aware of how difficult this unprecedented period of time has been for children and their parents/guardians. We want to better understand the unique barriers families face when incorporating physical activity and maintaining optimal mental health. We also hope to get a sense of how we can better support children and families through the remainder of the COVID-19 Pandemic.

This study will consist of a virtual interview (via Zoom) lasting 1.5 hours (1 hour for parents, 30 mins for children) where I will ask you questions about how the COVID-19 Pandemic has impacted your family and your child(ren). The virtual interview will help us gain a firsthand perspective from parents and guardians of children 7-12 and children themselves. Children's participation is not mandatory but we would really appreciate hearing and including their perspectives as well.

If you (or another parent/guardian) and/or your child(ren) are interested in participating in the virtual interview please feel free to reply to this email or email me at (redacted) and we can set up a time that works best for you. Each participant will be compensated with a \$10 Amazon gift card for their time.

Thank you for taking the time to consider participating in our research!

## **Appendix B**

### **Letter of Information**

#### **Understanding the Impact of COVID-19 on Children's and Families' Mental and Physical Health**

##### **Principal Investigator**

Dr. Barbara Fenesi, PhD, Psychology Western University  
(redacted)

##### **Co-Investigator**

Alexis Winfield, MA Counselling Psychology Western University  
(redacted)

##### **Introduction**

We are pleased to invite you and your child to participate in this virtual interview aiming to get a firsthand perspective on the impact that the COVID-19 Pandemic has had on children's and families' mental and physical health. You are being invited to participate because you fit the selection criteria and have indicated that you would like to find out more information regarding the study.

##### **Background/Purpose**

The purpose of this study is to discuss in detail your views on how the COVID-19 Pandemic has impacted your child's mental and physical health. The aim of this study will be to understand the unique barriers for maintain optimal mental health and incorporating physical activity during the COVID-19 Pandemic. This study also aims to establish ways in which we can better support children and families for the remainder of this Pandemic and looking into the future. It is important for the research team to hear firsthand insight as this is most valuable when trying to develop helpful supports.

##### **How long will you be in this study?**

The focus group will last 1.5 hours, 1 hour for parents/guardians and 30 minutes for children.

##### **What are the study procedures?**

Virtually, we will discuss you and your families' experience with the COVID-19 Pandemic. You will be asked questions about your child's mental and physical health along with any barriers and recommendations that you can identify in promoting mental and physical health at home. Each participant will have equal time to contribute their ideas and thoughts. You may refrain from

answering any questions that you are uncomfortable with. The virtual interview will be audio recorded so that researchers can fully capture and transcribe your ideas afterwards for analysis.

### **What are the risks and harms of participating in this study?**

There are no known or anticipated risks or discomforts associated with participating in this study.

### **What are the benefits?**

The possible benefits to you and the larger community are that we will get a more in-depth understanding of how the COVID-19 Pandemic has impacted your child and family and significant barriers you face when promoting mental and physical health. This information will then hopefully contribute to the development of effective supports to help children and families through the COVID-10 Pandemic and potential future pandemics.

### **Can participants choose to leave the study?**

If you do not wish to continue participating in the virtual interview at any time, you may leave at your discretion and your data will not be used.

### **How will participants' information be kept confidential?**

The data you provide will be secured by a password protected computer at all times. Only the primary investigator will have access to this computer. However, representatives of Western University's Non-Medical Research Ethics Board may require access to your study-related records to monitor the conduct of the research.

All identifiable information, such as your contact information will be linked to your data only by a unique ID code which will be assigned to you after the study by the research team. The master list linking your study ID and your identifiable information will only be available to the researchers. However, representatives of Western University's Non-Medical Research Ethics Board may require access in order to monitor the ethical conduct of the study. If the results of this study are published, only deidentified information will be made available.

The researcher will keep all personal information about you in a secure and confidential location for 7 years. A list linking your study number with your name and contact information will be kept by the researcher in a secure place, separate from your study file. If the results of the study are published, your name will not be used. The data will be stored on a secure server at Western University and will be retained for a minimum of 7 years. Your data may be retained indefinitely and could be used for future research purposes (e.g., to answer a new research question). By consenting to participate in this study, you are agreeing your data can be used beyond the purposes of this present study by either the current or other researchers.

### **Are participants compensated to be in this study?**

Guardian(s) will be compensated \$10 for their involvement in the study. Child(ren) will be compensated \$10 for their involvement (which is optional). The researcher will provide the compensation via Amazon gift cards.

### **What are the Rights of Participants?**

Your participation in this study is voluntary. You may decide not to be in this study. Even if you consent to participate, you have the right to not answer individual questions or to withdraw from the study at any time. If you choose not to participate or to leave the study at any time it will have no effect on you in any way. You do not waive any legal right by consenting to this study. We will give you any new information that may affect your decision to stay in the study. You will be compensated half the full amount (\$5/participant).

### **Whom do participants contact for questions?**

If you have questions about this research study, please contact Dr. Barbara Fenesi at (redacted).

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Human Research Ethics (redacted), email: (redacted). This office oversees the ethical conduct of research studies and is not part of the study team. Everything that you discuss will be kept confidential.

**This letter is yours to keep for future reference.**



## Appendix C

### Consent Form

**Dr. Barbara Fenesi**

Dr. Barbara Fenesi, PhD,  
Psychology Western University  
(redacted)

#### CONTACT FOR FUTURE STUDIES

Please check the appropriate box below and initial:

I agree to be contacted for future research studies

I do NOT agree to be contacted for future research studies

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date (*DD-MM-YYYY*)

My signature means that I have explained the study to the participant named above. I have answered all questions.

\_\_\_\_\_  
Print Name of Person Obtaining Consent

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date (*DD-MM-YYYY*)

## **Appendix D**

### **Assent Letter**

#### **Understanding the Impact of COVID-19 on Children's and Families' Mental and Physical Health**

##### **Child Assent Letter**

##### **Principal Investigator**

Dr. Barbara Fenesi Email: (redacted)

##### **Co-Investigator**

Alexis Winfield, MA, Counselling Psychology Email: (redacted)

##### **Why are you here?**

We want to tell you about a study we are doing that looks at how children feel and act during the COVID-19 Pandemic. We want to know if you would like to participate in a virtual interview.

##### **Why are they doing this study?**

We want to see if the COVID-19 Pandemic has affected your mental and physical health in anyway. We also want to understand if and how you have been exercising and feeling

##### **What will happen to you?**

If you want to be in this study, a few things will happen

- You will meet with a researcher virtually
- You will be asked questions about your mental and physical health during the COVID-19
- After you participate you will earn \$10 as a thank you for your time

##### **Will the study help you?**

The study probably won't help you directly right away, but it will help us understand ways to improve how children feel during the COVID-19 Pandemic.

##### **Do you have to be in the study?**

You do not have to be in the study. No one will be mad at you if you do not want to do this. If you do not want to be in the study, just tell any of the researchers or your parents. Even if you say yes, you can change your mind later. It is up to you.

**What if you have any questions?**

You can ask questions at any time, now or later. You can talk to Alexis, your family, or Dr. Fenesi.

**Assent Section****I want to participate in this study.****Print Name of Child** \_\_\_\_\_**Date** \_\_\_\_\_**Age** \_\_\_\_\_**Name of Person Obtaining Assent** \_\_\_\_\_**Signature of Person Obtaining Assent** \_\_\_\_\_

**This letter is yours to keep for future reference.**

## Appendix E

### Demographics Survey

- 1. What is your Participant ID Number? (Provided to you by the researcher)**
- 2. What is your age?**  
[Text Entry]
- 3. What is your gender?**
  - a) Male
  - b) Female
  - c) Non-Binary
  - d) Other[Text Entry]
- 4. What race/ethnicity do you identify the most with?**
  - a) Asian
  - b) Black
  - c) Caucasian
  - d) Hispanic
  - e) Indigenous
  - f) Prefer Not to Say
  - g) Other[Text Entry]
- 5. What is the highest level of education that you have completed?**
  - a) Some Highschool
  - b) Highschool
  - c) Some College
  - d) College
  - e) Some University
  - f) University Degree
  - g) Some Postgraduate/Professional Training
  - h) Other[Text Entry]
- 6. What is your household income?**
  - a) \$20,000 - \$30,000
  - b) \$30,000 - \$40,000
  - c) \$40,000 - \$50,000
  - d) \$50,000 - \$60,000
  - e) \$60,000 - \$70,000
  - f) \$70,000 - \$80,000
  - g) \$80,000 - \$90,000
  - h) \$90,000 - \$100,000
  - i) \$100,000+
  - j) Prefer not to say
- 7. How many children do you have?**
  - a) 1
  - b) 2

- c) 3
- d) 4
- e) 5
- f) 6+

**8. How old is your child(ren)? Please type your response as follows: Child 1: 7 years old, Child 2: 4 years old, Child 3: 2 years old.**

[Text Entry]

**9. Has your child(ren) been formally diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) by a professional?**

- a) No
- b) Yes
- c) Prefer Not to Say
- d) My Child is Suspected of Having ADHD

**10. IF YES to Q6: How many of your children have been formally diagnosed with ADHD by a professional?**

[Text Entry]

**11. Has your child(ren) been formally diagnosed with a co-morbid neurodevelopmental/behavioural disorder (Autism Spectrum Disorder, Oppositional Defiant Disorder) by a professional? If yes, please specify.**

- a) No
- b) Yes

[Text Entry]

- c) Prefer Not to Say

**12. IF YES to Q8: How many of your children have been formally diagnosed with a co-morbid neurodevelopmental/behavioural disorder?**

[Text Entry]

**13. Has your child(ren) been formally diagnosed with a co-morbid mental disorder (depression, anxiety) by a professional? If yes, please specify.**

- a) Yes

[Text Entry]

- b) No

- c) Prefer Not to Say

**14. IF YES to Q9: How many of your children have been formally diagnosed with a co-morbid mental disorder by a professional?**

[Text Entry]

**15. Does your child have a physical/visual/auditory impairment? If yes, please specify.**

- a) Yes

- b) No

- c) Prefer Not to Say

**16. IF YES to Q12: How many of your children have a physical/visual/auditory impairment?**

[Text Entry]

**17. Is there anything else you would like us to know about your child(ren) and family?**

[Text Entry]

## Appendix F

### Interview Guide for Parents/Guardians and Children

#### Parent/Guardian Interview Guide:

Today, I am going to ask you how the COVID-19 Pandemic has impacted your child and family.

#### General Well-Being/Barriers Questions:

*For families with child(ren) with ADHD only]*

When thinking of your child with ADHD...

1. Have there been unique barriers for your child during the COVID-19 because of their ADHD diagnosis?
2. Have you noticed any changes in the presenting characteristics or symptoms associated with your child's ADHD?

*[For families with multiple children, potentially with a mix of those with/without ADHD, give them preamble below; if families only have child(ren) with or without ADHD, just ask the interview questions directly in relation to those children]*

For the following questions, I want you to think about both your child(ren) (with and without ADHD), and comment on both.

#### Mental Health Questions:

This section aims to understand how your child's mental health (a person's condition with regard to their psychological and emotional well-being) has been impacted by the COVID-19 Pandemic.

1. How was your child's mental health (overall well-being, temperament, mood) prior to the COVID-19 Pandemic?
2. How was your mental health (overall well-being, temperament, mood) prior to the COVID-19 Pandemic?
3. Since the COVID-19 Pandemic, have you noticed changes in your child's temperament?
4. Since the COVID-19 Pandemic, have you noticed changes in your child's mood? (mood swings, extended periods of positive/negative moods)
5. Since the COVID-19 Pandemic, have you noticed an increase/decrease in your child's anxiety/depression levels?
6. Since the COVID-19 Pandemic, have you noticed that your child has become more/less energetic?
7. Since the COVID-19 Pandemic, has your child seemed more socially isolated?
8. In your opinion, what are the biggest barriers to maintaining optimal mental health for yourself and your child during the COVID-19 Pandemic?
9. In your opinion, what do you need to feel better supported in maintaining optimal mental health for yourself and your child during the COVID-19 Pandemic?

### **Physical Health Questions:**

This section aims to understand how your child's physical health (condition of your body, fitness level) has been impacted by the COVID-19 Pandemic.

1. What was your child's daily/weekly amount of physical activity prior to the COVID-19 Pandemic? (including school, extra-curricular activities)
  - a. If child(ren) were active → What kinds of physical activity were they doing?
2. What was *your* daily/weekly amount of physical activity prior to the COVID-19 pandemic?
  - a. If guardian(s) were active → What kinds of physical activity were you doing?
3. Have you been able to incorporate physical activity into your child's/families' daily routine? If so, how? Can you recommend any strategies? If not, why not?
4. How has your child's physical activity level during COVID-19 Pandemic impacted their physical health and general behaviour? (increased sedentary/screen time, weight gain/loss, soreness, discomfort, restlessness, sleep quality)
5. If you have been able to incorporate physical activity, what effect has this had on your child's mental health?
6. In your opinion, what is the biggest barrier to incorporating physical activity into your and your child(ren)'s routine during the COVID-19 Pandemic? (stress levels, time)
7. In your opinion, what do you need to feel better supported in incorporating physical activity during the COVID-19 Pandemic?

We want to end the interview on a positive note by asking if anything positive has come from the COVID-19 Pandemic? What do you hope for in the future?

### **Child Interview Guide:**

Today I am going to ask you some questions about how COVID-19 Pandemic has affected you.

#### **Demographic Questions:**

1. How old are you?
2. What is your gender?

#### **COVID-19 Related Questions:**

3. How do you feel about the COVID-19 Pandemic?
4. What is the hardest part about dealing with the COVID-19 Pandemic?
5. What has been the biggest change for you since the COVID-19 Pandemic?
6. Have you found ways to make dealing with the COVID-19 Pandemic easier?

#### **Physical Health Questions:**

7. What type of physical activity did you do before the COVID-19 Pandemic? How often? Do you miss that physical activity? What do you miss about it?
8. Have you been able to participate in physical activity during the COVID-19 Pandemic? If yes, what activities do you do? If no, do you wish you could do more?

#### **Looking Forward Questions:**

9. Have you found any positive things since the COVID-19 Pandemic started?
10. What do you look forward to? (each day, after COVID-19)

## Appendix G

### Codebook

#### Research Questions:

1. How has the COVID-19 pandemic impacted the physical activity behaviours of families with children who have ADHD?
2. What are the barriers to maintaining optimal mental health for children with ADHD and their families during the COVID-19 pandemic?
3. What supports would help families better incorporate physical activity into their lives during COVID-19?

#### Codebook:

#### **Research Question 1: How has the COVID-19 pandemic impacted the physical activity behaviours of families with children who have ADHD?**

1. Reduction in Physical Activity for Children with ADHD: Use this code to indicate guardians and/or children who identified an overall reduction in physical activity during the COVID-19 pandemic. Attachment: Use this code if the child's anxiety was related to attachment issues.
  - i. Social Distancing Mandate: Use this code to indicate when a guardian/child describes a reduction in overall physical activity related to government mandated social distancing. This includes, but is not limited to, a lack of social interaction, a lack of extracurriculars, school closures, less time outdoors, indoor and outdoor park closures, and so on.
  - ii. Decreased Motivation: Use this code when a guardian/child describes a reduction in overall physical activity related to a lack of motivation in participating in physical activity.
  - iii. Decrease in Overall Health: Use this code when a guardian/child describes a reduction in overall physical activity related to decreases in overall health outcomes. This includes, but is not limited to, a decrease in overall energy levels, weight gain/loss, worsened eating habits, worsened sleeping patterns, restlessness, and so on.
2. Increase in Physical Activity for Children with ADHD: Use this code to indicate guardians and/or children who identified an overall increase in physical activity during the COVID-19 pandemic.
3. Reduction in Physical Activity for Guardians: Use this code to indicate guardians who self-identified an overall reduction in physical activity during the COVID-19 pandemic.
  - i. Facility Closures: Use this code when a guardian describes a reduction in overall physical activity related to the closure of facilities that were used prior to mandated social distancing measures for physical activity. This includes, but is not limited to, gym closures, sports field closures, pool closures, and so on.
  - ii. Decreased Motivation: Use this code when a guardian describes a reduction in overall physical activity related to a lack of motivation in participating in physical activity.



4. Increase in Physical Activity for Guardians: Use this code to indicate guardians who self-identified an overall increase in physical activity during the COVID-19 pandemic.
  - i. Increase in At-Home Workouts: Use this code when a guardian describes an increase in overall physical activity related to deliberate exercise at home.
  - ii. Increase in Leisurely Physical Activity: Use this code when a guardian describes an increase in overall physical activity related to leisurely forms of physical activity. This includes, but is not limited to, going on walks, going on bike rides, going on hikes, and so on.

**Research Question 2: What are the barriers to maintaining optimal mental health for children with ADHD and their families during the COVID-19 pandemic?**

1. Decrease in Available Time: Use this code to indicate when a guardian describes a barrier to implementing daily physical activity related to a lack of available time.
  - i. Increase in Guardian Responsibilities: Use this code when a guardian describes a barrier to implementing daily physical activity related to an increase in their responsibilities. This includes, but is not limited to, increased responsibilities related to parenting, teaching, housekeeping, working, and so on.
  - ii. Decrease in Respite: Use this code when a guardian describes a barrier to implementing daily physical activity related to a decrease in respite support. This includes, but is not limited to, respite support from family members, friends, public programs, and so on.
2. Increased Intrapersonal Difficulties: Use this code to indicate when a guardian and/or child describes a barrier related to their individual, biological, or personal factors that interfere with their implementation of daily physical activity.
  - i. Decreased Self-Efficacy: Use this code to indicate when a guardian describes a barrier to implementing physical activity related to a belief in their inability to implement daily physical activity.
    - a. Environmental Influences: Use this code when a guardian describes a negative belief in their ability to implement daily physical activity influenced by an environmental factor. This includes, but is not limited to, a lack of access to appropriate space and/or equipment.
  - ii. Increased Mental Health Difficulties: Use this code to indicate when a guardian and/or child describes a barrier to implementing physical activity related to experiencing an increase in mental health difficulties.
  - iii. Decreased Energy Levels: Use this code to indicate when a guardian and/or child describes a barrier to implementing physical activity related to experiencing a decrease in overall energy levels.
3. Dysregulated Routine: Use this code to indicate when a guardian and/or child describes a barrier to implementing physical activity related to a disruption/dysregulation in their daily routine.
4. Dysregulated Routine: Use this code to indicate when a guardian and/or child describes a barrier to implementing physical activity related to a disruption/dysregulation in their daily routine.

5. **Increased Screen Time:** Use this code to indicate when a guardian and/or child describes a barrier to implementing physical activity related to an increase in electronics use. This includes, but is not limited to, watching movies/shows, using social media, playing video games, and so on.

**Research Question 3: What supports would help families better incorporate physical activity into their lives during COVID-19?**

1. **Community Supports:** Use this code to indicate when a guardian indicates that community supports would be helpful in better implementing physical activity.
  - i. **Physical Activity Related Community Supports:** Use this code to indicate when a guardian indicates community supports related to physical activity would be helpful in better implementing physical activity. This includes, but is not limited to, in person or remote community programming that directly facilitates physical activity, re-introducing school related physical activity (i.e., physical education classes, recess, etc.), and so on.
  - ii. **Psycho-Emotional Related Community Supports:** Use this code to indicate when a guardian indicates community supports related to improving psycho-emotional functioning would be helpful in better implementing physical activity. This includes, but is not limited to, support groups, psycho-emotional education opportunities, and so on.
2. **Unsure of Supports Needed:** Use this code to indicate when a guardian indicates that they are unsure of the supports they need in order to better implement physical activity throughout the COVID-19 pandemic.
  - i. **Hopelessness:** Use this code to indicate when a guardian declines the need for support due to hopelessness that any support would be able to help them better implement physical activity.
  - ii. **Sufficiently Supported:** Use this code to indicate when a guardian declines the need for support due to already receiving sufficient support.

## Appendix H Ethics Approval



**Date:** 28 July

**2020 To:** Dr

Barbara Fenesi

**Project ID:**

116190

**Study Title:** Understanding the Impact of COVID-19 on Children's and Families' Mental and Physical Health

**Short Title:** COVID Parental and Child

**Interviews Application Type:** NMREB Initial

**Application Review Type:** Delegated

**Full Board Reporting Date:** August 7 2020

**Date Approval Issued:** 28/Jul/2020

**REB Approval Expiry Date:** 28/Jul/2021

Dear Dr Barbara Fenesi

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

**Documents Approved:**

Document Name	Document Type	Document Date	Document Version
Webb Lab - Impact of COVID-19 - Parent:Guardian Interview Consent Form	Written Consent/ Assent		
Webb Lab - Impact of COVID-19 - Interview Assent Form	Written Consent/ Assent		
Webb Lab - Impact of COVID-19 - Telephone Script	Recruitment Materials	13/Jul/2020	1
Webb Lab - Impact of COVID-19 - Survey Questionnaire	Online Survey	13/Jul/2020	2
Webb Lab - Impact of COVID-19 - Email Script	Recruitment Materials	13/Jul/2020	1
Webb Lab - Impact of COVID-19 Interview Guide	Interview Guide	13/Jul/2020	1

No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any

questions.

Sincerely,

Kelly Patterson, Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair **Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).**

## Appendix I

### Copyright Permission

A version of this thesis has been published in the open access MDPI Brain Sciences journal as part of the Special Issue: Advances in ADHD. Copyright permission was obtained upon publication on May 31, 2023:

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1. Seal, E., Vu, J., Winfield, A., & Fenesi, B. (2023). Impact of COVID-19 on physical activity in families managing ADHD and the cyclical effect on worsening mental health. *Brain Sciences*, 13(6), 887.

## Curriculum Vitae

**Name:** Erica E. Seal

**Post-secondary Education and Degrees:** University of Windsor  
Windsor, Ontario, Canada  
2017-2021 B.A. Psychology with Thesis

Western University  
London, Ontario, Canada  
2022-Present M.A. Counselling Psychology

**Honours and Awards:** Dean's Renewable Entrance Scholarship  
2017

FAHSS LEAD Scholar Gold Medallion  
2021

Western University Graduate Scholarship  
2022-2024

Social Science and Humanities Research Council (SSHRC)  
Master's Program  
2023-2024

**Publications:**

Seal, E., Vu, J., Winfield, A., & Fenesi, B. (2023). Impact of COVID-19 on physical activity in families managing ADHD and the cyclical effect on worsening mental health. *Brain Sciences*, 13(6), 887. doi: 10.3390/brainsci13060887