3-20-2023 10:00 AM

Return to Play: Impact of Urbanicity and Socioeconomic Status on Parents' Attitudes Regarding Their Children's Play and Sport During the COVID-19 Pandemic

Kendall Saravanamuttoo, *The University of Western Ontario*

Supervisor: Tucker, Trish, *The University of Western Ontario*

A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Health Promotion

Abstract

The COVID-19 pandemic has had a profound impact on the daily routines of parents and children. The primary aim of this study was to explore the influence of socioeconomic status (SES) and urbanicity on parents' attitudes toward their children's active play opportunities 6 months and 1.5 years into COVID-19. The secondary objective was to explore how parents' attitudes at 6 months related to the structured and unstructured play opportunities that children returned to 1 year later, while moderating the effects of SES and urbanicity. A sample of 239 Ontario parents of children (< 12) completed two online surveys (August – December 2020; 2021). In general, parents in communities with urban features (e.g., densely populated areas), single-parents, full-time employed parents, and parents of lower-income were more hesitant to return their children to active play during the pandemic. Findings from this work highlight SES and urbanicity disparities that continue to exist during COVID-19.

Keywords

Physical Activity, Active Play, COVID-19, Urbanicity, Socioeconomic Status, Children, Parent, Pandemic

Summary for Lay Audience

Physical activity is critical for children's (0-12 years) overall health. However, many children are not engaging in sufficient levels of physical activity to obtain health benefits, including, but not limited to, strengthened muscles and bones, healthier bodyweight, and improved mental well-being. Children often accumulate physical activity through unstructured active play (e.g., playing in the neighbourhood) and organized sport (e.g., sport teams). In recent years, researchers have noted declines in children's play, which might be linked to parental safety concerns or increased access to technology (e.g., screens). Furthering this decline, the COVID-19 pandemic has reduced children's opportunities for active play and sport, as spaces conducive to this behaviour (e.g., community centres, recreational facilities) were closed intermittently as a public health protection. However, all children are unique, and it is important to consider how the pandemic has affected families of different socioeconomic statuses (SES; i.e., income, education, employment) and urbanicities (e.g., the impact of living in urban areas). As such, it is important to consider the role of parents in supporting their children's active play.

This study explored the influence of SES and urbanicity on parents' attitudes toward returning their children to active play 6 months and 1.5 years into the COVID-19 pandemic in Ontario, Canada. This study also explored how parents' attitudes towards active play at 6 months influenced the different structured (sport) and unstructured (neighbourhood play) activities that children returned to 1 year later. This study involved the use of two online surveys that parents filled out 6 months (August – December 2020) and 1.5 years (August – December 2021) into the pandemic. Overall, parents with a lower income, single-parents, and full-time employed parents, reported more hesitancy toward returning their children to active play opportunities. Differences were also noted regarding children's return to structured versus unstructured play. In addition, parents in communities with more urban features (e.g., busy roads, densely populated areas) and parks nearby felt more hesitant toward their children returning to play. Going forward, it will be important to ensure appropriate supports are in place for parents to reduce inequities toward play that continue to exist.

Co-Authorship Statement

Although this dissertation presents my original work, I would like to acknowledge my co-authors. Dr. Trish Tucker, Dr. Leigh Vanderloo, and Monika Szpunar were fundamental in the conceptualization, design, and implementation of the *Return to Play* study. Moreover, I would also like to thank Dr. Matthew Bourke for his analytical expertise, and Dr. Shiran Zhong for his GIS expertise and the creation of the urbanicity indices. Finally, I would like to thank the remainder of the co-authors of *Return to Play;* Drs. Brianne Bruijns, Stephanie Truelove, Shauna Burke, Jason Gilliland, and Jennifer Irwin.

Acknowledgments

First, to my supervisor – **Dr. Trish Tucker** – I am so grateful that you welcomed me into the lab. I truly would not have made it here without your constant encouragement, guidance, and unwavering kindness. You continue to make your students a priority, and for that I am endlessly grateful. Thank you for being the best mentor, and friend, I needed!

To **Dr. Jennifer Irwin** and **Dr. Jason Gilliland** – thank you both for serving as my advisory committee. Your kindness and willingness to help were instrumental to my research. I would also like to thank the other *Return to Play* team members, **Dr. Leigh Vanderloo, Dr. Stephanie Truelove,** and **Dr. Shauna Burke** for your guidance and support.

To **Monika Szpunar** for your continued support, friendship, and leadership of the *Return to Play* project, and to **Dr. Matthew Bourke** for your statistical expertise, patience, revisions, and willingness to teach. As well, to **Dr. Shiran Zhong**, for your instrumental role in creating the GIS indices, and **Dr. Brianne Bruijns** for your countless edits and support. I could not have done this without all your insight. To my other lab mates, **Emma Ostermeier,** and **Leah Taylor** thank you for all of your encouragement, kindness, and willingness to help!

To the **Children's Health Research Institute** for funding my Master's work.

To my London **friends** – **Nia,** for being my adventure (and Junction of course) buddy, **Vanessa,** and **Sarah,** and to everyone else near and far! I could not have done it without you all.

To my **family** – **Mum, Dad, Callum**, and everyone else (you know who you are!) – thank you for your love and support, and for showing up no matter what. I could not have made it this far without any of you.

To **Aidan** – thank you for cheering me on when I needed it most. And finally, to **Dover,** my furry companion who has been by my side since the start of this. You boys make me smile the most. Thank you!

Table of Contents

List of Tables

List of Figures

List of Appendices

Chapter 1

1 Introduction and Literature Review

Research on the health benefits of physical activity for children (0 to 12) have been well documented (Carson et al., 2017a; Carson et al., 2017b; Chaput et al., 2014; Janssen & LeBlanc, 2010; Poitras et al., 2016). Caspersen et al. (1985) defined physical activity as "any bodily movement produced by skeletal muscles that requires energy expenditure" (p. 126) which can be achieved through leisure activities, recreation, transportation and/or incidental physical activity throughout the day (e.g., going up the stairs). Not only is physical activity essential for children's physical (Tremblay et al., 2016), psychological (Taylor et al., 2021), and social health outcomes (Lees & Hopkins, 2013), but it also promotes increased cognitive development (Carson et al., 2017a; Poitras et al., 2016). More specifically, physical activity in childhood is associated with healthier body composition (Tremblay et al., 2016), lower blood pressure (Carson et al., 2017a), 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 among children has been tied to improved mental well-being (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). Moreover, research in the field of children's physical activity points to a correlation between physical activity and improved working memory (Bidzan-Bluma & Lipowska, 2018; Timmons et al., 2012), as it can assist with the learning of new words and languages (Bidzan-Bluma & Lipowska, 2018). Moderate-to-vigorous physical activity (MVPA; i.e., higher intensity physical activity) generally offers more consistent and additional health benefits for children compared to light physical activity (LPA; Carson et al., 2017b; Tremblay et al., 2016). Finally, a dose-response relationship between physical activity and overall health exists among children, meaning that the more total physical activity acquired, the greater the health benefits (Janssen & LeBlanc, 2010).

Nonetheless, even small bouts of physical activity can provide crucial health advantages to high-risk individuals such as children with obesity (Janssen & LeBlanc, 2010). It has also been suggested that individuals on the lower end of the physical activity spectrum should take a progressive approach to increasing their activity to adopt sustainable changes (Tremblay et al., 2016; World Health Organization [WHO], 2020a).

As important as increasing physical activity is for improving children's health, the opposite is true for sedentary behaviour, which can be defined as "any waking behaviour characterized by an energy expenditure ≤1.5 metabolic equivalents (METs), while in a sitting, reclining or lying posture" (Tremblay et al., 2017, p. 75). Higher sedentary behaviour in childhood, especially during activities that involve any type of screen-viewing (e.g., TV watching, mobile phones), is associated with higher body mass index, disease risk, and reduced physical fitness among children (Carson et al., 2017a). Engaging in excess amounts of sedentary behaviour has also been found to be associated with negative health outcomes such as decreased academic achievement, self-esteem, and pro-social behaviour in school-aged children (5 to 12 years; Tremblay et al., 2011); and reduced psychological health and cognitive development among young children (0 to 4 years; LeBlanc et al., 2012). High screen-time is particularly worrisome compared to other more purposeful sedentary behaviours such as reading, given its respective influence on attention (i.e., increased distractibility; Christakis et al., 2004), increased intake of caloric dense foods (e.g., high fat foods; Cooper et al., 2006), and higher risk for obesity (LeBlanc et al., 2012) among young children. Thus, it is important that research efforts in the area of children's health and well-being prioritize physical activity, with a particular emphasis on MVPA, and limit sedentary behaviour and screen time (Poitras et al., 2016).

1.1 24-Hour Movement Guidelines

Recent evidence suggests that looking at health behaviours as individual entities (i.e., physical activity, sedentary behaviour, sleep) in the context of children's health, is not as beneficial as looking at them in conjunction (Chaput et al., 2014; Saunders et al., 2016;

Tremblay et al., 2016). Rather, an integrated collection of healthy movement behaviours is known to collectively support children's health (Tremblay et al., 2016). This knowledge informed the establishment of the *Canadian 24-Hour Movement Guidelines* (Canadian Society for Exercise Physiology [CSEP], 2017), which include recommendations for physical activity, sedentary behaviour, and sleep. Similar guidelines have also been adopted in Australia (Australian Government, 2021), the United Kingdom (National Health Service, 2018), South Africa (Draper et al., 2020), and the World Health Organization (WHO, 2019).

Specific to Canadian children, the *24-Hour Movement Guidelines* offer recommendations for the early years (ages 0 to 4) and school-aged children (ages 5 to 11; CSEP, 2017). Guidelines for the early years are further divided into distinct recommendations for infants (<1 year), toddlers (1 to 2 years), and preschoolers (3 to 4 years). Briefly, a healthy 24-hours for infants includes 30 minutes of tummy time (i.e., prone position while awake); 14 to 17 and 12 to 16 hours of sleep (high quality, including naps) for 0- to 3-month-olds, and 4- to 11-month-olds, respectively; no screen time; and limiting periods of sitting (e.g., in stroller or highchair) to no more than 1 hour per day (CSEP, 2017). Toddler and preschooler recommendations include 180 minutes per day of total physical activity (60 mins of which should be MVPA for preschoolers) and reducing prolonged periods of sitting; no screen time under 2 years, and no more than 1 hour for those 2 years and older; and, 11 to 14 hours and 10 to 13 hours of good quality sleep for toddlers and preschoolers, respectively (CSEP, 2017). A healthy day for school-aged children includes at least 60 minutes of MVPA (primarily aerobic); several hours of light, unstructured physical activity; 9 to 11 hours of uninterrupted sleep with consistent wake up and bedtimes; and limiting periods of sitting to no more than 2 hours per day (CSEP, 2017). Finally, additional bone strengthening activities 3 days per week are also recommended for this age group (CSEP, 2017). Following these guidelines is encouraged for optimal health and developmental outcomes among children (Tremblay et al., 2016).

1.1.1 Proportion of Canadian Children Meeting Guidelines

Despite the importance of physical activity and the health benefits associated with meeting the *24-Hour Movement Guidelines* (Carson et al., 2017a), many children are not engaging in sufficient physical activity (Carson et al., 2017a; Roman-Viñas et al., 2016). For example, Carson et al. (2017a) reported that only 17% (accelerometer-based) of children (6 to 17 years) were meeting the overall movement guidelines, while the Canadian Health Measures Survey (Statistics Canada, 2016-2017; accelerometer-based) found that 39% of children (5 to 17 years) were meeting the physical activity component of the guidelines. With reference to the early years, a nationally representative survey reported that 12.1% of preschoolers (*n* = 803) were meeting the overall movement guidelines (accelerometer-based), while 61.8% were meeting the physical activity component (Chaput et al., 2017). These statistics are concerning, as physical activity habits formed in the early years of life often continue into adolescence and adulthood (Telama et al., 2005). Moreover, these findings emphasize the urgent need to get children more active as the direct global health care cost of physical inactivity is estimated to reach US$300 billion between 2020-2030 if no changes to current physical activity trends occur (WHO, 2022b). By creating strategies (e.g., interventions, policies) aimed at increasing children's physical activity, it is possible, and in the best interest of countries (e.g., financially) to reduce this burden and mitigate the risks for these youngsters before they become adults (Fernandez-Jimenez et al., 2018).

1.2 Parents' Role in Children's Physical Activity

The worrisome rates of children's physical inactivity, as noted above, warrant consideration to broader sources of influence that shape children's behaviours (Hu et al., 2021). Currently gaining attention in the field of children's physical activity is the role that parents (including guardians) have on children's movement behaviours (Carson, 2016; Trost & Loprinzi, 2011). Parents and the household setting can shape a child's life and play a crucial role in predicting children's health behaviours (Rhodes et al., 2019). For example, parents arrange bedtime routines for children's sleep (Pyper et al., 2017),

determine access to and duration of time on electronic devices (e.g., screen time; Giannotti & Cortesi, 2009), and provide physical activity opportunities inside (e.g., hockey in the driveway, family hikes) as well as outside (e.g., extracurricular sports) of the home (Brown et al., 2016; Neshteruk et al., 2017). Concerningly, only half (53%) of Canadian parents reported facilitating physical activity opportunities for their children (e.g., encouraging outdoor play, transport, spectating) often or very often in 2021-2022 (Canadian Fitness and Lifestyle Research Institute [CFLRI], 2022), suggesting the need to provide intervention strategies and support at the parent level. As such, it is crucial to examine parents' attitudes when understanding how a child's physical activity habits are formed, and how those habits can be improved.

Findings from a representative sample of parents in Canada (*n* = 1,328) found that parents' physical activity was directly linked to their children's physical activity, supporting the notion that active parents tend to have more active children (Stearns et al., 2016). This finding is consistent with that of Garriguet and colleagues' (2017) who noted that every additional 20 minutes of parental MVPA led to an additional 5 minutes of a child's (6 to 11 years) daily physical activity; with similar increases noted in Carson's (2016) study specific to parental support and MVPA among children in the early years (19 to 60 months). For these reasons, it is recommended that parents serve as active role models for their children by reducing their own sedentary behaviour and promoting being physically active as a family (ParticipACTION, 2020; Rhodes et al., 2020). Not only can this improve physical health, but it can also strengthen social bonds and foster family connections (Rhodes et al., 2020). Research also suggests that parents can influence their children's physical activity through mechanisms such as their own perceived competence (i.e., ability) and self-efficacy (i.e., belief in their ability to be successful) to promote physical activity for their children (Davison et al., 2013). Other sources of influence that parents can provide include logistical support (e.g., signing up, paying, and driving children to practices; Beets et al., 2010), providing resources (e.g., equipment; Trost & Loprinzi, 2011), spectating (e.g., watching their children's games; Trost et al., 2003), and positive reinforcement (Trost & Loprinzi, 2011). Finally, previous

research demonstrates that parental motivation and encouragement are often more influential to children's outdoor time than the built environment (Cleland et al., 2010), and that without parental involvement, long-term changes to children's physical activity are unlikely (Brown et al., 2016; Kipping et al., 2014; Sluijs & McMinn, 2010). Undoubtedly, parents' roles as facilitators to their children's physical activity opportunities are critical to understand.

1.3 Opportunities for Physical Activity during Childhood

1.3.1 Unstructured (Outdoor & Indoor) Active Play

Active play, a primary source of unstructured physical activity among children (Boxberger & Reimers, 2019; Lee et al., 2015) can be defined as "a form of gross motor or total body movement in which young children exert energy in a freely chosen, fun, and unstructured manner" (Truelove et al., 2017, p. 164). Unstructured active play is an important component of childhood and is a critical contributor to children's healthy development (WHO, 2018). Psychosocially, engaging in active play has been found to support children's well-being during times of stress, help develop cognitive skills (e.g., assist in learning) and improve social engagement (Lee et al., 2021). Further, play has been recognized as so essential that the United Nations High Commission for Human Rights deemed it a basic right for all children (United Nations, 1990). Although not the only type of active play, unstructured outdoor play is one of the most valuable types of play in which children can engage (Herrington & Brussoni, 2015, p. 481). This is because this behaviour is associated with large increases in children's physical activity (Gray et al., 2015), and teaches children to engage with risk in their environment, encouraging risk detection among children (Brussoni et al., 2015; Lavrysen et al., 2017). Contrary to organized sport, outdoor play is inexpensive, making it available to more families (Farley et al., 2007), and it is spontaneous and child-led; therefore, requiring little to no facilitation from adults (Herrington & Brussoni, 2015). Furthermore, as children engage in outdoor play, they satisfy their creative needs and learn through peer interactions, supporting their development and social skills (Tremblay et al., 2015).

Physiologically, there is consistent evidence supporting the relationship between outdoor time and outdoor play. Research has revealed that outdoor play is associated with greater MVPA, better fitness outcomes, and lower sedentary behaviour than indoor play (Faulkner et al., 2015; Gray et al., 2015; Larouche et al., 2019). More specifically, a study conducted by Vanderloo et al. (2013) found that preschoolers (*n* = 31) acquired an additional 4.49 min/hr of MVPA when playing outdoors as compared to indoors. Similarly, Faulkner and colleagues (2015) found that grades 5 and 6 children (*n* = 889) who spent more than 2 hours outdoors accumulated 27% and 38% more MVPA on weekdays and weekends, respectively, than those who played for less than 30 minutes outdoors. Perhaps even more important, a systemic review conducted by Gray et al. (2015; *n* = 28 studies) concluded that all studies examining the relationship between outdoor time and active play (among children 3 to 12 years) reported a positive association with MVPA ranging from 2.2 to 3.3 times higher outdoors than indoors. Together, these data stress the value of unstructured outdoor play for children, with respect to achieving sufficient physical activity, particularly MVPA.

The plethora of evidence demonstrating the benefits of outdoor play prompted Tremblay et al.'s (2015) evidence-based Position Statement on Active Outdoor Play. This position statement posits that, "[a]ccess to active play in nature and outdoors—with its risks—is essential for healthy child development" (p. 6,476), while also recommending to, "increas[e] children's opportunities for self-directed play outdoors in all settings—at home, at school, in childcare, the community and nature" (p. 6,476). Unfortunately, a decline in outdoor and indoor active play among children has been noted by researchers (Boxberger & Reimers, 2019; Tandon et al., 2015). Specifically, during 2021-2022, only 33% of Canadian children (5-11 years) were reportedly meeting the recommendation for outdoor and indoor active play (several hours; 2 hours of unstructured leisure activities; CFLRI, 2022). This reduction may be a result of parental safety concerns (Barnes et al., 2012; Carver et al., 2008; Stone et al., 2012) and/or increased accessibility to screen-based technology (i.e., television, videogames, phones, tablets; Dauw, 2016; Wunsch et al., 2021). Nevertheless, given that "[p]arents act as gatekeepers to their

child's outdoor play" (ParticipACTION, 2020, p. 49), it is not surprising that parents' perceptions and views on the importance of active play can impact the amount of active play their children are afforded (ParticipACTION, 2020). It is important to note that barriers to outdoor play continue to exist (e.g., limited mobility) and indoor active play should also be promoted as a valuable source of active play among children (ParticipACTION, 2022).

1.3.2 Structured Physical Activity (Organized Sport)

In contrast to unstructured active play, structured physical activities can occur through activities such as organized sport or teacher-led activities (e.g., bean bag games, follow the leader) and take place at specific times and locations pre-determined and monitored by adults (Herrington & Brussoni, 2015). While recent data suggests that only 33% of Canadian children engage in unstructured activity (ParticipACTION, 2022), approximately 63% of Canadian children engaged in organized sport between 2021-2022 (ParticipACTION, 2022). The higher prevalence of children engaging in organized sport versus unstructured activity reiterates the importance of diversity in physical activity opportunities, and parents' role as facilitators toward these opportunities. This is important given parents' involvement in organizing, funding, and managing such activities for their children (Trost & Loprinzi, 2011). Furthermore, organized sport has often been prioritized by parents given its perceived benefits for childhood development over unstructured active play (Watchman & Spencer-Cavaliere, 2017).

Beyond the benefits associated with children's engagement in leisure physical activities (Tremblay et al., 2016), organized sport can bring additional benefits (Wijtzes et al., 2014). For example, participating in organized sport is associated with improvements in social integration, teamwork, confidence, discipline, empathy, and emotional wellbeing among young children (Wijtzes et al., 2014). A systematic review conducted by Eime et al. (2013; *n* = 30 studies) similarly found that the benefits of sport include better psychological and social health and go above and beyond the benefits of leisure physical activity. The most frequently reported benefits from the review include higher self-

esteem, improved social skills, and less depressive symptoms, particularly in team sport environments because of higher social cohesion (Eime et al., 2013). However, despite these added benefits, participation in organized sport is not always conducive to increasing levels of MVPA (Herrington & Brussoni, 2015); nor is it accessible to all families given the high costs (e.g., equipment, transportation, enrollment fees; Farley et al., 2007; Hesketh et al., 2017). As such, it is important to examine children's opportunities for a variety of physical activities (e.g., unstructured play and sport), and the role that parents play in providing access to such opportunities.

1.4 Coronavirus Disease (COVID-19)

On March 11, 2020, the World Health Organization (2020a) declared the infectious coronavirus disease caused by the SARS-CoV-2 virus (COVID-19) a global pandemic. This disease, spread through respiratory droplets of an infected individual through breathing, talking, coughing, sneezing, and aerosols (i.e., airborne), or through touching surfaces that have the virus, and then touching your nose, mouth, or eyes without hand washing, is highly transmissible (Public Health Ontario, 2021). The list of disease symptoms has changed and grown as new variants have emerged; mild symptoms include, but are not limited to, fever, cough, tiredness, and/or loss of taste and smell, while more serious symptoms include shortness of breath, chest pain, loss of speech, mobility, confusion, and in serious cases, death (WHO, 2021). Given the severity and communicability of COVID-19, numerous public health protections, such as physical distancing (i.e., remaining 2 metres apart from others), lockdowns (i.e., essential trips only [groceries], non-essential businesses closed), mask and/or vaccine mandates, and hand sanitization, have been adopted by countries around the world to slow the spread (WHO, 2021). Specifically, in Canada, on March 18, 2020, the government declared an emergency order to protect the health and safety of the provinces (Government of Canada, 2020a). This forced many establishments in Canada to close, including facilities with indoor recreation programs, childcare centres, schools, and restaurants, while also restricting public gatherings with large indoor and outdoor crowds (Government of Canada, 2020).

These public health protections continued uninterrupted for several months and have since been removed and re-implemented across the provinces, country, and globe dependant on contextual factors such as disease transmission rate, positive community cases, institutional outbreaks, and local government authority (Government of Canada, 2020). In many cases, protections were re-imposed following the emergence of new variants that overwhelmed the healthcare system (i.e., Delta, Omicron; Public Health Ontario, 2022), and/or additional 'waves' of the pandemic, described as periods in which COVID-19 cases rose after a lull in transmission (Government of Canada, 2020). During the early months of COVID-19 (i.e., spring 2020) in Canada, governments in Ontario and Quebec imposed some of the strictest COVID-19 protections (e.g., restrictions to playgrounds) across the country given their high case counts (de Lannoy et al., 2020), which correlated with the greatest decline in outdoor play among children in these provinces during this time (Paterson et al., 2021; Riazi et al., 2021).

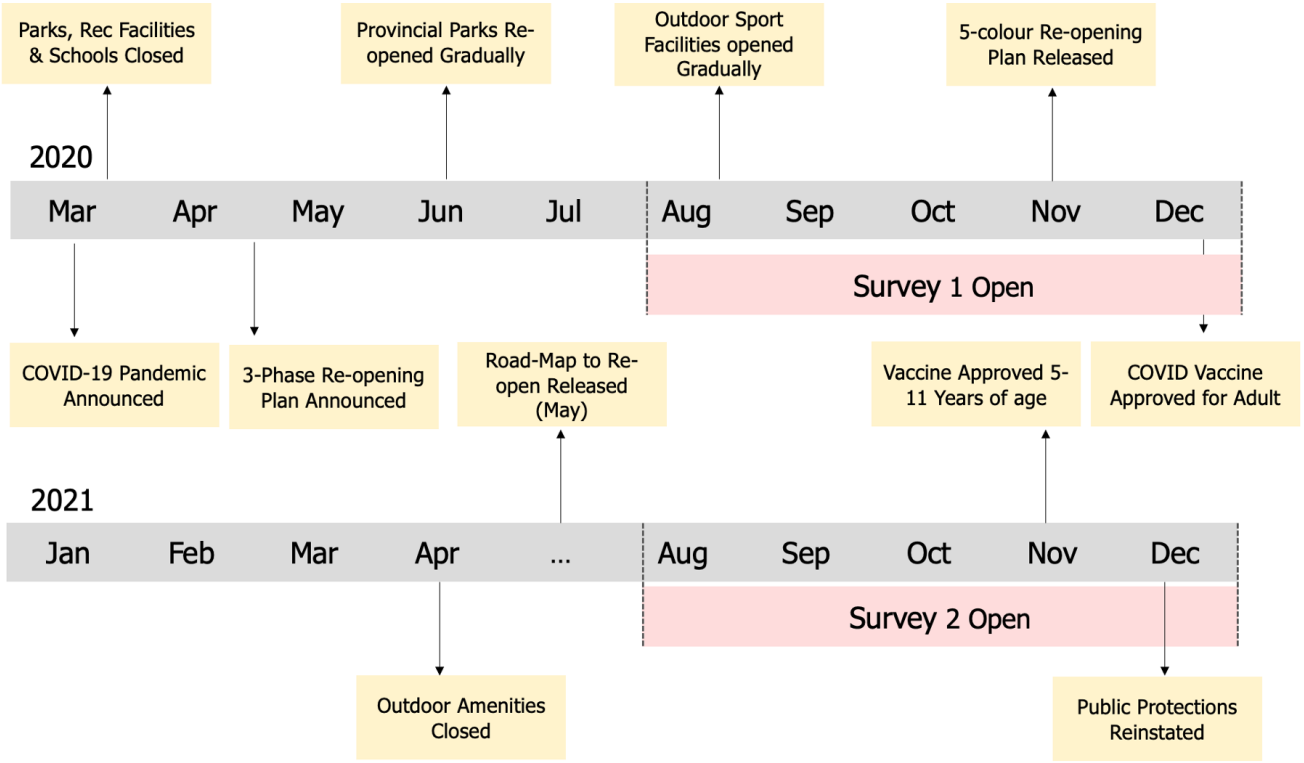
1.4.1 COVID-19 in Ontario

In Ontario, Canada, the government released a series of COVID-19 reopening plans as case-counts fluctuated (Government of Ontario, 2020a). During the first COVID-19 reopening plan (spring/summer 2020), the government closely monitored case counts and correspondingly assigned cities into 1 of the 3 reopening phases [Phase 1—protect and support; Phase 2—restart; and Phase 3—recovery], with community centres and recreational facilities only permitted to open if cities were in Phase 2 (Government of Ontario, 2020b). The format of reopening plans shifted as the has pandemic progressed, and by fall of 2020 (November), the Ontario government moved to a five-colour framework: Green-Prevent, Yellow-Protect, Orange-Restrict, Red-Control, and Lockdown-last resort/urgent; with protections again being removed or reinstated dependant on COVID-19 case-counts (Government of Ontario, 2020a). In regions across the province with less active COVID-19 cases, cities/communities were able to reopen sooner, compared to more densely populated cities (e.g., Toronto) that remained in stricter lockdowns for more extended time periods occurring during the winter months

(November-February 2020-2021; Government of Ontario, 2021a). During the summer months when case counts tended to be lower in Ontario (May to September 2020-2021), more recreational facilities were able to re-open (e.g., community centres, parks; Government of Ontario, 2021a). During the spring months of 2021 (May-June), Ontario again readjusted the reopening plans, returning to a similar 'Roadmap to Reopen' three-step plan (Government of Ontario, 2021b), that included the gradual reopening of outdoor, followed by indoor services, guided by the fluctuating case-counts during the fall and winter months. Please refer to Figure 1 for a visual timeline of COVID-19 protections in Ontario.

Figure 1

Timeline of Key COVID-19 Events in Ontario, Canada (Government of Ontario, 2020, 2021)



Regarding school closures throughout the pandemic, schools in Ontario faced 20 weeks of closures during the period of March 2020 to May 2021; the longest of any other

province or territory (Gallagher-Mackay et al., 2021). Parks were also closed during the early months of the COVID-19 pandemic, opening with limited capacity for the first time in June 2020 (Nielson, 2021), followed by the opening of outdoor sport facilities in August 2020 (Nielson, 2021). However, closures were reinstated in April 2021 following a resurgence in case counts (Nielson, 2021). Although at the current moment, few public health protections remain in place in Ontario (e.g., vaccine/mask mandates in specific settings), COVID-19 continues to exist and infect individuals in communities (Government of Ontario, 2022b).

1.4.2 Short-Term Impact on Children's Physical Activity

Given the closure of spaces conducive to physical activity (e.g., parks and playgrounds) as a result of COVID-19-related public health protections during the spring of 2020, many outdoor spaces that were previously readily available to families became inaccessible (Riazi et al., 2021). These settings became unusable as parks and recreational facilities were closed by the Government of Ontario to reduce the spread of COVID-19 (Government of Ontario, 2021a). For example, organized sport opportunities were significantly reduced (e.g., team sports cancelled or moved to online platforms), and schools, daycares, and parks were closed during this time (Government of Canada, 2020a). Although necessary to protect the health and safety of individuals, these facility closures undoubtedly altered physical activity patterns for families (Guerrero et al., 2020; Lesser & Nienhuis, 2020; Mitra et al., 2020). Many sport organizations also faced challenges during the early stages of the COVID-19 pandemic (i.e., spring/summer 2020). For instance, 70% of local sport organizations in Canada reported declines in registration and participation fees 3 months into the pandemic (Jackman & Way, 2020). Beyond pandemic restrictions, parental anxiety surrounding their children's inability to physically distance during activities, and/or fear of virus transmission likely impacted children's physical activity during earlier stages of the pandemic (Ostermeier et al., 2021). Given the declines in organized sport enrollment, and heighted anxieties surrounding the virus, research exploring whether parents' attitudes regarding their

children's physical activity have shifted throughout the pandemic, and how their return to play (unstructured play, sport) plans for their children during early and later stages of the pandemic have changed, is warranted.

1.4.3 Long-Term Impact on Children's Physical Activity

Considering that 3 years have passed since the onset of COVID-19, many international studies have captured parents' perceptions of the impacts of the pandemic on their children's movement behaviours at various stages of the pandemic (Carroll et al., 2020; Dunton et al., 2020; Guan et al., 2020; Guerrero et al., 2020; Lesser & Nienhuis, 2020; Moore et al., 2020, 2021; Ng et al., 2020a; Ostermeier et al., 2022; Riazi et al., 2021; Szpunar et al., 2022a). For example, a Spanish study examining children's (<12 years; *n* = 837) daily routines via parent-reports, demonstrated lower levels of physical activity, and more time spent with electronic devices during the first year of the pandemic (2020-2021), compared to pre-pandemic times (Cachón-Zagalaz et al., 2021). Interestingly, their study concluded that families who were able to establish routines with healthy sleep patterns were better able to maintain daily physical activity during this period of the pandemic (Cachón-Zagalaz et al., 2021), reiterating the importance of a healthy 24-hours (Tremblay et al., 2016). However, other worrisome results transpired from Canada (Moore et al., 2020, 2021), the United States (Dunton et al., 2020; Pavlovic et al., 2021), Australia (Arundell et al., 2021), the Netherlands (Velde et al., 2021), Ireland (Ng et al., 2020), and others (Kharel et al., 2022), as parents reported COVID-19-related barriers to physical activity for their children. Of particular concern, a systematic review conducted by Kharel et al. (2022) found that nearly all studies conducted at earlier stages in the pandemic (*n* = 71, across 35 countries) observed declines in children's physical activity, and that countries with the strictest public health protections during 2020, including Spain and Brazil, were impacted the most. Alternatively, some researchers reported that certain characteristics were found to be facilitators for physical activity (Moore et al., 2020, 2021; Ng et al., 2020). For instance, Ng and colleagues (2020) found that from a sample of Irish adolescents (*n* = 1,214),

almost one-fifth (19.1%) reported doing more physical activity during April 2020, compared to pre-COVID, with facilitators including 'staying healthy' and 'needing to get out'. Likewise, a study measuring the impact of the strictest COVID-19 protections (i.e., lockdowns) in Germany (in 2020) on movement behaviours found that while a decrease in sport was noted, an overall increase in physical activity among children (4 to 17 years, *n* = 1,711) occurred (Schmidt et al., 2020). Regarding physical activity in Canada, a study conducted by Moore et al. (2021) during the first 6 months of the pandemic found that few (11%) children (5-11 years), as reported by parents, were meeting the MVPA component of the movement guidelines. Nonetheless, it is apparent that the pandemic has had an outstanding impact on children's physical activity and that different countries have taken different approaches to disease prevention and physical activity promotion as the pandemic has progressed.

1.4.4 Barriers and Facilitators to Children's Physical Activity During COVID-19

Canadian findings have provided insight into some of the barriers and facilitators of children's physical activity levels as the pandemic has continued (Moore et al., 2020, 2021; Pelletier et al., 2021; Riazi et al., 2021; Szpunar et al., 2021). Findings from previous studies (via qualitative interviews) within the larger *Return to Play* program of research (under which the current study falls) referenced the importance of the home environment during earlier stages of the pandemic (i.e., December 2020-January 2021), and found that having outdoor spaces (e.g., backyards, communal courtyards) and outdoor play equipment (e.g., trampolines) were conducive to outdoor play (Szpunar et al., 2021). Given the loss of opportunity for structured physical activities in the spring/summer of 2020 (Moore et al., 2020), a shift to unstructured play was seen across some families and countries (Dunton et al., 2020; Moore et al., 2020, 2021; Nathan et al., 2021; Pelletier et al., 2021; Szpunar et al., 2021). For instance, Nathan et al. (2021) found that while overall physical activity among a sample of Australian children (*n* = 157) did not change, organized sport was largely replaced by increases in outdoor play in May of 2020. Likewise, the qualitative *Return to Play* study noted above,

found that the most common facilitator for children's physical activity during the 2020-2021 winter of the COVID-19 pandemic was being active outdoors, particularly in the form of hiking, long walks, or playing in the in backyard (Szpunar et al., 2021). Outdoor play was also found to be conductive to children's higher intensity activity, often in the form of unstructured activities, as reported by parents (Szpunar et al., 2021); however, levels remained below children's pre-pandemic unstructured play at 6 months into the pandemic (Moore et al., 2020). Taken together, these data present a case for an increased emphasis on outdoor play during and post-pandemic given its low-cost and feasibility (i.e., less time/organization from parents), and extensive health benefits (Moore et al., 2020, 2021; Schaefer et al., 2014), as emphasized by researchers at the organization, Outdoor Play Canada (de Lannoy et al., 2022). Without a doubt, increased research is needed to identify how we can promote families to engage in activities outdoors given that this is a feasible (e.g., low cost), low contact (e.g., in the case of a pandemic) and health-promoting activity.

Riazi et al. (2021) similarly conducted qualitative research in Ontario and British Columbia to gain rich descriptions of barriers and facilitators to children's physical activity in June 2020. Parents emphasized their sense of fear regarding the virus and the challenge of balancing work-from-home with their child's online schooling as barriers (Riazi et al., 2021). Additionally, the loss of structured activities, limited access to parks, lack of motivation and/or appropriate resources were noted as other common barriers. Parents tended to be less likely to allow their children to play outside due to traffic and physical distancing concerns (Riazi et al., 2021). Interviews with children in Ontario, from the earlier study under *Return to Play* described barriers that included missing friends/coaches, closure of parks, and lack of things to do at home (Szpunar et al., 2021). Finally, many studies found that lower socioeconomic status (e.g., income) and single-parent households tended to be associated with less physical activity among children during earlier stages of the pandemic (late 2020, early 2021; Paterson et al., 2021; Poulain et al., 2021; Rossi et al., 2021). Likewise, pre-pandemic research has also revealed that the conditions in which people live and work influence health behaviours

and wellbeing, including physical activity levels (WHO, 2022a), and as such, must also be considered within the context of the COVID-19 pandemic. This will help us understand how to reduce barriers and return children to play more equitably (Hu et al., 2021).

1.5 Social Determinants of Health (SDoH) & Socioeconomic Status (SES)

The social determinants of health (SDoH), known as the conditions people are born into, including where they grow, work, live, and age, consist of many social factors that influence the health behaviours of individuals beyond personal lifestyle choices and genetics (WHO, 2022a). SES, one important SDoH, can be defined as "a measure of ones combined economic and social status" (Baker, 2014, para 1), and is often measured using indicators such as income, parental education, and/or occupation, composite measures (i.e., Family Affluence Scale), and/or area level indicators (e.g., socioeconomic indices) in research (Owen et al., 2022). The impacts of SES on health outcomes in adulthood are well known (Grzywacz & Fuqua, 2000; Power et al., 2005). For example, Power et al. (2005) provided strong evidence of a correlation between low SES (occupation) and subsequent health risk (e.g., smoking, obesity) for adults. Similar findings have been presented by Grzywacz and Fuqua (2000) who found that adults of lower SES (including indicators of education, income, employment status) consistently exhibit poorer health outcomes (e.g., psychological wellbeing, risk for smoking, binge drinking) than higher SES adults. However, the relationship between SES and health risks in childhood is more complex, as during childhood, children are influenced by their parents' SES (Duncan et al., 2015). Nonetheless, research suggests that many SES indicators influence a young child's health outcomes (Duncan et al., 2015). For example, income gaps have been noted to be related to children's academic achievement and/or behaviours problems (e.g., acting out); though correlation can be difficult to assess because of bias in research design (Duncan et al., 2015). However, given that childhood SES is a distal risk factor (i.e., is a risk factor to poorer health outcomes as an adult; Duncan et al., 2015), other SDoHs (e.g., housing, food security), and the extent of time (e.g., fluctuating family incomes, parents returning to school) and experiences (e.g.,

early childhood education) encountered between childhood and adulthood may account for why some children are able to improve their SES as adults while others are not (Drenowatz et al., 2010).

Evidence suggests that the relationship between SES and health is best described as a gradient given the complex, multilevel relationship, prompting the need for additional research (Grzywacz & Fuqua, 2000). Specifically in the context of the COVID-19 pandemic, individuals with lower SES indicators (education, employment, income) have again been impacted disproportionately (Khanijahani et al., 2021; Patel et al., 2020); often experiencing additional challenges in their ability to physically distance (e.g., poorer housing conditions), having fewer opportunities to work from home (i.e., maintained essential jobs), and experiencing increased exposure to, and poorer health outcomes from the virus (Patel et al., 2020). Furthermore, researchers have revealed that many children of lower SES indicators (income, education, employment) have faced greater emotional symptoms such as increased worry and unhappiness as a result of the pandemic (Moulin et al., 2022). As such, it is important to consider how one's SES during the pandemic has affected families' attitudes surrounding their children's physical activity. More specifically, it is important to consider how parents' SES has influenced their attitudes and decisions to return their children's return to play at various time-points during the pandemic.

1.5.1 SES and Physical Activity

Individuals of lower SES tend to face barriers to engaging in physical activity and sport compared to higher SES individuals due to factors that include, but are not limited to, enrollment fees and equipment, lack of time, limited resources, and unsafe environments (Rittsteiger et al., 2021; Wijtzes et al., 2014). As such, the World Health Organization (2018) released the Global Action Plan on Physical Activity (GAPPA) 2018-2030. The mission of this action plan is to "ensure that all people have access to safe and enabling environments and to diverse opportunities to be physically active in their daily lives, as a means of improving individual and community health and contributing to

the social, cultural and economic development of all nations" (WHO, 2018, p. 7). Research on the relationship between physical activity and SES among children has been somewhat mixed, with several studies finding no relationship (Kelly et al., 2006; Voss et al., 2008), mixed results (Booth et al., 2002; Maher & Olds, 2011), or more recent evidence suggesting a strong positive relationship between SES and MVPA (Love et al., 2019; Rittsteiger et al., 2021; Wijtzes et al., 2014). These discrepancies are likely a result of different SES measures (e.g., income, education, indexes), different physical activity measurement techniques (e.g., parent self-report, accelerometers), varying physical activity intensities (MVPA vs. TPA), and outcome measures (e.g., types of activity being measured) in research. For example, Voss et al. (2008) concluded that while low-income families attended significantly fewer structured sessions (i.e., sport teams), this did not equate to less total weekly or less intense physical activity compared to the wealthier cohort. They attributed this finding to unstructured activity making up for the lack of structured activity (Voss et al., 2008). However, given the relatively small sample size (*n* = 214), geographic location (United Kingdom), and focus solely on income, this study cannot be generalized to families of low SES in Canada. Maher and Olds (2011) also suggest that study results may differ based on which SES characteristics are measured. Studies measuring individual-level factors (e.g., parental education) often showed differences, while area-level indictors (based on geographic location/population) did not. Most recently, a systematic review and meta-analysis (n = 104 studies) observed that children in high income countries from higher SES households (index-based) were physically active for longer and more likely to meet physical activity guidelines than children from lower SES households (1.21 times higher; Owen et al., 2022). Beyond these factors, characteristics including but not limited to language, culture-based norms and values, and discrimination may also act as additional barriers to physical activity among populations with structural inequities (Wijtzes et al., 2014).

1.5.1.1 Canada-Specific Evidence

Recent evidence from Canada has also shown that socioeconomic disparities in relation to physical activity continue to exist (ParticipACTON, 2020; Stearns et al., 2016; Stone et

al., 2012). For example, children (5 to 11 years) with university-educated parents are more likely to reach 12,000 steps per day (~60 minutes of MVPA) when compared to their counterparts (children with parents who attained high school or college; CFLRI, 2019). Additionally, Stearns et al. (2016) found that the child-parent physical activity relationship among 7– to 8-year-olds in Alberta was significant in high-income but not low-income families, further confirming the previous studies findings. These data are also supported by international studies showing that significantly more minutes of MVPA are accumulated across higher SES groups (Love et al., 2019). Although further research is needed to confirm these claims, research to date is supportive of the notion that socioeconomic disparities to physical activity in Canada exist (ParticipACTON, 2020; Stearns et al., 2016; Stone et al., 2012).

1.5.2 Parents' SES and Children's Sport Participation/Unstructured Play

Many researchers have explored the relationship between parents' SES and children's sport/outdoor play participation (Owen et al., 2022). As evidenced by Wijtzes et al. (2014), sport participation was higher among a sample of 6-year-old Dutch children (*n* = 4,726) with highly educated, working mothers living in middle- to high-income families, compared to families with lower SES and those identifying as ethnic minorities. Kellstedt and colleagues (2021) found that higher income families were nearly four times more likely to have children that are enrolled in sport, while White and McTeer (2012) similarly concluded that SES (assessed by educational attainment, working status of parent, family income, and number of adults in family) was a significant predictor of sport involvement among 6- to 9- year-olds in Canada. It is likely that this is because of increased access to resources (e.g., fees, equipment; Rittsteiger et al., 2021). These results were echoed by a recent systematic review and meta-analysis (*n* = 104 studies) concluding that children from higher SES households (index-based) were two times more likely to participate in sport, and spent more time engaging in sport, than their lower SES counterparts (Owen et al., 2022). Moreover, a Canadian specific (Toronto, Ontario) study suggested that children (10 to 11 years) living in low socioeconomic

neighbourhoods had less access to, and used physical activity resources (e.g., parks, trails, sport facilities, community centres; Ravensbergen et al., 2016).

With respect to unstructured play, Rittsteiger et al. (2021) found that SES of parents and play among children (n = 7127) had only a weak association. Conversely, Delisle Nyström et al. (2019) found that children (n = 1699) living in lower SES areas (median household income, census based) were less likely to spend greater than two hours outdoors (i.e., opportunities for outdoor MVPA) compared to their higher SES area peers. Finally, a longitudinal study conducted by Cairney et al. (2015) found that children (*n* = 1805) in Southern Ontario living in high income neighbourhoods (i.e., 75th percentile) engaged in higher rates of organized sport and active free play than children in middle (i.e., 50th percentile) and low (i.e., 25th percentile) income neighbourhoods.

Regarding accessibility of physical activity resources, parents with a lower income living in Ontario reported far more barriers to using recreational facilities (e.g., community centres, swimming pools) when compared to parents with higher incomes (Harrington et al., 2017). These trends appeared to continue into the pandemic, as parents noted that finances were a barrier to engaging their children in sport during earlier stages of the COVID-19 pandemic (December 2020-January 2021; Szpunar et al., 2021). These data are worrisome, as disadvantaged children seem to be less likely to experience the added benefits of organized sport and unstructured play, regardless of the MVPA possibly accumulated from leisure activities. Additionally, given that parents have more commonly faced financial hardship and/or job instability during the pandemic (Kerr et al., 2021; Ostermeier et al., 2021), and that children with parents of higher financial wellbeing demonstrated better mental and physical health early in the pandemic (i.e., April 2020; Kerr et al., 2021; Ostermeier et al., 2021); it is imperative to understand the attitudes of parents in varying socioeconomic positions regarding their children's return to play (unstructured play, sport) to better implement needs-based resources and programs during the pandemic and beyond.

1.6 Understanding Urbanicity and the Built Environment

Previous literature has found that the impact of SES on health and physical activity is often dependant on where an individual is situated (i.e., the social and physical environment; Vlahov & Galea, 2002). Specifically, living in a poor neighbourhood (SES index) independent from individual SES, has been associated with poorer individual health outcomes (Grzywacz & Fuqua, 2000). This calls for a greater focus on SES and the geographic environment in physical activity research.

1.6.1 Urbanicity and the Population Density Spectrum

Urbanicity, defined as "the impact of living in urban areas at a given time" (Vlahov & Galea, 2002. p. 1), is viewed as a meaningful determinant of population health. The health impacts of being situated in distinct levels of urbanicity is concerned with the presence of conditions that are unique, or more readily available to urban areas (e.g., proximity of healthcare services; Vlahov & Galea, 2002). Furthermore, identifying factors of the urban environment that promote or inhibit health can help develop context-specific programs and policies (Vlahov & Galea, 2002). However, the concept of 'urban' is often dependent on location and author/researcher terminology/definitions (Vlahov & Galea, 2002). For example, among 228 countries, approximately "half use administrative definitions of urban (e.g., living in the capital city), 51 use size and density, 39 use functional characteristics (e.g., economic activity), 22 have no definition of urban, and 8 define all (e.g., Singapore) or none (e.g., Polynesian countries) of their population as urban" (Vlahov & Galea, 2002, p. 4). This heterogeneity in definitions and associated outcomes makes drawing conclusions on the impact of urbanicity challenging. In Canada, Statistics Canada updated its urban classification system to use the term 'population centres' based on population size and density, with areas falling outside of this classified as rural areas (Statistics Canada, 2017). Nonetheless, many researchers in Canada continue to use the urban versus rural dichotomy, which neglects communities that fall somewhere in between (e.g., suburban; Sandercock et al., 2010; Vlahov & Galea, 2002), misses nuances in urbanicity characteristics that exist between

geographic areas (Button et al., 2020a), and run the risk of 'one-size-fits-all' policies that do not meet the needs of communities (e.g., insufficient access to healthcare; Taylor et al., 2018a; Yousefian et al., 2009).

Physical activity research to date has also frequently used this dichotomous categorization. For example, studies often consider urban and rural regions without considering features of the built environment (Sandercock et al., 2010). Instead, Sandercock et al. (2010) urged researchers to use an urbanicity spectrum or scale. This more suitable measure of urbanicity provides greater detail on the physical (built environment) features including, but not limited to, cul-de-sacs and mixed land (suburban), agricultural land (rural), large-grid networks and buildings, infrastructure, norms and more (Sandercock et al., 2010). The built environment can be defined as the human-made (or modified) environment in which people live, work, and play (Bancroft et al., 2015). Research recognizes the built environment as an important determinant of population health and activity, as it lends itself well to describing the urbanicity of communities (Bancroft et al., 2015). These more descriptive features provide context-specific characteristics of the environment and allow for better representation of the various regions within the Canadian population in physical activity research.

1.6.2 Urbanicity, the Built Environment, and Physical Activity Trends

The physical characteristics of communities, including buildings, roads, and opens spaces, can either help or hinder children's opportunities for physical activity (Stone et al., 2012). Therefore, considering different features of the built environment is one way to explore environmental influences on a child's physical activity (Orton et al., 2017; Taylor et al., 2018a). Previous findings from urbanicity and physical activity research among children has been somewhat mixed. Moore et al. (2013) found that children (n = 284, grades 7 and 8) in rural areas were at elevated risk for physical inactivity (15.9 min/day vs. 19.2 min/day in urban areas) in southeastern USA. Likewise, another American study found that preschoolers in rural areas (n = 572) were at higher risk for obesity than preschoolers in urban areas (Contreras et al., 2021). Conversely, systematic

and narrative reviews conducted by Sandercock et al. (2010; *n* = 18 studies) and McCormack and Meendering (2016; *n* = 17 studies) found that overall, studies exploring differences between children living in urban and rural areas did not exhibit differences in physical activity; recognizing the dichotomy (i.e., lack of an urbanicity spectrum; Cyril et al., 2013), as probable cause. As such, there remains a lack of clear evidence regarding urban-rural differences in children's MVPA (Button et al., 2020b).

When research moves beyond the dichotomy and considers the built environment, more conclusive findings ensue (Stone et al., 2012). Turning to Ontario-specific research, a study conducted in Toronto showed that children living in suburban areas were most active compared to their rural and urban counterparts (Stone et al., 2012). Some differences were noted between sexes (e.g., boys in inner-suburban vs. girls in urban had highest physical activity levels); however, neighbourhood SES might have presented as a confounding barrier, supporting the importance of examining SES and urbanicity as covariates. These findings were echoed in a systematic review by Sandercock et al. (2010) that utilized an urbanicity spectrum approach (Joens-Matre et al., 2008; Kristjansdottir & Vilhjalmsson, 2001; Nelson et al., 2006; Springer et al., 2008). The authors concluded that children in suburban areas were more likely than children living in urban or rural areas to be active, which may be a result of higher SES and/or the mix of urban (easier access to sport facilities) and rural (open space) characteristics of the built environment (Sandercock et al., 2010). Nuances in barriers to physical activity between children in rural, urban, and suburban areas of Ontario have also been documented (Taylor et al., 2018a). Specifically, children in suburban areas listed high perceived crime rates as a top barrier whereas children in rural areas named 'too far from home' or 'not enough bike lanes' as top barriers (Taylor et al., 2018a). Additionally, children from the same study in urban areas were more likely to report being worried about getting hurt or taken by strangers whereas children in rural areas were more likely to report barriers related to the neighbourhood and local infrastructure for physical activity (Taylor et al., 2018a). Interestingly, a study conducted in Toronto found that parents' perspectives on the neighbourhood environment have been reported as a

greater indicator of outdoor play and physical activity than access to play-related land use (i.e., backyard, school facility; Faulkner et al., 2015); emphasizing the important role that parents play in children's activity.

When considering descriptive components of the built environment (e.g., population density, street connectivity, proximity to parks) as recommended by Sandercock and colleagues (2010), several findings are worthy of noting. A systematic review (*n* = 51 studies) exploring the built environment as a determinant of physical activity in adults and children found evidence that street connectivity (i.e., intersections in street networks), higher walkability, parks, and playgrounds nearby, and higher population density were associated with increased physical activity in most studies (Kärmeniemi et al., 2018). In a similar review of 28 studies focusing exclusively on the childhood population, comparable results transpired; nearby parks and playgrounds, and recreational facilities were both associated with increased physical activity (Oliveira et al., 2014). Alternatively, a review and meta-analysis (*n* = 23 studies) conducted by McGrath et al. (2015) reported that built environment features may have a negative impact on young children's MVPA, linking parental concern to neighbourhood traffic (i.e., higher street connectivity could be considered more dangerous to young children) as possible reasoning (McGrath et al., 2015). However, the review by McGrath and colleagues did reveal that GPS/GIS spatial data identified that children that walked to and used neighbourhood amenities were more active than those who did not (McGrath et al., 2015). Specific to Ontario, one study showed that children (*n* = 435, aged 9-14) with greater neighbourhood access to parks, sports fields, and multi-use pathways had significantly more MVPA during non-school hours in comparison to children with less access to these resources (Mitchell et al., 2016). Overall, some inconsistencies in the literature remain, and additional research is needed to explore the influence of the built environment on children's physical activity (Bancroft et al., 2015).

It is critical to consider how the COVID-19 pandemic has influenced the role of the built environment in relation to children's physical activity levels and opportunities. Some

research from early in the pandemic (i.e., 2020-2021) conducted in Croatia found that children in urban areas showed greater declines in physical activity compared to children in suburban or rural areas (Zenic et al., 2020). This finding is supported by a scoping review (*n* = 21 studies) that explored the influence of physical distancing on children's physical activity during the first year of the pandemic with studies conducted in Europe, the Americas, and China (Yomoda & Kurita, 2021). The authors found that children in rural areas were less likely to experience declines in physical activity, attributing densely-populated urban areas with high case counts and additional closures of sport facilitates as likely causes (Yomoda & Kurita, 2021). Canadian-specific research has also described the influence of the built environment on physical activity at earlier stages of the COVID-19 pandemic, showing that living in low-dwelling density (i.e., less populated/less houses) neighbourhoods was a facilitator to outdoor activity (Mitra et al., 2020), while families without backyards or outdoor space struggled to keep their children active (Szpunar et al., 2021). More recently, data from the Canadian Community Health Survey (CCHS) found that youth in urban areas faced significant declines in physical activity compared to pre-pandemic activity levels (-135 minutes/week), but youth living in rural areas did not (-86 minutes/week, non-significant; Colley & Watt, 2022). Turning to research regarding characteristics of the built environment during the pandemic, features of the built environment, including walking/cycling infrastructure and recreational facilities were associated with outdoor but not indoor play behaviours in children and youth (Gu et al., 2022). Given country-specific features of the built environment, and the dynamic nature of the COVID-19 pandemic in Ontario, it is important to understand how features of the built environment influence parents' attitudes surrounding their children's activity.

1.7 Positioning the Use of the Social-Ecological Model (SEM) - Conceptual Framework

It is commonly understood among researchers in the physical activity and geography fields that individual physical activity is shaped by interactions with the physical and social environments of daily life (Mitchell et al., 2016; Mitra et al., 2017; Sandercock et

al., 2010; Taylor et al., 2018a; Vlahov & Galea, 2002). To account for the multiple levels of influence on children's physical activity levels and the respective influences of SES, urbanicity, and COVID-19-related factors, the SEM is well-suited for research relating to parents' attitudes. Furthermore, a growing body of physical activity research supports the adoption of this model given that physical activity often takes place outside of the home, in the physical environment, and is therefore subject to its influence (Button et al., 2020a; Hoekman et al., 2017; Hu et al., 2021). Of particular interest, the Position Statement on Outdoor Active Play employs the SEM, noting that levels of influence on physical activity include "the family, the social environment, the built environment and public policies" (Tremblay et al., 2015, p. 6,488). Further, a consensus statement by Rhodes et al. (2020) also describes multiple spheres of influence on a children's healthy movement behaviours (e.g., family structure) in line with the SEM.

According to Bronfenbrenner (1981), the SEM considers the individual in relation to the micro- (family, school), meso- (schools, neighbourhood), exo- (SES, mass media), macro- (attitudes, social values), and chrono- (time) systems. Pertaining to physical activity, the SEM suggests that physical activity is influenced by the five following groups: "(1) intrapersonal factors; (2) interpersonal processes; (3) organizational factors; (4) community factors; and (5) public policy" (Hu et al., 2021, p. 2) with interventions varying by level. For instance, the interpersonal level, of particular interest to this research, aims to address support networks such as family and friends. However, this will be influenced by broader levels including schools or workplaces (organization), policy (local, provincial, national), and environments/services (community; McLeroy et al., 1988). Therefore, it is apparent that a child's physical activity is impacted by their parents, and that both children and parents are influenced by what surrounds them (Davison et al., 2013). More broadly, these factors are also influenced by large societal changes (e.g., a global pandemic and what comes along with it). Researchers have already described barriers and facilitators to physical activity using the SEM (Davison et al., 2013; Hesketh et al., 2017). For instance, children living in close proximity to childcare centres was a positive influence (Hesketh et al., 2017) while prioritizing

academic achievements was a notable barrier (Martínez-Andrés et al., 2020). Parental attributes such as parenting styles, their enjoyment of activity and their assigned value toward physical activity have all been found to influence children's physical activity, and these, in turn, are influenced by other external factors (e.g., policy, community, infrastructure, SES; Davison et al., 2013).

In light of the COVID-19 pandemic, researchers have turned to the SEM to highlight factors impacting children's health behaviours (Knight et al., 2022; Riazi et al., 2021). For example, Riazi et al. (2021) described policy (COVID-19 restrictions), individual (child motivation), interpersonal (parent support and work schedules), social (friends), and built environment (park closures) factors which contribute to the challenge of engaging in physical activity during the pandemic. Moreover, a systematic review conducted by Knight and colleagues (2022; *n* = 16 studies) addressing the SEM in relation to the pandemic and children's physical activity, found that family engagement was critical to promoting children's activity. As such, the SEM is important to consider when looking at urbanicity and SES given the complex, multi-level influence of both variables on children's physical activity levels.

1.8 Rationale and Purpose of Study

Clear evidence supports the health benefits of physical activity, with additional benefits accrued from outdoor play and sport (Wijtzes et al., 2014). However, the prevalence of children in Canada meeting guidelines remains low, with a predominantly downward trend observed in children since the onset of the COVID-19 pandemic (Moore et al., 2020, 2021; Paterson et al, 2021). Canadian evidence points to differences in physical activity among children depending on their family SES (income, employment, education, etc.) and geographic location; however, few studies have examined the influence of socioeconomic disparities on sport participation and unstructured play during the COVID-19 pandemic (Owen et al., 2022). There is also a need to better understand children's engagement in physical activity using more descriptive features of the built environment (i.e., beyond the urban vs. rural dichotomy), as there is a paucity of

research on this topic, particularly during the COVID-19 pandemic (Hu et al., 2021; ParticipACTION, 2022). Research exploring the role of SES and urbanicity in facilitating children's physical activity is needed to determine how to best support parents in helping them promote active play during and beyond the pandemic, given the impact of SES and the built environment on resources available to families (e.g., access to recreation facilities, parks, organized sport; Lambert et al., 2019). As such, it is critical to understand parents' attitudes and feelings toward their children's return to active play in the context of the pandemic.

Parents play an instrumental role in supporting their children's physical activity levels, acting as a child's key decision maker, financing (e.g., registration), supporting, and providing transportation to physical activity opportunities (Brown et al., 2016; Neshteruk et al., 2017). Similarly, researchers have found that family characteristics, such as SES and geographic factors can influence a child's engagement in physical activity (e.g., Owen et al., 2022, Mitchell et al., 2016), and that parental fears and/or attitudes can influence a child's opportunities for physical activity (Jelleyman et al., 2019). This is particularly important in the context of the COVID-19 pandemic, as public health protections and the closures of spaces conducive to children's physical activity were in place for long durations, limiting children's opportunities and increasing parental anxiety about the virus (Ostermeier et al., 2021). In addition, given the changes to the physical activity landscape in Ontario (e.g., the intermittent and prolonged closures of organized sport facilities in Ontario, decline in sport registration during early COVID-19 (Jackman & Way, 2020)), less is known about parents' preferences toward returning their children to structured versus unstructured activities during and beyond the pandemic.

To this end, the purpose of this thesis was to explore the influence of family SES indicators (income, employment, education, family situation) and urbanicity (features of the built environment) on parents' attitudes toward their child(ren)'s (<12 years of age) active play (unstructured play, sport) opportunities 6 months and 1.5 years into the

COVID-19 pandemic, and to explore changes over time. Specifically, because outdoor play is less expensive (Farley et al., 2007) and has become more available during the pandemic (Riazi et al., 2021), the secondary objective was to explore how parents' attitudes at 6 months relate to the structured (organized sport) and unstructured play (neighbourhood play) opportunities that children return to 1.5 years into the pandemic, moderating the effects of SES and urbanicity. To our knowledge, this is the first study of its kind to examine parents' attitudes regarding their children's return to play, and the influence of built environment and SES on these attitudes during the context of the COVID-19 pandemic.

Chapter 2

2 Methods

2.1 Study Design and Procedures

This thesis reported on data collected as part of the larger *Return to Play* study (Szpunar et al., 2021). *Return to Play* employed a repeated measures design and aimed to quantitatively and qualitatively examine Ontario parents' (including guardians) perspectives and intentions to return (or not return) their children to active play and sport opportunities during the COVID-19 pandemic. Two online surveys (Survey 1 – Appendix A; [August – December 2020 – 6 months] and Survey 2 – Appendix B; [August – December 2021] – 1.5 years) were administered using Qualtrics to collect data on children's pre-COVID-19 activities and parents' current plan for their child's return to play (unstructured play, sport; Szpunar et al., 2021). In addition, two rounds of interviews (i.e., January 2021 and 2022, respectively) were conducted to capture in-depth perspectives from parents and children on their physical activity, play and sport behaviours (e.g., barriers/facilitators to getting active during COVID-19 closures; Szpunar et al., 2021). For this thesis, survey data were drawn from two time points: ~6 months into the pandemic (August to December 2020) and ~1.5 years into pandemic (August to December 2021). The Non-Medical Research Ethics Board (REB) at the University of Western Ontario approved all study procedures and associated documents (REB #116331; Appendix C). Refer to Figure 1 for survey timelines.

2.2 Recruitment and Participants

Participants in this study were parents (including guardians) of a child(ren) 12 years of age or under residing in Ontario, Canada. Recruitment took place through social media posts (e.g., Twitter, Facebook, Instagram) and infographics describing the study (e.g., eligibility criteria, QR code to online survey, principal investigator's contact information; Appendix D) were circulated. In addition, a member of the research team contacted various sport/physical activity organizations in Ontario and asked them to share the

infographic with study details with their communities. Participation in the survey was voluntary, and implied consent was given when participants completed the survey. Before participants could begin the survey, they were prompted with a questionnaire to determine their study eligibility. To be eligible for the study, participants had to be: (1) an Ontario resident, (2) a parent of a child under 12 years (at the time of recruitment - ~6 months into COVID-19), (3) had custody of their child at least 50% of the time, and (4) were able to read and write in English. If individuals did not meet these criteria, they were unable to begin the survey. Participants created their own unique identification code by answering a series of simple questions (e.g., what is the first letter of the town/city that you were born?). The same process was followed for the second survey so researchers could link responses at 6 months (Survey 1) and 1.5 years (Survey 2) while maintaining participant anonymity.

2.3 Instruments and Tools

Created and available in English, two online Qualtrics surveys (Appendices A and B) were designed by the research team using the best available evidence 'at the time' regarding the COVID-19 pandemic situation in Ontario (i.e., closure of facilities, phased re-opening plans; Government of Ontario, 2020). A letter of information (Appendix E – 6 months, Appendix F – 1.5 years) was included at the beginning of each survey to inform participants of the study purpose, procedures, consent process, possible harms/ benefits, compensation, and confidentiality. For the purpose of this thesis, items were taken from three sections: demographics (Survey 1), parents' intentions, beliefs, and comfort (i.e., attitudes) regarding their children's return to play (unstructured play, sport; Surveys 1 and 2), and active play opportunities (i.e., which sports [soccer, hockey, etc.] and unstructured activities [play in neighbourhoods] children *had* returned to 1.5 years into the pandemic; Survey 2).

2.3.1 Survey 1

The first survey included 162 items, and collected information such as participant demographics (*n* = 16 items, e.g., gender, postal code, ethnicity, employment status, household income), children's pre-pandemic activities (i.e., what sports/unstructured activities children participated in during 2019; *n* = 6 items), parents' current plans for their child's return to play (unstructured play, sport) during and following the pandemic (*n* = 8 items), measures of parents' risk tolerance (*n* = 30 items), as well as information regarding children and parents' own MVPA (*n* = 2 item).

2.3.1.1 Demographic Questionnaire

Sixteen items assessed participant demographics capturing information including: number of children, parent gender, child(ren)'s biological sex, parent and child age, postal code, geographical area type (i.e., rural, urban, suburban), ethnicity, employment status (i.e., full-time, part-time, etc.), family situation (i.e., single/dual parent household), highest level of education achieved, housing type (e.g., apartment, semi-detached home), dog ownership, and income (i.e., total annual household income). All indicators of SES were pulled from the demographic section. Similarly, all urbanicity variables (i.e., indices) were created using participant postal codes collected in the demographic section of Survey 1.

2.3.1.2 Parents' Attitudes Regarding their Children's Return to Play

Parents' intentions, beliefs, and comforts (i.e., their attitudes) concerning their child's eventual return to play (unstructured activity, sport) were assessed in Survey 1 using a 5-point Likert Scale (i.e., 1 – *strongly disagree*, 5 – *strongly agree*). Parents were asked 14 questions about their attitudes toward their children's return to play (e.g., *even if my child can follow physical distancing guidelines, I am still hesitant to return them to active play programming).* These attitude questions were designed to capture different aspects of children returning to play in the context of the COVID-19 pandemic (e.g.,

organized programming, in the home, etc.). As such, for analysis purposes, subscales within this tool were explored to group parent attitudes that were similar in scope.

2.3.1.3 Socioeconomic Status

Indicators of family SES were assessed using parent-reported data from the demographic section of Survey 1 (employment status, family situation, education, and income). Previous research has suggested that exploring the role of SES in relation to health often involves the use of single measures (often income or education), without justification of its impact on analysis and/or study findings; despite a consensus in the literature that SES is multifactorial and difficult to categorize (Braveman et al., 2005; Duncan et al., 2015). As such, this study used multiple demographic measures to provide a more fulsome overview of different indicators of family SES. Following best practices for measuring SES informed by Diemer et al. (2013), the American Psychological Association (APA; 2022) provides recommendations for researchers to improve the consistency of SES indicators used by researchers. These measurements include consideration of education, income, occupation, and family size and relationships (e.g., number of children, family situation; APA, 2022). Thus, demographic data from Survey 1 relating to parents' level of education (e.g., college, graduate school), total household income, occupation, and family situation (dual or single-parent household), were used as unique indicators for family SES in this thesis.

Given that composite measures of SES (e.g., SES indices created by aggregating characteristics into one SES measure) do not provide detailed representation of which specific SES indicators correlate to disparities (e.g., is the impact a result of education or income, both, neither etc.; Braveman et al., 2005; Duncan et al., 2015), an index was not used in this study. Rather, each SES indicator was analysed as a unique variable to provide a comprehensive overview of which (if any) SES indicators impact parents' attitudes toward their children's return to play (unstructured play, sport). This is in line with recommendations from Braveman and colleagues (2005), who suggested that researchers avoid making claims about overall SES, and instead specify which

components of SES (e.g., income, education, etc.) are measured/impact the outcome variable. This will allow for a more specific interpretation of results with the goal of more appropriate guidance on target areas of interventions and/or programs relating to specific measures of SES (i.e., should the focus be on low-income households, single-parent families, etc.?).

2.3.1.4 Urbanicity

The current study utilizes postal code data collected in the demographic section of Survey 1 to understand how urbanicity influences parents' attitudes to return their children to play during the COVID-19 pandemic. Participant postal codes were used to objectively measure urbanicity using a Geographic Information System (GIS; a system that captures, stores, retrieves, analyses, and displays data with information related to a specific location on the Earth's surface; Chang, 2019; ArcGIS Pro 2.9.0 software), developed by researchers in the Department of Geography at Western University. This method uses several built environment (e.g., intersection, population density) indices, as used by other researchers in the geography field (Mitchell et al., 2016). For instance, similar urbanicity indices have been used previously in research to examine the influence of the built environment on children's MVPA (Mitchell et al., 2016), as well as to explore children's perceived barriers and facilitators to physical activity in the context of different urbanicities (Taylor et al., 2018a). Similarly, it was anticipated that identifying participants' urbanicity in this study would highlight different land uses (built environment) and result in less bias than self-reported parental area-type (i.e., urban, rural, or suburban) selected by parents in demographic questionnaire.

Research suggests that postal codes serve as reasonable proxies for residential addresses in urban and suburban areas (Healy & Gilliland, 2012); however, rural postal codes that encompass a larger geographic area should be used with caution (Healy & Gilliland, 2012). As such, it is recommended that a 1000-metre buffer should be used as a proxy to reduce the risk of misclassification (Healy & Gilliland, 2012). Therefore, a 1000-metre buffer (i.e., radius around the postal codes) was created around each

participant's home postal code (i.e., from the geographic centre of the postal code), of which the coordinates were derived from the 6-digit Digital Mapping Technologies Inc. (DMTI) Spatial single link postal code locations dataset. Participants' urbanicity was then measured using seven indices; the Canadian Active Living Environment Index, physical environment index (greenness, 1000m buffer), built environment index (street intersection density, 1000m buffer), social environment index (population density, 1000m buffer), as well as three sets of indices to represent accessibility to parks and recreational areas. Similar measures have been used by other researchers in the geography and health science fields, using an urbanicity spectrum (Mitchell et al., 2016; Taylor, 2018b). A description of all urbanicity variables (indices) is available in Table 1 and described in the following section.

2.3.1.4.1 Description of Urbanicity Variables and Calculation of Indices

The Canadian Active Living Environment Index (Can-ALE), created by Ross and colleagues (2018), measures the active living friendliness of communities within the Canadian context, and is often referred to as the 'walkability' of neighbourhoods (Ross et al., 2018). The index examines the relationship between physical activity and the way in which communities were built, focusing on walking rates and active transportation (i.e., cycling, walking; Ross et al., 2018). This index was calculated as the sum of the z-score of the intersection density, dwelling density, and points of interest as measured by postal code (Ross et al., 2018). Specifically, intersection density is classified by the number of ≥3-way intersections per square kilometre; dwelling density is classified by the number of dwellings (e.g., house, apartment, etc.) per square kilometre; and the points of interest are classified as specific locations that citizens may find useful or interesting (e.g., service centres; Ross et al., 2018). Participants with no data were entered as -9999, and participants with data insufficient to calculate value were entered as -1111. Higher Can-ALE class indicates greater neighbourhood walkability (Ross et al., 2018).

The physical environment index measures the greenness of a geographic area using the Normalized Difference Vegetation Index (NDVI) calculated from satellite imagery. The NDVI quantifies vegetation by measuring the difference between near-infrared (i.e., strongly reflected by vegetation) and red light (i.e., absorbed by vegetation; CanMap, 2015; Gorelick et al., 2017; Landsat, 2017; USGS, 2017). The NDVI ranges from -1 to +1; with higher values indicative of higher green vegetation density. Mean NDVI of each postal code within a 1000-metre radius was mapped and converted to a score between -100 and 100 for analysis. The built environment index approximates the urbanicity of each participant's residence classified through the number of street intersections within a 1000-metre buffer of participant postal codes. Street intersection datasets were sought through the Scholars GeoPortal (Ontario Council of University Libraries, 2022). The social environment index is indicative of the population density of participant's residence within a 1000-metre buffer; population density is calculated using the census dissemination block data (Statistics Canada, 2021).

The park variables are encompassed by three indices that represent the accessibility to parks and recreational areas generated using DMTI Spatial Park Boundary/point data. The park data include parks and recreational areas across Canada, including, but not limited to, national parks, provincial parks, municipal parks, wilderness areas, golf courses, campgrounds, cemeteries, sports fields, historical sites, and swimming pools (DMTI Spatial Inc., 2020b, 2020a). Using these data, indices for proximity to nearest park, total park area within the buffer, and number of parks within the buffer were generated. Proximity to parks (metres) was calculated as the street network distance from the geographic centre of the postal code to the nearest park using the GeoPortal (Ontario Council of University Libraries, 2022). The total park area within a buffer distance of a postal code was calculated within the 1000-metre radius. Finally, like total park area, the park count index counts the number of parks falling within the 1000-metre buffer of the postal code. Using the 1000-metre buffer as a standard across urbanicity variables helped to reduce the risk of postal code misclassification (Healy & Gilliland, 2012).

Table 1

Description of Urbanicity Variables Employed

Urbanicity Variables (Indices)	**Description**
Active living index (Can-ALE)	The walkability (walking rates) and active transportation of Canadian neighbourhoods.
Greenness (physical environment index)	Quantifies the amount of vegetation from satellite imagery.
Street intersection density (built environment index)	The number of street intersections within a 1000-metre buffer of participant postal codes.
Population density (social environment index)	The population density of participant's residence within a 1000-metre buffer.
Distance to nearest park (km)	The accessibility of participant postal code to nearest park
Park area (10,000m^2)	Estimates the total park area within a 1000-metre buffer of participant postal code.
Number of parks (1000m)	The number of parks falling within a 1000-metre buffer of participant postal codes.

Note. These variables were included because they provide objective data of participant urbanicity (i.e., built environment), and were drawn from a variety of Canadian data sources (e.g., Census dissemination block data, CanMap, etc.; CanMap, 2015; Gorelick et al., 2017; Landsat, 2017; Statistics Canada, 2021; USGS, 2017).

2.3.2 Survey 2

Survey 2 (*n* = 58 survey items) included similar items to Survey 1 but did not include parent demographics or risk tolerance measures. Questions were similarly tailored to the pandemic reopening plans in Ontario at the time of the survey (e.g., has your children *returned* to activities?).

2.3.2.1 Parents' Attitudes Regarding their Children's Return to Play

Parents completed the same attitude questions (i.e., 5-point Likert - 1 – *strongly disagree*, 5 – *strongly agree*) in Survey 2, to compare attitudes across time points during the pandemic (6 months; 1.5 years), with one additional attitude item (*n* = 15 [not used in this thesis]).

2.3.2.2 Children's Return to Active Play 1.5 Years into COVID-19

Parents were asked to describe which types of unstructured play and sport activities children *had* returned to ~1.5 years into the pandemic by answering *"which activities have you returned your child(ren) to at this moment in time (i.e., at this point during the pandemic in Ontario)".* Using a drop-down list (multiple choice), parents were prompted to select all activities that applied to each of their children. A total of 24 choices were available; options included structured organized sport (e.g., archery, dance, gymnastics, soccer, etc.), unstructured outdoor activities (e.g., play in neighbourhoods), 'other' (participants were prompted to specify via open an ended item), or 'not applicable'. The types of activities that children *had* returned to 1.5 years into the pandemic were grouped into two categories: sports (hockey, soccer, etc.) and unstructured play (play in the neighbourhood) for analysis. For analysis, the 'other' responses were grouped into one of the corresponding categories (i.e., sports, unstructured play) based on the interpretation and agreement of two researchers, and the 'not applicable' responses were removed.

2.4 Data Preparation and Analysis

Statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS; Version 27), the lme4 (Bates et al., 2015) and lmerTest (Kuznetsova et al., 2017) packages in R v. 4.1.3 (R Core Team, Vienna, Austria) using R studio v. 1.3 (RStudio Team, Boston, MA), and Mplus (v. 8.4; Muthén & Muthén, 2017). Descriptive statistics including means, standard deviations, and frequencies, were computed for all parent demographics and independent variables, parents' return to play (unstructured activity, sport) plans for their children, and attitudes. The dataset was checked for missing values and mechanism of missingness were explored using Little's Missing Completely at Random Test. This revealed that missing data was sparse (4.46%), and that missing data was completely at random (p = .063). Only participants that completed both surveys were included in this study to allow for a comparison across the two time points. Data were checked for extreme outliers, with outliers three standard deviations (SD) above the mean being truncated to reduce the impact of extreme outliers on analysis. As such, outliers (1 greenness; 2 street intersection density; 3 population density; 4 distance to nearest park; 6 park area; 5 number of parks; and 8 active living index) were truncated (i.e., replaced with value 3 SD away from the mean).

2.4.1 Exploratory Factor Analysis

An exploratory factor analysis (EFA) was conducted to group the 14 attitude items into subscales for analysis, to ensure reliability and validity of attitude measures. The EFA was completed using MPlus (Muthén & Muthén, 2017) to determine the clustering of attitude items into factors by examining geomin (oblique) rotated factor loadings of the model. An eigenvalue ≥1 was used to determine the number of factors. The original factor analysis of attitude items (n = 14) indicated a four-factor solution. However, in this analysis, two variables had a factor loading that was less than 0.3 for all factors ('*I feel willing to return my child to active play opportunities where they can follow physical distancing guidelines' and 'I feel worried that I will no longer be able to afford by child's extracurricular activities post pandemic').* Therefore, these items were removed, and the

final factor analysis was conducted on the 12 remaining items. After the removal of these two items, the factor analysis suggested a three-factor solution. As a result, three attitude subscales emerged: *safety-related* (2 items), *general return to active play* (4 items) and *active play at home* (6 items). See Table 2 for each of the items and their factor loadings from the EFA.

Table 2

Parental Attitude Items used in Subscales Developed through the Exploratory Factor Analysis

	Factor 1	**Factor 2**	**Factor 3**
	Safety	*General return to active play*	*Active play at home*
I feel that having my child at home with me makes me feel safe (2)	**.48**	.41	.01
I feel that having my child at home with me makes them feel safe (3)	**1.04**	.00	-.17
Even if my child can follow physical distancing guidelines, I am still hesitant to return them to active play programming (4)	-.01	**-.84**	-.04
I am confident that if I return my child to active play, my child will follow Ontario's public health guidelines (e.g., hand sanitizing) (5)	-.19	**.52**	-.01
I am looking forward to allowing my child to interact with others (6)	-.16	**.44**	-.03
I prefer to allow my child to interact with people via social networking sites and screen-based technology than in person (7)	-.03	**-.43**	.11
My child has missed out on health benefits of extracurricular activities due to the COVID-19 pandemic (8)	.06	.02	**-.46**
I have enough skills to support my child's active play at home (9)	.14	-.00	**.67**
I have access to what I need at home to support my child's active play (10)	.05	-.00	**.86**
I have the ability to support my child's physical activity/active play at home without engagement in extra-curricular activities (11)	-.02	.12	**.85**
I have enough access to resources (i.e., space, time, toys) that allow me to support my child's active play (12)	.01	.06	**.78**
I reserve time out of my day to support my child's active play (13)	.17	-.03	**.31**

2.4.2 Measurement of Invariance

Following the establishment of the attitude subscales, measurement of invariance was used to determine if attitude factors measured the same construct across both time points (i.e., 6 months, 1.5 years into the pandemic). Because the *safety*-related attitudes subscale only had two items that loaded onto it, it was removed from any further analysis, and only the attitudes toward *general return to active play* and *active play at home* subscales were analyzed. Three levels of measurement invariance were tested including configural (i.e., items load onto same factors across time), metric (i.e., factor loadings are equivalent in strength over time), and scalar (i.e., item intercepts are equivalent across time), with each level building upon the last to achieve stronger forms of invariance (Bialosiewicz et al., 2013). The following cut-off values were used to determine invariance: a change in the Comparative Fit Index (CFI) of ≤ -.01, a change in the root mean square error of approximation (RMSEA) of ≥ .015, and a change in standardized root mean square residual (SRMR) of ≥ .030 for configural and metric variance and ≥ .010 for scalar invariance (Chen, 2007). Results of the invariance tests can be found in Table 3. Configural and metric invariance were achieved. Strict scalar invariance was not achieved. However, because scalar invariance is often difficult to achieve (Bialosiewicz et al., 2013), partial scalar invariance was also assessed (i.e., at least half of the intercepts for each factor were invariant across time), and the model met the cut-off for this level of invariance. Thus, the model suggests partial scalar invariance meaning that the attitude factors hold across time points. As such, the two attitude subscales were used in analysis at both time points (*general return to active play, active play at home*).

Table 3

Measurement Invariance Results of the 3 Parental Attitude Factor Loadings

	CFI	**Δ CFI**	**SRMR**	**Δ SRMR**	**RMSEA (90% CI)**	**Δ RMSEA**
Configural invariance	0.933		0.060		0.054 (0.044-0.064)	
Metric invariance	0.931	-0.002	0.066	0.006	0.053 (0.04-0.063)	-0.001
Scalar invariance	0.895	-0.036	0.077	0.011	0.064 (0.055-0.073)	0.011
Partial scalar invariance	0.923	-0.008	0.068	0.002	0.055 (0.046-0.064)	0.002

Note. CFI = comparative fit index, Δ = change, SRMR = standardized root mean square residual, RMSEA = root mean square error of approximation.

2.4.3 Influence of SES and Urbanicity on Parents' Attitudes

2.4.3.1 Influence of SES and Urbanicity on Parents' Attitudes at 6 Months and 1.5 Years

Cross-sectional analyses were conducted to identify whether the seven urbanicity variables [Active living index, Greenness, Street intersection density, Population density, Distance to nearest park (m), Park area (10,000m^2), Number of parks (1000m)] and the four SES indicators (employment status, education, family situation [dual or single parent], total household income) influenced parents' *general return to active play* and *active play at home* attitudes at 6 months and 1.5 years. Items from each attitude subscale were added to create a single score for each subscale. Negatively worded items (e.g., *My child has missed out on health benefits of extracurricular activities due to the COVID-19 pandemic)* were reverse scored so higher scores indicate more favourable attitudes. Data were inspected prior to analysis to determine if outcomes were normally distributed (skewness < 1.5; Tabachnick et al., 2019). Pearson's correlation coefficient was used to determine the bivariate correlations between all continuous, normally distributed, parametric variables with attitudes subscales, and Spearman's Rank Coefficient was used for all continuous variables with non-normal, non-parametric distributions. One-way analysis of variance (ANOVAs) was used to compare means between categorical data sets (i.e., SES indicators) to identify the influence of these indicators on parents' attitudes toward *general return to active play* and *active play at home* at 6 months, respectively. Post-hoc analyses were completed to determine any between-group differences. All correlations and ANOVAs were repeated to explore these relationships at 1.5 years.

2.4.3.2 Influence of SES and Urbanicity on Parents' Attitudes over Time

Linear mixed effects models were estimated to explore changes in *general return to active play* and *active play at home* attitudes between 6 months and 1.5 years. The models were run with a random intercept to account for the repeated measures design. Additionally, interaction terms were entered to determine if changes in parents'

attitudes over time were influenced by SES indicators and urbanicity. To account for the limited power of interaction terms (Champoux & Peters, 1987), and like previous studies (D'Haese et al., 2016; Wang et al., 2017), moderation effects were considered significant if p <.10 (Twisk, 2006). For categorical moderators with more than two categories, *t*-scores were calculated to probe differences between individual groups.

2.4.4 Parents' Attitudes at 6 Months and the Active Play Opportunities Children Returned to 1.5 Years into COVID-19

The second objective of this study was to explore the relationship between parents' attitudes and the structured (sport) and unstructured play opportunities children returned to at 1.5 years into the pandemic. More specifically, objective 2 explored how attitudes at 6 months (i.e., the 2 subscales developed from the factor analysis) relate to the structured and unstructured activities that children *had* returned to 1.5 years into the pandemic; using SES and urbanicity indicators as moderators.

Multivariate logistic regression models were estimated to examine how attitudes at 6 months related to the activities that children returned to 1.5 years into the COVID-19 pandemic. Attitudes and all moderator variables (SES, urbanicity, attitudes) were entered as main effects into a single model. Then, interaction terms were entered individually to the main effects model to determine if any SES or urbanicity variables moderated the association between attitudes and children returning to sports or unstructured play. Separate models were estimated with return to sport and return to unstructured play as outcomes and with each subscale of the attitudes scale as an independent variable (i.e., 4 models in total). Before categorical variables were added to the model (e.g., employment, income), each variable was dummy coded (0 = reference group, 1 = comparison) with the largest category acting as the reference group. Again, statistical significance was set at $p < 0.10$ to account for lower power of interaction terms.

Chapter 3

3 Results

3.1 Descriptive Statistics

A total of 800 participants completed Survey 1, and 243 participants completed Survey 2. Of these participants, 239 participants had complete data and were included in analysis. Participants were, on average, 38.76 ± 5.72 years old, with the majority self-identifying as female (95.4%), Caucasian (87.0%), living in a detached home (78.2%), employed full-time (69.5%), and as a dual-parent household (85.3%). For complete participant demographics, refer to Table 4. The average *general return to active play* attitude score was 18.79 (*SD* = 3.71) at 6 months, and 20.63 (*SD* = 3.19) at 1.5 years. The average *active play at home* attitude score was 18.53 (*SD* = 5.38) at 6 months, and 17.91 (*SD* = 5.30) at 1.5 years.

Table 4

Participant Demographics (n = 239)

Demographic Factors	***M***	***SD***
Age	38.76	5.72
Number of children	1.76	0.78
	N	***%***
Community type		
Rural	53	22.2%
Suburban	104	43.5%
Urban	82	34.3%
Ethnicity		
Caucasian	208	87%
South Asian	9	3.8%
First Nations/Aboriginal	7	2.9%
Latin American	3	1.3%
East Asian	2	0.8%
Middle Eastern	1	0.4%
Other	6	2.5%
Prefer not to answer	3	1.3%
Employment		
Full-time	166	69.5%
Part-time/occasional	35	15.2%
Unemployed	29	12.6%
Prefer not to answer	9	3.8%
Education		
High school	17	7.1%
College	52	21.8%
Undergraduate	81	33.9%
Graduate school	89	37.2%
Housing type		
Apartment/condo	18	7.6%
Townhouse	12	5.4%
Semi detached	19	7.9%
Detached	187	78.2%
Other	2	0.8%
Income		
≤$59,999	35	14.6%
$60,000-$99,999	48	20.1%
$100,000-$139,999	66	27.6%
≥$140,000	75	31.4%
Prefer not to answer	15	6.3%
Parent Gender		
Female	228	95.4%
Male	10	4.2%
Transgender	1	0.4%

Family situation		
Single-parent	29	12.2%
Dual-parent	203	85.3%
Other	5	2.1%
Prefer not to answer	1	0.4%

Note. Column total may not always match the total number of participants due to skipped questions.

3.2 Influence of Urbanicity and SES on Parents' Attitudes Toward Their Children's Active Play Opportunities 6 Months into COVID-19

The first objective of this study was to explore the influence of SES on parents' attitudes toward their children's *general return to active play* and *active play in the home*. Results showed that active living index, street intersection density, population density, and number of parks were inversely correlated to parents' attitudes toward *general return to active play* at 6 months (Table 5). No significant correlations were noted regarding attitudes toward *active play at home* ($p > .05$). The correlations between urbanicity variables and parents' attitudes at 6 months are displayed in Table 5.

Differences in attitudes towards *active play at home* and *general attitudes towards active play* at 6 months are displayed in Table 6. Results of the one-way ANOVA indicated that parents employed full-time and parents with higher reported household incomes had more positive attitudes toward *general return to active play*. Further, significant differences in attitudes toward *general return to active play* were found between income categories (F [3] = 2.803). Post-hoc analysis revealed that participants with a household income $140,000 or greater reported significantly more positive attitudes toward *general return to active play* than participants with household incomes of $59,000 or less (MD = 1.550, $p = .042$) and those with household incomes between $60,000 and $99,000 (MD = 1.824, $p = .009$).

Table 5

Correlations Between Urbanicity Variables and Parents' Attitudes Toward General Return to Active Play and Active Play at Home at 6 months and 1.5 years into COVID-19

	6 Months		1.5 Years	
Urbanicity Variable	***General return to active play***	***Active play at home***	***General return to active play***	***Active play at home***
Active living index	-.178**	-.021	-.194**	.009
Greenness	.109	.053	.105	.011
Street intersection density	-.148*	.025	-.155*	.072
Population density	-.153*	-.009	-.190**	.54
Distance to nearest park (m)	-.049	-.085	.026	.115
Park area (10,000m^2)	-.112	.091	-.173*	.064
# of parks (1000m)	-.154*	.05	-.132	.03
# of children	-.012	.003	.016	.011

Note. *p <.05, **p <.01

Table 6

Relationship Between SES Indicator Variables and Parents' Attitudes Toward General Return to Active Play and Active Play at Home at 6 months and 1.5 years into COVID-19

	6 Months				1.5 Years			
Variable	***General return to active play M (SD)***	***p***	***Active play at home M (SD)***	***p***	***General return to active play M (SD)***	***p***	***Active play at home M (SD)***	***p***
Employment status		**.012**		.077		.166		.195
Full-time (*n* = 166)	19.21 (3.57)		18.10 (5.55)		20.74 (3.05)		17.78 (5.24)	
Parttime/occasional	18.03 (3.46)		20.31 (4.37)		20.97 (3.02)		19.31 (4.87)	
(*n* = 35)	17.21 (4.46)		18.93 (4.92)		19.54 (3.92)		16.81 (5.86)	
Unemployed (*n* = 29)								
Education		.168		.376		.079		.151
High school (*n* = 17)	20.29 (3.98)		17.29 (5.41)		21.69 (3.11)		16.31 (6.27)	
College (*n*= 52)	17.94 (3.67)		17.86 (5.46)		20.04 (3.18)		16.66 (4.90)	
University (*n*= 81)	18.74 (4.19)		18.48 (5.00)		21.17 (3.29)		18.30 (5.59)	
Graduate school (*n*=	18.94 (3.10)		19.22 (5.65)		20.24 (3.03)		18.45 (4.99)	
89)								
Family situation		.508		.192		.239		.063
Dual-parent (*n* = 203)	18.70 (3.70)		18.72 (5.49)		20.71 (3.09)		18.11 (5.27)	
Single-parent/other (*n*	19.15 (3.83)		17.39 (4.67)		19.97 (3.76)		16.17 (5.46)	
=34)								
Total household income		**.041**		.504		.756		.207
≤$59,999 (*n* = 35)	18.14 (3.90)		18.15 (4.66)		20.21 (3.96)		15.70 (5.06)	
$60,000-$99,999 (*n* =	17.87 (3.91)		18.54 (5.59)		20.39 (2.94)		18.21 (5.78)	
48)	18.83 (3.80)		17.91 (5.69)		20.73 (3.05)		17.80 (5.39)	
$100,000-$139,999 (*n*	19.69 (3.35)		19.27 (5.55)		20.91 (3.20)		18.10 (5.06)	
= 66)								
≥$140,000 (*n* = 75)								

Note. M = mean; *SD* = standard deviation; SES = socioeconomic status; $p < .05$

3.3 Influence of Urbanicity and SES on Parents' Attitudes Toward Their Children's Active Play Opportunities 1.5 Years into COVID-19

The correlations between urbanicity variables and parents' attitudes at 1.5 years into the COVID-19 pandemic are displayed in Table 5. Results showed that active living index, street intersection density, population density, and park area were inversely correlated to parents' attitudes toward *general return to active play* (Table 5). Like 6 months, no significant correlations were found between urbanity variables and attitudes toward *active play at home* at 1.5 years ($p > .05$). Additionally, no significant results were found for the one-way ANOVA comparing SES indicators and attitudes toward *general return to active play* or *active play at home* at 1.5 years (Table 6).

3.4 Influence of Urbanicity and SES on Parents' Attitudes Toward Their Children's Active Play Opportunities over Time

Results from the linear mixed effects models are displayed in Tables 7 and 8. Parents' attitudes toward *general return to active play* increased over time (MD = 1.758 [1.322, 2.194], $p < .001$); however, there was no significant change in attitudes toward *active play at home* (MD = -0.524 [-1.115, 0.068], $p = .84$). Changes in attitudes towards active play at home were moderated by park area. Parents that lived in areas with greater park area had a significantly larger decrease in attitudes towards active play at home over time ($p = .055$). No other variables significantly moderated changes in attitudes toward *active play at home* over time. However, of note, parents who were unemployed (MD = -1.90, $p = .028$), and from the lowest income households (MD = - 1.73, $p = .037$), had significant decreases in attitudes toward *active play at home* over time.

For attitudes toward *general return to active play*, employment status significantly moderated changes in attitudes toward *general return to play* ($p = .098$). Parents that were employed full-time had significantly smaller increases in attitudes toward *general return to active play* over time compared to parents who were employed part-time (MD = 1.37, $p = .043$). Additionally, family situation significantly moderated changes in attitudes toward general return to active play. Parents from dual-parent households had

significantly greater increases in attitudes toward *general return to active play* compared to parents from single-parent households over time (MD = 1.21, p = .061). No other SES or urbanicity indicators moderated changes in attitudes toward *general return to active play* over time.

Table 7

Moderating Effect of Urbanicity Variables on Changes in Parents' Attitudes Toward General Return to Active Play and Active Play at Home Between 6 Months and 1.5 Years into COVID-19

	General return to active play			***Active play at home***		
Moderator	**Moderation effect**	**95% CI**	***p***	**Moderation effect**	**95% CI**	***p***
Active living index	0.049	-0.300, 0.399	.783	0.203	-0.278, 0.682	.409
Greenness	-1.238	-5.973, 3.509	.609	-3.056	-9.463, 3.363	.351
Street intersection density	0.000	-0.003, 0.003	.904	0.003	-0.001, 0.008	.185
Population density (1000s)	0.008	-0.302, 0.317	.962	0.151	-0.280, 0.581	.493
Distance to nearest park (km)	-0.021	-0.104, 0.062	.619	0.039	-0.073, 0.151	.495
Park area (10,000m^2)	-0.007	-0.029, 0.015	.540	-0.029	-0.059, 0.000	**.055**
# of parks (1000m)	0.049	-0.083, 0.181	.464	-0.013	-0.0196, 0.170	.890
# of children	0.100	-0.457, 0.656	.724	-0.190	-0.946, 0.567	.623

Note. CI = confidence interval; $p < .10$

Table 8

Moderating Effect of SES Indicators on Changes in Parents' Attitudes Toward General Return to Active Play and Active Play at Home Between 6 Months and 1.5 Years into COVID-19

General return to active play					***Active play at home***				
Moderator	**Effect**	**95% CI**	***p***	**Moderation effect**	**Moderator**	**Effect**	**95% CI**	***p***	**Moderation effect**
Employment status				**.098**	Employment status				.235
Full time (n = 159)[a]	1.480	0.963, 1.997	**<.001**		Full-time (n = 159)[a]	-0.307	-1.011, 0.397	.392	
Part-time/occasional (n = 30)[a]	2.850	1.688, 4.012	**<.001**		Part-time/occasional (n=30)	-0.584	-2.199, 1.031	.479	
Unemployed (n = 27)	2.050	0.796, 3.304	**.002**		Unemployed (n = 27)[a]	-1.901	-3.591, 0.211	**.028**	
Education				.164	Education				.787
High School (n = 16)	1.380	-0.221, 2.981	.091		High school (n = 16)	-0.794	-2.999, 1.411	.481	
College (n = 47)	1.910	0.965, 2.855	**<.001**		College (n = 47)	-0.883	-2.177, 0.411	.182	
University (n = 76)[b]	2.350	1.611, 3.089	**<.001**		University (n = 76)	-0.122	-1.139, 0.895	.815	
Graduate School (n = 82)[b]	1.190	0.475, 1.905	.001		Graduate school (n = 82)	-0.688	-1.666, 0.290	.17	
Family Situation				**.061**	Family situation				.816
Dual-parent (n = 201)[c]	1.904	1.432, 2.376	**<.001**		Dual-parent (n = 201)	-0.529	-1.174, 0.116	.109	
Single parent/other (n =34)[c]	0.699	-0.465, 1.863	.241		Single-parent/other (n =34)	-0.737	-2.236, 0.889	.375	
Total Household Income					Total household income				.273
≤$59,000 (n = 35)	1.910	0.720, 3.100	**.002**	.317	≤$59,999 (n = 35)	-1.734	-3.351, -0.117	**.037**	

$60,000-$99,000 (n = 48)[d]	2.280	1.302, 3.258	**<.001**	$60,000-$99,999 (n = 48)	-0.107	-1.367, 1.153	.868
$100,000-$139,000 (n = 65)	1.860	1.049, 2.671	**<.001**	$100,000-$139,999 (n = 65)	-0.187	-1.243, 0.869	.729
≥$140,000 (n = 75)[d]	1.150	0.382, 1.918	**.004**	≥$140,000 (n = 75)	-1.092	-2.088, -0.096	**.033**

Note. SES = socioeconomic status, CI = confidence interval.

[a,b,c] reflects significant difference at $p < .10$

3.5 Objective 2

3.5.1 Parents' Attitudes at 6 Months and the Organized Sport Children Returned to 1.5 Years into COVID-19

The secondary objective of this study was to explore whether urbanicity and SES factors moderated the association between parents' attitudes at 6 months and children returning to structured (organized sport) opportunities at 1.5 years. There was a significant positive association between attitudes toward *general return to active play* at 6 months and returning to organized sport at 1.5 years (OR = 1.328 [1.143, 1.543], *p* <.001; Table 9). There was also a significant positive association between dual-parent households and returning children to organized sport at 1.5 years (OR = 0.219 [0.065, 0.739]. *p* = .014). Only the interaction between unemployment and attitudes toward *general return to active play* was significant at *p* < .10. Post-hoc analysis showed that attitudes toward *general return to active play* at 6 months was significantly associated with returning to organized sport at 1.5 years in parents that were employed full time (OR = 1.421 [1.205, 1.677], *p* < .001), but not parents who were unemployed (OR = 1.043 [0.841, 1.294], *p* = .700).

Parents' attitudes toward *active play at home* were not related to returning their children to organized sport (OR = 1.034 [0.949, 1.127]. *p* = .440; Table 10). Only the interaction between single-parent households and attitudes toward *active play at home* was significant at *p* < .10. Post-hoc analysis revealed that attitudes towards a*ctive play at home* at 6 months was significantly associated with returning to organized sport at 1.5 years in dual-parents (OR = 1.095 [1.007, 1.190], *p* = .034), but not single-parent households (OR = 0.926 [0.800, 1.072], *p* = .303). Refer to Table 9 and 10 for complete results from the association between parents' attitudes and the organized sport children returned to 1 year later.

Table 9

Parents' General Return to Active Play Attitudes at 6 Months on Children's Return to Organized Sport Participation at 1.5 Years, Effects of Socioeconomic Status and Urbanicity Variables

	OR	95% CI	*p*
Main effects			
General Return to Active Play Time 1	1.328	1.143, 1.543	**<.001**
Employment			
Full-time (ref)			
Part-time/occasional	1.784	0.457, 6.967	.405
Unemployed	1.624	0.362, 7.284	.527
Family situation			
Dual-parent (ref)			
Single-parent/other	0.219	0.065, 0.736	**.014**
Income			
≤$59,999	0.428	0.091, 2.018	.284
$60,000-$99,999	0.359	0.092, 1.396	.139
$100,000-$139,999	3.922	0.801, 19.214	.092
≥$140,000 (ref)			
Education			
High school	0.201	0.029, 1.396	0.105
College	0.516	0.120, 2.213	0.373
University	0.806	0.216, 3.013	0.748
Graduate school (ref)			
Active living index	1.334	0.478, 3.724	.582
Greenness	1.006	0.946, 1.070	.851
Street intersection density	1.001	0.994, 1.009	.697
Population density	0.840	0.431, 1.638	.609
Distance to nearest park (m)	1.039	0.905, 1.192	.587
Park area (10,000m^2)	0.981	0.954, 1.010	.191
# of parks (1000m)	1.013	0.817, 1.257	.906
Moderating effects			
Employment			
Attitudes * Part-time/occasional	0.848	0.555,1.297	.448
Attitudes * Unemployed	0.677	0.483, 0.948	**.023**
Family situation			
Attitudes * Single-parent	1.318	0.880, 1.974	.180
Income			
Attitudes * ≤$59,999	1.050	0.705, 1.564	.810
Attitudes * $60,000-$99,999	0.908	0.627, 1.316	.610
Attitudes * $100,000-$139,999	1.011	0.637, 1.606	.962
Education			
Attitudes * High school	3.527	0.302, 41.254	.315
Attitudes * College	0.938	0.621, 1.415	.759
Attitudes * University	0.872	0.607, 1.253	. 460
Attitudes * Active living index	0.955	0.845, 1.079	.458

Attitudes * Greenness	1.626	0.322, 8.214	.556
Attitudes * Street intersection density	1.000	0.998, 1.001	.618
Attitudes * Population density	0.996	0.889, 1.117	.947
Attitudes * Distance to nearest park	1.006	0.939, 1.078	.862
Attitudes * Park area (10,000m^2)	0.999	0.992, 1.005	.673
Attitudes * # of parks (1000m)	1.001	0.960, 1.044	.968

Note. OR = odds ratio, CI = confidence interval, p = < .10 (moderating effects)

Table 10

Parents' Active Play at Home Attitudes at 6 Months on Children's Return to Organized Sport Participation at 1.5 Years, Effects of Socioeconomic Status and Urbanicity Variables

	OR	95% CI	*p*
Main effects			
Play at Home Time 1	1.034	0.949, 1.127	.440
Employment			
Full-time (ref)			
Part-time/occasional	1.323	0.372, 4.707	.665
Unemployed	1.040	0.254, 4.254	.956
Family situation			
Dual-parent (ref)			
Single-parent/other	0.318	0.103, 0.984	**.047**
Income			
≤$59,999	0.339	0.078, 1.472	.149
$60,000-$99,999	0.326	0.093, 1.139	.790
$100,000-$139,999	2.823	0.612, 13.029	.183
≥$140,000 (ref)			
Education			
High school	0.555	0.083, 3.712	.544
College	0.50	0.137, 2.204	.398
University	0.684	0.202, 2.319	.542
Graduate school (ref)			
Active living index	0.888	0.380, 2.075	.784
Greenness	1.017	0.958, 1.080	.587
Street intersection density	1.002	0.996, 1.009	.477
Population density	1.131	0.599, 2.134	.705
Distance to nearest park (m)	1.050	0.922, 1.196	.459
Park area (10,000m^2)	0.989	0.964, 1.015	.417
# of parks (1000m)	0.977	0.804, 1.188	.818
Moderating effects			
Employment			
Attitudes * Part-time/occasional	1.117	0.854, 1.461	.419
Attitudes * unemployed	0.988	0.782, 1.247	.917
Family Situation			
Attitudes * Single-parent	0.821	0.672, 1.003	**.053**
Income			
Attitudes * ≤$59,999	1.113	0.849, 1.460	.438
Attitudes * $60,000-$99,999	1.116	0.899, 1.386	.319
Attitudes * $100,000-$139,999	0.933	0.703, 1.238	.629
Education			
Attitudes * High school	1.351	0.899, 2.032	.148
Attitudes * College	1.130	0.898, 1.422	.296
Attitudes * University	1.019	0.827, 1.255	.863
Attitudes * Active living index	0.962	0.896, 1.032	.281
Attitudes * Greenness	1.003	0.994, 1.012	.474

Attitudes * Street intersection density	1.000	0.999. 1.000	.560
Attitudes * Population density	0.990	0.932, 1.050	.729
Attitudes * Distance to nearest park	0.947	0.866, 1.036	.236
Attitudes * Park area (10,000m^2)	0.999	0.994, 1.003	.494
Attitudes * # of parks (1000m)	1.019	0.990, 1.049	.206

Note. OR = odds ratio, CI = confidence interval, p = < .10 (moderating effects)

3.5.2 Parents' Attitudes at 6 Months and the Unstructured Play Children Returned to 1.5 Years into COVID-19

The secondary objective of this study also explored how urbanicity and SES factors moderated the association between parents' attitudes at 6 months and the unstructured play children returned to at 1.5 years. The main effects model showed that parents' attitudes toward *general return to active play* (Table 11) and *active play at home* (Table 12) were not related to returning their children to unstructured play. No significant interactions with parents' attitude toward *general return to active play* were found (Table 11); however, the interaction between single-parent households and attitudes toward *active play at home*, and between street population density and attitudes toward *active play at home* were significant ($p < .10$; Table 12). Post-hoc analysis showed that attitudes toward *active play at home* at 6 months were negatively associated to unstructured play at 1.5 years in dual-parents (OR = 0.931 [0.874, 0.992], $p = .027$) but not in single-parents (OR = 1.047, [0.895, 1.224], $p = .568$). Additionally, there was a negative association between attitudes toward *active play at home* at 6 months and unstructured play at 1.5 years in parents that lived in areas with a street intersection density above the sample median (OR = 0.891 [0.804, 0.988], $p = .028$), but not parents living in areas with street intersection density below the sample median (OR = 0.967, [0.899, 1.040], $p = .369$). Refer to Tables 11 and 12 for complete results from the association between parents' attitudes and the unstructured play children returned to 1 year later.

Table 11

Parents' General Return to Active Attitudes at 6 Months on Children's Return to Unstructured Play at 1.5 Years, Effects of Socioeconomic Status and Urbanicity Variables

	OR	95% CI	*p*
Main effects			
General Return to Active Play Time 1	0.954	0.862, 1.056	.366
Employment			
Full-time (ref)			
Part-time/occasional	0.650	0.244, 1.732	.389
Unemployed	0.809	0.234, 2.799	.738
Family situation			
Dual-parent (ref)			
Single-parent/other	0.808	0.291, 2.246	.682
Income			
≤$$59,999	0.666	0.198, 2.234	.510
$60,000-$99,999	1.506	0.524, 4.330	.447
$100,000-$139,999	2.231	0.856, 5.811	.101
≥$140,000 (ref)			
Education			
High school	2.948	0.436, 19.949	.268
College	0.900	0.289, 2.808	.857
University	1.046	0.428, 2.560	.921
Graduate school (ref)			
Active living index	0.892	0.457, 1.742	.783
Greenness	1.030	0.983, 1.079	.209
Street intersection density	1.000	0.995, 1.005	.938
Population density	1.077	0.645, 1.796	.777
Distance to nearest park (m)	0.995	0.914, 1.083	.904
Park area (10,000m^2)	1.002	0.978, 1.026	.875
# of parks (1000m)	1.130	0.937, 1.362	.199
Moderating effects			
Employment			
Attitudes * part-time/occasional	1.192	0.908, 1.565	.205
Attitudes * unemployed	1.174	0.889, 1.549	.258
Family situation			
Attitudes * Single-parent	0.937	0.710, 1.236	.645
Income			
Attitudes * ≤$$59,999	1.094	0.821, 1.459	.539
Attitudes * $60,000-$99,999	1.219	0.907, 1.601	.156
Attitudes * $100,000-$139,999	1.133	0.868, 1.478	.360
Education			
Attitudes * High school	0.640	0.260, 1.577	.332
Attitudes * College	1.054	0.791, 1.403	.721
Attitudes * University	1.006	0.797, 1.271	.959
Attitudes * Active living index	0.924	0.840, 1.016	.102

Attitudes * Greenness	1.008	0.996, 1.019	.189
Attitudes * Street intersection density	1.000	0.999, 1.001	.809
Attitudes * Population density	0.977	0.894, 1.068	.258
Attitudes * Distance to nearest park	1.023	0.975, 1.074	.355
Attitudes * Park area (10,000m^2)	0.997	0.991, 1.003	.266
Attitudes * # of parks (1000m)	0.970	0.930, 1.010	.143

Note. OR = odds ratio, CI = confidence interval, p = < .10 (moderating effects)

Table 12

Parents' Active Play at Home Attitudes at 6 Months on Children's Return to Unstructured Play at 1.5 Years, Effects of Socioeconomic Status and Urbanicity Variables

	OR	95% CI	*p*
Main effects			
Play at home Time 1	0.949	0.887, 1.016	.130
Employment			
Full-time (ref)			
Part-time/occasional	0.877	0.325, 2.368	.769
Unemployed	1.078	0.313, 3.715	.906
Family situation			
Dual-parent (ref)			
Single-parent/other	0.793	0.278, 2.263	.664
Income			
≤$$59,999	0.577	0.167, 1.992	.385
$60,000-$99,999	1.340	0.496, 3.829	.585
$100,000-$139,999	2.225	0.848, 5.838	.104
≥$140,000 (ref)			
Education			
High school	2.373	0.351, 16.047	.376
College	0.716	0.232, 2.211	.562
University	0.983	0.398, 2.429	.971
Graduate school (ref)			
Active living index	0.876	0.446, 1.720	.701
Greenness	1.032	0.985, 1.080	.188
Street intersection density	1.000	0.995, 1.005	.960
Population density	1.072	0.643, 1.785	.791
Distance to nearest park (m)	0.989	0.908, 1.077	.799
Park area (10,000m^2)	1.002	0.978, 1.027	.859
# of parks (1000m)	1.151	0.955, 1.387	.140
Moderating effects			
Employment			
Attitudes * part-time/occasional	0.953	0.772, 1.175	.650
Attitudes * unemployed	0.883	0.699, 1.115	.295
Family situation			
Attitudes * Single-parent	1.262	1.006, 1.582	**.044**
Income			
Attitudes * ≤$$59,999	1.093	0.869, 1.377	.447
Attitudes * $60,000-$99,999	0.925	0.772, 1.110	.403
Attitudes * $100,000-$139,999	0.998	0.844, 1.181	.984
Education			
Attitudes * High school	1.411	0.843, 2.363	.191
Attitudes * College	0.978	0.826, 1.158	.797
Attitudes * University	0.970	0.825, 1.141	.717
Attitudes * Active living index	0.962	0.903, 1.025	.229
Attitudes * Greenness	1.003	0.996, 1.010	.400

Attitudes * Street intersection density	0.999	0.999, 1.000	**.076**
Attitudes * Population density	0.959	0.904, 1.017	.160
Attitudes * Distance to nearest park	1.011	0.988, 1.034	.359
Attitudes * Park area (10,000m^2)	1.004	0.999, 1.008	.109
Attitudes * # of parks (1000m)	1.016	0.989, 1.045	.250

Note. OR = odds ratio, CI = confidence interval, p = < .10 (moderating effects)

Chapter 4

4 Discussion

The purpose of this study was to explore the influence of SES and urbanicity on parents' attitudes toward their children's active play (unstructured play, sport) opportunities 6 months and 1.5 years into the COVID-19 pandemic, and to examine changes across time. Additionally, this study explored the relationship between parents' attitudes at 6 months and the structured (organized sport) and unstructured activities that children returned to 1.5 years into the COVID-19 pandemic, examining whether SES and urbanicity were moderators. This study highlights several social-ecological factors influencing parents' attitudes and their children's return to play during the COVID-19 pandemic, as well as recommendations to reduce inequities that stem from SES and urbanicity toward children's active play. Multiple findings are discussed below.

Cross-sectional analyses were used to identify SES and urbanicity influences on parents' general return to play and active play at home attitudes at two specific time points (i.e., 6 months, 1.5 years). Several SES indicators significantly influenced parents' attitudes. Notably, results showed that full-time employed parents and parents with higher-than-average household income felt less hesitant toward their children's general return to active play 6 months into the pandemic, compared to parents that were unemployed or employed part-time, and parents in the lowest income bracket, respectfully. This is not surprising, as a body of research supports that parental income and employment status are often related to children's engagement in physical activity (CFLRI, 2019; Love et al., 2019; Stearns et al., 2016), meaning that full-time employment and higher income may have enabled parents to feel better able to support their children's return to play in this study.

As evidenced by a systematic review by Khanijahani and colleagues (2021), SES indicators such as income and employment have also been associated with additional barriers during the pandemic such as poorer housing conditions (e.g., inability to

isolate/work from home, difficulty physical distancing), increased exposure to, and worse health outcomes from, COVID-19, and additional hardships such as risk of unemployment and financial worry. Further, Fleming et al. (2023) found that parents who reported they were unable to work during the COVID-19 pandemic experienced additional 'health' related barriers (e.g., fear of their children getting sick if they resumed sport) compared to parents that were employed full-time. This might explain why, in the present study, unemployment was associated with parents' increased hesitancy to return their children to active play at 6 months. It is possible that parents in such circumstances felt less able to prioritize their children's active play because of their employment situation. In fact, individuals with lower income frequently reported to work front-line jobs outside of the home, often with extended hours (Blau et al., 2021). Conversely, many parents with higher income reported working from home during earlier stages of the pandemic, with stable access to internet, food, and comfortable living conditions (Wanberg et al., 2020), better enabling them to support their children's active play. As such, it is possible that parents in this study with lower household income and those who were unemployed felt less positively about returning their children to play because of increased financial worry or job-related strain.

Interestingly, there were no significant correlations between SES indicators and parents' attitudes (generally, or at home) at 1.5 years. This finding was unexpected, as SES inequities have continued to be exacerbated by the pandemic (Khanijahani et al., 2021), up to 3 years later. It is possible that the perceived threat of the virus was lower 1 year later, or that many parents had returned to in-person work, and that this influenced parents' attitudes surrounding return to play. While more research exploring SES inequities and active play opportunities throughout the pandemic is needed, it is apparent that the COVID-19 pandemic has shed light on pre-existing SES inequities to children's active play, serving as a call to action for governments to create support for parents of low income and unemployment.

With regard to urbanicity, parents living in areas with higher active living index scores (i.e., increased walkability and active transportation), greater street intersection density, population density, and more parks nearby, had less favourable attitudes toward their children's return to active play 6 months into the pandemic; however, no differences were noted in their attitudes toward supporting active play at home (i.e., reported via the play at home attitude subscale). Similar results transpired 1 year later (captured via the follow-up survey; 1.5 years into COVID-19), as parents living in areas with a higher active living index, greater street intersection density, population density, and park area had less positive attitudes toward their children's general return to active play. These findings suggest that parents from areas with features more typical of the urban environment were more hesitant to return their children to active play (unstructured activities, sport, with friends, etc.) outside of the home at both time points. To expand, large metropolitan areas (e.g., cities) are often considered physical activity-promoting communities as they typically have greater walkability (Shahid & Bertazzon, 2015), and active transportation resources including bike infrastructure (Rothman et al., 2021), multi-use paths (Mitchell et al., 2016), sidewalks (Rothman et al., 2021), and parks nearby (Mitra et al., 2020), but also consist of high-density neighbourhoods and street networks (Sandalack et al., 2013). Much of the pre-pandemic research supports the association between features of the built environment, such as street connectivity, walkability, and higher population density, and increased physical activity in the form of active transportation (Kärmeniemi et al., 2018).

In Ontario, Canada, following the onset of the pandemic, many urban communities experienced challenges with overcrowding and physical distancing, facing higher COVID-19 infection and death rates than low-dwelling communities (Mitra et al., 2020; Public Health Ontario, 2022b). For instance, densely populated areas such as the Greater Toronto Area (GTA) faced consistently higher case-counts and institutional outbreaks and struggled with new variants of COVID-19 that emerged in the fall and winter of 2021, including Delta and Omicron, resulting in many public health protections being reinstated (Government of Ontario, 2022a; Public Health Ontario, 2022a). As such, with

the risk of virus transmission higher in these areas (Xia et al., 2022), it is likely that parents felt increased fear and/or anxiety regarding themselves and their family's overall wellbeing. This might explain why parents from densely populated communities in the present study were more hesitant toward their children's general return to play at 6 months and 1.5 years into the pandemic, as postal code data revealed that many participants reside in the GTA. This is in line with findings from a study in the United States reporting that from May 2020 to September 2021, parents (*n* = 6,183) living in urban neighbourhoods experienced significantly greater levels of health (i.e., child getting sick) and practical (i.e., time, cost, location of sport) concerns regarding returning their children to sport than parents residing in suburban or rural areas (Fleming et al., 2023). As such, it is likely that parents' attitudes toward their children's general return to active play at 6 months and 1.5 years into the pandemic had a profound impact on what play behaviours children returned to in urban areas.

The number of parks located near study participants was also associated with less positive (i.e., increased hesitancy) parental attitudes to return their children to active play at 6 months. Similarly, park area was associated with increased general return to play hesitancy at 1.5 years. These findings are interesting, as researchers have noted the importance of access to parks and recreational facilities in high-density areas as an important facilitator to physical activity before (Mitchell et al., 2016) and during the pandemic (Gu et al., 2022). Interestingly, Mitra and colleagues (2020) similarly concluded that access to parks (derived from Digital Mapping Technologies Inc. dataset) within a 1-kilometre radius of participants was unexpectedly associated with decreased outdoor activity among children aged 5 to 11, but not amongst youth aged 11-17 years, in April 2020. A possible explanation for this finding is the notion that parents' perspectives of the built environment may be more important than features of the built environment themselves (Cleland et al., 2010; Faulkner et al., 2015). For example, a systematic review found that certain park characteristics (e.g., amenities, sport facilities, clean, safety, paths) are often prioritized by parents of children aged 8-12 years over proximity to parks (Padial-Ruz et al., 2021). This may imply that parents in the present

study did not have adequate access to high quality parks despite proximity/park area nearby. Particularly during the uncertainty of the COVID-19 pandemic, and the closures to many features of the built environment (e.g., parks, playground) that came about (Nielson, 2021), it is also possible that parents may have felt concerned about their children's safety, as well as the overall safety of their family and community, while awaiting vaccination and additional information about the virus. This is supported by researchers from Calgary, Canada who found that parents (*n* = 328) with higher reported COVID-19-related anxiety were less likely to visit parks with their children in the first 3 months of the pandemic (April-May 2020), than parents with lower reported COVID-19-related anxiety (McCormack et al., 2020).

Longitudinal analyses explored the influences of SES and urbanicity across time to gather a greater understanding of how parents' attitudes shifted as the pandemic has progressed. Not surprisingly, parent's attitudes toward their children's general return to active play significantly increased over time. This is likely due to the novelty of the pandemic wearing off after the initial months (i.e., perceived threat; Trogen & Caplan, 2021), vaccinations becoming available for parents (Government of Canada, 2020b), and increased symptoms of COVID-19 fatigue/burnout (Kerr et al., 2021). Paired with the opening of many sports facilities, community centres, and parks (Nielson, 2021), it is possible that parents felt more capable about returning their children to active play, regardless of the true threat of the virus. Furthermore, many parents began to consider the long-term implications of physical distancing and lack of social interaction over the fear of the virus, as many reported their children experienced psychological concerns such as increased clinginess and dependence on parents (MacDonald & Hill, 2022). Additionally, research during the pandemic has emphasized the role of sport and play on children's mental wellbeing; a study in Canada found that during the COVID-19 pandemic (May 2020), access to outdoor play spaces and quality indoor spaces were significantly associated with improved wellbeing (Mitra et al., 2021). Therefore, it is possible that parents in the present study became increasingly worried about their children's physical and mental health following the prolonged lack of in-person social

interactions due to the pandemic, while facing their own burnout toward technology and home-schooling their children, contributing to an overall desire to return their children to active play.

Interestingly, there were significantly greater increases in parents' attitudes toward their children's general return to active play over time reported by parents that were part-time employed compared to parents that were full-time employed. This finding is somewhat surprising given the high cost of organized sport in Ontario, Canada (Cairney et al., 2015). However, this might be attributed to additional time to support children's return to active play among parents who reported part-time employment, considering that other researchers have noted parent work schedules as a prominent barrier to promoting children's activity during the initial stages of the pandemic (i.e., spring 2020; Eyler et al., 2021). Parents who worked part-time may have also had external support (e.g., emotional, financial, etc.) from a partner regarding their children's return to play. To expand, parents in dual-parent households in this study had significantly more positive attitudes toward their children's general return to play over time than parents in single-parent households. It is likely that parents in dual-parent households were better equipped to support the increased demands that parents faced during the pandemic as they navigated their children's online learning, split parental duties, and balanced their own responsibilities (Eyler et al., 2021). Changes in attitudes towards general return to active play were not moderated by any urbanicity factors.

While parents' general attitudes to return their children to active play increased over time, parents' attitudes toward active play at home decreased slightly (although this change was not significant). This slight decrease might be a result of parents prioritizing the return to in-person programming over activity in the home, which is consistent with other researchers who found that the home environment became less supportive to physical activity as the pandemic progressed whereby parents placed less importance on prioritizing play at home (Sheldrick et al., 2022). Results from the moderation analysis showed that parents living in neighbourhoods with greater park area reported

significantly greater reductions in attitudes towards active play at home over time. This might be a result of parents in these communities placing less value on physical activity inside the home as they were better able to utilize access to the outdoors, and more specifically, lived in environments with larger outdoor facilities such as trails or provincial/national parks nearby (i.e., features more typical of rural environments) to facilitate this. This is consistent with a recent qualitative study in which parents from rural and urban areas were interviewed, with results showing that parents in rural areas more frequently reported natural features (e.g., open fields, woods) that allowed for a greater range of types of active play compared to parents from urban and suburban environments that reported their children played closer to their immediate neighbourhood (e.g., in cul-de-sacs, alleys, sidewalks; Eyler et al., 2021). Undoubtedly, parents from different urbanicities have been impacted disproportionally during the COVID-19 pandemic. To this end, future urban planning initiatives should include parents in the design of parks (Padial-Ruz et al., 2021), and prioritize natural features, when possible, to ensure parks are meeting the needs of families and supporting children's physical activity.

A secondary objective of this thesis was to explore how parents' attitudes at 6 months relate to the structured (organized sport) opportunities that children returned to 1.5 years into the pandemic, and whether this relationship was moderated by SES and urbanicity. Parents with more positive attitudes toward general return to active play at 6 months were more likely to return their children to organized sport 1 year later. This is not surprising, as it is likely that parents who initially reported more positive attitudes regarding their children's return to play placed greater value on such experiences and may have been more risk tolerant toward re-engaging their children in activity during the pandemic (Brussoni et al., 2021; Jelleyman et al., 2019). This finding reiterates the importance of parental engagement in children's organized sport participation, as parents act as a child's key decision maker; without parental support, children are unlikely to engage in sport (Trost & Loprinzi, 2011). Regarding SES indicators, results revealed that attitudes toward general return to active play (at 6 months) were less

positively associated with returning to organized sport (at 1.5 years) among parents who were unemployed, compared to parents who were employed full-time. This finding furthers our understanding regarding the results of the cross-sectional analysis at 6 months, confirming not only that parents who were unemployed were more hesitant to return their children to play 6 months into the pandemic, but that this also resulted in their children being less likely to return to organized sport 1 year later. A possible explanation for this finding, as highlighted by others (Jumpstart, 2022; Ostermeier et al., 2022) is that the cost of sport has been noted as a prominent barrier by parents during the pandemic. This suggests that parents that were unemployed may have increased financial and/or logistical barriers towards enrolling their children in sport.

Unlike attitudes towards general return to active play, attitudes towards active play at home at 6 months were not related with children's participation in organized sport 1 year later in the main effects model. However, there were some significant moderation effects, which showed that the association differed based on SES factors. Specifically, there was a positive relationship between attitudes toward active play at home at 6 months and return to organized sport 1 year later in dual-parent households, but not single-parent households. It is possible that this association is a result of dual-parent households having the resources at home to support their children's active play at 6 months, but also felt it was important to return their children to play when safe and were more capable to do so because of these resources (e.g., financial, equipment, time). Alternatively, many single-parents faced increasing demands during the pandemic such as essential work (Blau et al., 2021; Khanijahani et al., 2021), and as such, may have been less able to support play at home, and to return their children to sport as a result of logistical barriers. Post et al. (2022) similarly concluded that married parents were more likely to report that their children were likely to return to sport in the next year than non-married parents. These results emphasize the importance of creating adequate supports for parents from various SES indicators to ensure children do not miss out on the important health benefits of physical activity (Tremblay et al., 2016).

Interestingly, results from the logistic regression models indicated that no urbanicity factors moderated the relationship between parents' attitudes (both subscales at 6 months) and children's return to organized sport at 1.5 years. This contradicts other pandemic research suggesting that children in urban areas reported higher levels of sport participation (May 2020-September 2021), which can likely be attributed to living in closer proximity to sport facilities (e.g., community centres, hockey arenas; Fleming et al., 2023). However, research by Caldwell et al. (2022) conducted during the second wave of the pandemic in Canada found no differences in parent-reported outdoor sport participation between children living in rural versus urban areas from a national sample of parents (*n* = 1,568). Clearly, increased research is needed regarding differences in sport participation between children from different urbanicities in Ontario.

This thesis also explored how parents' attitudes at 6 months relate to the unstructured play opportunities that children returned to 1.5 years into the pandemic, and whether this relationship was moderated by SES and urbanicity. Neither attitude subscale (*general return to active play, active play at home*) at 6 months was significantly related to the unstructured play children returned to 1 year later. This is an interesting finding that might be a result of parents' preferences to return their children to organized sport activities, over unstructured play, in line with pre-pandemic research (Watchman & Spencer-Cavaliere, 2017). Regarding SES indicators, family situation significantly moderated the relationship between attitudes toward active play at home (at 6 months) and children's return to unstructured play (1.5 years). More specifically, attitudes toward active play at home were inversely associated with returning to unstructured play for dual-parent but not single-parent households. This finding differs from the relationship between home attitudes and returning to organized sport noted above. This result might be explained by the fact that parents from single-parent households placed a greater emphasis on supporting active play at home and on returning their children to unstructured play. For instance, it is possible that single-parent households felt better equipped to have their children engage in unstructured play in and around the home because of the low-cost and the convenience of allowing their children to

interact with friends locally in the neighbourhood (e.g., neighbourhood play, playgroups; Schaefer et al., 2014). Given the low-cost alternative to sport, and benefits of unstructured play, it should be in the best interest of governments and policy makers to increase opportunities for this type of play and ensure parents are aware of the extensive health benefits for their children.

For urbanicity, the association between attitudes toward active play at home (i.e., play at home subscale) and children's return to unstructured play was more negative among parents that lived in communities with higher street intersection density (e.g., larger city, closer to busy roads) than among parents in communities with lower street intersection density. It is possible that parents living in areas with higher intersection density did not have as much open space nearby (e.g., woodlands, trails, big backyards) to engage in outdoor unstructured play (Padial-Ruz et al., 2021). Additionally, these parents may have lived in smaller apartments or houses, and as such, felt that they were less able to support their children's active play at home. This is supported by other pandemic findings that families living in detached houses (or houses with more space) were better able to support their children's physical activity inside or outside the home, compared to parents living in apartments, and that proximity to major streets was a notable barrier to outdoor activity among children (Mitra et al., 2020). Taken together, these findings reiterate the critical role parents' play in relation to their children's participation in active play. Therefore, it will be important for urban planners to ensure there are adequate facilities that promote outdoor play in urban neighbourhoods, helping to create more equitable active play, and to mitigate the loss of active play that occurred during the earlier periods of the pandemic in Ontario (Moore et al., 2020, 2021).

4.1 Strengths and Limitations

The present study provides an overview of parents' attitudes toward their children's return to play during the pandemic, with a focus on multiple SES indicators and built environment features. To our knowledge, this is one of the first studies to explore the

influence of the built environment on parents' attitudes during the COVID-19 pandemic using objective indicators. Additionally, a strength of this study includes validating the scale used to measure attitudes towards returning to play and taking a multifactorial approach to examining SES and urbanicity. However, despite the noted strengths, several limitations must be discussed. First, given the cross-sectional nature of the analysis at 6 months and 1.5 years, casual inferences cannot be made from these findings. Additionally, although efforts were made to recruit an adequate sample of Ontario parents, only 800 participants completed in first survey in its entirety, and many participants (*n* = 539) were lost to follow-up/incorrectly entering participant ID. As well, the study sample was predominantly female, Caucasian, dual-parent, and higher income households, which hinders the generalizability of results. Further, demographic information regarding SES indicators was only collected in Survey 1. Although this is typical in research protocol, due to the ever-changing nature of the COVID-19 pandemic, and economic instability during the pandemic (Khanijahani et al., 2021), it is possible that parent demographics may have changed during the time between Survey 1 and Survey 2. Furthermore, research following the creation of the *Return to Play* surveys also recommends the inclusion of pandemic-specific indicators of SES such as pandemic-related loss of employment, additional workload because of frontline occupations, and death of a family member due to COVID-19 (Gauvin et al., 2022), which this study did not include. Another limitation is that urbanicity data were pulled from participant postal code rather than specific home location to uphold participant anonymity. Although a large buffer (1000m) was used to reduce misclassification (Healy & Gilliland, 2012), particularly in rural areas where postal codes cover a greater geographic region, there is less accuracy regarding the unique geographic features compare to urban areas with smaller postal code regions (Healy & Gilliland, 2012). Finally, it is also possible that some factors not discussed in this study including, but not limited to, vaccination status (not yet readily available at 6 months; CIHI, 2022), and community case-counts could have influenced parents' attitudes at various time points.

4.2 Future Implications and the SEM

As the percentage of children meeting physical activity and movement guidelines before and during the pandemic in Canada continues to be insufficient to support health and development (Guerrero et al., 2020; Mitra et al., 2020; Moore et al., 2020, 2021), it is important to explore the role that parents have on their children's active play opportunities. This study contributes to the public health literature by examining SES and urbanicity and the influence of parents during the COVID-19 pandemic in relation to their children's active play. Findings from the present study, in relation to the SEM (Bronfenbrenner, 1981), consider a variety of policy, individual, interpersonal, social, and built environment factors that have contributed to parents' attitudes toward their children's return to active play at various points during the COVID-19 pandemic. For example, parents' attitudes and motivation toward their children's active play are influenced by a number of broader levels (Bronfenbrenner, 1981), including, but not limited to, SES indicators, support networks, built environment features, vaccine mandates, and public health protections.

These findings provide important considerations for future programming to ensure subsidized opportunities for active play and safe community resources (e.g., parks, community centres; Gu et al., 2022; Post et al., 2022). Findings from this study may also encourage governments to consider the implications of the pandemic on parents' perceptions of the built environment and consider how SES indicators have affected parents' attitudes toward their children's return to play. As well, future efforts should target low (or no cost) physical activity programming initiatives (Ostermeier et al., 2022), improve safe active transportation and routes to school (e.g., bike lanes, crossing guards), and educate parents on the importance of unstructured play. Furthermore, it is critical to consider how large metropolitan areas have struggled with overcrowding during the pandemic, and how future planning initiatives are needed to ensure children in these areas are able to engage in active play opportunities safely, which includes

rethinking how cities are designed to better promote unstructured outdoor play (e.g., increased parks).

As parks have now been re-opened, and organized sport has resumed, future work should explore parents' preferences toward structured versus unstructured activities for their children. Future research should also explore how the built environment influences children's physical activity as many public health protections have been eased. Furthermore, in the case of a future pandemic, efforts are needed to ensure that families of lower income, single-parents, and full-time and unemployed households, and families from more urban areas receive more equitable opportunities to engage in active play. For instance, ensuring that parents have the self-efficacy and perceived capability, as well as the skills, and resources (e.g., equipment, time) to promote physical activity (Guerrero et al., 2020), is one important avenue to explore. Nonetheless, it is imperative that researchers continue to explore the influence of SES indicators and urbanicity on children's physical activity inside and outside of the home.

4.3 Conclusion

The purpose of this study was to explore the influence of SES and urbanicity on parents' attitudes regarding their children's return to active play. This work provides a thorough understanding of SES and urbanicity disparities, on which future research and programs can be based. It is clear from the present study that more supports are needed for single parents, parents that are employed full-time, have lower income, and those living in communities with features more typical of the urban environment to encourage active play for their children during the pandemic. In addition, future efforts should focus on the importance of unstructured play, include parents in the design of parks and neighbourhood play facilities, and note the provision of outdoor facilities as critical components of designing healthy and resilient communities (Mitra et al., 2020). Given the instrumental role that parents have on their children's active play, innovative health promotion efforts need to be tailored to parents, with adequate attention to SES indictors and urbanicity. This work highlights the necessity to consider parents' attitudes

and perspectives, as their stress level has been linked to children's physical activity avoidance during the COVID-19 pandemic (Khozaei & Carbon, 2022). As such, it is essential that parents are better equipped to support their children gain the benefits associated with active play (Tremblay et al., 2016). The COVID-19 pandemic has continued to provide challenging times in Ontario, and inequities toward children's active play needs to remain a priority.

References

American Psychological Association. (2022). Measuring Socioeconomic Status and Subjective Social Status. https://www.apa.org/pi/ses/resources/class/measuring-status

Arundell, L., Salmon, J., Timperio, A., Sahlqvist, S., Uddin, R., Veitch, J., Ridgers, N. D., Brown, H., & Parker, K. (2021). Physical activity and active recreation before and during COVID-19: The Our Life at Home study. *Journal of Science and Medicine in Sport, 25*(3), 235-241. https://doi.org/10.1016/j.jsams.2021.10.004

Australian Government. (2021, January 14). *For children and young people (5 to 17 years)*. Australian Government Department of Health; Australian Government Department of Health. https://www.health.gov.au/health-topics/physical-activity-and-exercise/physical-activity-and-exercise-guidelines-for-all-australians/for-children-and-young-people-5-to-17-years

Baker, E. H. (2014). Socioeconomic status, definition. *The Wiley Blackwell Encyclopedia of Health, Illness, Behavior, and Society* (p. 2210–2214). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118410868.wbehibs395

Bancroft, C., Joshi, S., Rundle, A., Hutson, M., Chong, C., Weiss, C. C., Genkinger, J., Neckerman, K., & Lovasi, G. (2015). Association of proximity and density of parks and objectively measured physical activity in the United States: A systematic review. *Social Science & Medicine*, *138*, 22–30. https://doi.org/10.1016/j.socscimed.2015.05.034

Barnes, J. D., Colley, R. C., & Tremblay, M. S. (2012). Results from the Active Healthy Kids Canada 2011 Report Card on Physical Activity for Children and Youth. *Applied Physiology, Nutrition, and Metabolism*, *37*(4), 793–797. https://doi.org/10.1139/h2012-033

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*, 1–48. https://doi.org/10.18637/jss.v067.i01

Beets, M. W., Cardinal, B. J., & Alderman, B. L. (2010). Parental social support and the physical activity-related behaviors of youth: A review. *Health Education & Behavior*, *37*(5), 621–644. https://doi.org/10.1177/1090198110363884

Bialosiewicz, S., Murphy, K., & Berry, T. (2013). *An introduction to measurement invariance testing: Resource packet for participants* (p. 37). Claremont Evaluation Center. https://higherlogicdownload.s3-external-1.amazonaws.com/EVAL/AEA%2013%20measurement%20invariance%20resource%20packet.pdf?AWSAccessKeyId=AKIAVRDO7IEREB57R7MT&Expires=1670360808&Signature=vQ4sqZfCqme%2Fv3gVWLQh5JPIJmQ%3D

Bidzan-Bluma, I., & Lipowska, M. (2018). Physical activity and cognitive functioning of children: A systematic review. *International Journal of Environmental Research and Public Health*, *15*(4), Article 4. https://doi.org/10.3390/ijerph15040800

Blau, F. D., Koebe, J., & Meyerhofer, P. A. (2021). Who are the essential and frontline workers? *Business Economics (Cleveland, Ohio)*, *56*(3), 168–178. https://doi.org/10.1057/s11369-021-00230-7

Booth, M. L., Okely, A. D., Chey, T., Bauman, A. E., & Macaskill, P. (2002). Epidemiology of physical activity participation among New South Wales school students. *Australian and New Zealand Journal of Public Health*, *26*(4), 371–374. https://doi.org/10.1111/j.1467-842x.2002.tb00189.x

Boxberger, K., & Reimers, A. (2019). Parental correlates of outdoor play in boys and girls aged 0 to 12—A systematic review. *International Journal of Environmental Research and Public Health*, *16*(2), 190. https://doi.org/10.3390/ijerph16020190

Braveman, P. A., Cubbin, C., Egerter, S., Chideya, S., Marchi, K. S., Metzler, M., & Posner, S. (2005). Socioeconomic status in health research: One size does not fit all. *JAMA*, *294*(22), 2879–2888. https://doi.org/10.1001/jama.294.22.2879

Bronfenbrenner, U. (1981). *The Ecology of Human Development*. Harvard University Press. https://www.hup.harvard.edu/catalog.php?isbn=9780674224575

Brown, H. E., Atkin, A. J., Panter, J., Wong, G., Chinapaw, M. J. M., & van Sluijs, E. M. F. (2016). Family-based interventions to increase physical activity in children: A systematic review, meta-analysis and realist synthesis. *Obesity Reviews*, *17*(4), 345–360. https://doi.org/10.1111/obr.12362

Brussoni, M., Gibbons, R., Gray, C., Ishikawa, T., Sandseter, E. B. H., Bienenstock, A., Chabot, G., Fuselli, P., Herrington, S., Janssen, I., Pickett, W., Power, M., Stanger, N., Sampson, M., & Tremblay, M. S. (2015). What is the relationship between risky outdoor play and health in children? A systematic review. *International Journal of Environmental Research and Public Health*, *12*(6), Article 6. https://doi.org/10.3390/ijerph120606423

Brussoni, M., Han, C. S., Lin, Y., Jacob, J., Pike, I., Bundy, A., Faulkner, G., Gardy, J., Fisher, B., & Mâsse, L. (2021). A web-based and in-person risk reframing intervention to influence mothers' tolerance for, and parenting practices associated with, children's outdoor risky play: Randomized controlled trial. *Journal of Medical Internet Research*, *23*(4), e24861. https://doi.org/10.2196/24861

Button, B. L. G., Clark, A. F., & Gilliland, J. A. (2020). Understanding factors associated with children achieving recommended amount of MVPA on weekdays and weekend days. *Preventive Medicine Reports*, *19*, 101145. https://doi.org/10.1016/j.pmedr.2020.101145

Button, B. L. G., Clark, A. F., Martin, G., Graat, M., & Gilliland, J. A. (2020). Measuring temporal differences in rural Canadian children's moderate-to-vigorous physical activity. *International Journal of Environmental Research and Public Health*, *17*(23), 8734. https://doi.org/10.3390/ijerph17238734

Button, B. L. G., Tillmann, S., & Gilliland, J. (2020). Exploring children's perceptions of barriers and facilitators to physical activity in rural Northwestern Ontario, Canada. *Rural and Remote Health*, *20*(3), 5791 https://doi.org/10.22605/RRH5791

Cachón-Zagalaz, J., Zagalaz-Sánchez, M. L., Arufe-Giráldez, V., Sanmiguel-Rodríguez, A., & González-Valero, G. (2021). Physical activity and daily routine among children aged 0–12 during the COVID-19 pandemic in Spain. *International Journal of*

Environmental Research and Public Health, *18*(2), Article 2. https://doi.org/10.3390/ijerph18020703

Cairney, J., Joshi, D., Kwan, M., Hay, J., & Faught, B. (2015). Children's participation in organized sport and physical activities and active free play: Exploring the impact of time, gender and neighbourhood household income using longitudinal data. *Sociology of Sport Journal*, *32*(3), 266–283. https://doi.org/10.1123/ssj.2014-0100

Caldwell, H. A. T., Faulkner, G., Tremblay, M. S., Rhodes, R. E., de Lannoy, L., Kirk, S. F. L., Rehman, L., & Moore, S. A. (2022). Regional differences in movement behaviours of children and youth during the second wave of the COVID-19 pandemic in Canada: Follow-up from a national study. *Canadian Journal of Public*, *113*(4), 535–546. https://doi.org/10.17269/s41997-022-00644-6

Canadian Fitness and Lifestyle Research Institute. (2019, March 13). *Bulletin 8: Achieving sufficient steps per day among Canadian children and youth | CFLRI*. Bulletin 8: Achieving Sufficient Steps per Day among Canadian Children and Youth. https://cflri.ca/bulletin-8-achieving-sufficient-steps-day-among-canadian-children-and-youth

Canadian Fitness and Lifestyle Research Institute. (2022). *Impact of pandemic on physical activity in key settings | CFLRI* (p. 1) [Survey]. https://cflri.ca/impact-pandemic-physical-activity-key-settings

Canadian Institute for Health Information [CIHI]. (2022). *Canadian COVID-19 intervention timeline |CIHI*. https://www.cihi.ca/en/canadian-covid-19-intervention-timeline

Canadian Society for Exercise Physiology [CSEP]. (2017). *Canadian 24-Hour Movement Guidelines*. https://csepguidelines.ca/

CanMap. (2015). *CanMap Postal Code Suite v2015.3. [Computer file]*. Markham: DMTI Spatial Inc.,.

Carroll, N., Sadowski, A., Laila, A., Hruska, V., Nixon, M., Ma, D. W. L., Haines, J., & on behalf of the Guelph Family Health Study. (2020). The Impact of COVID-19 on health behavior, stress, financial and food security among middle to high income Canadian families with young children. *Nutrients*, *12*(8), Article 8. https://doi.org/10.3390/nu12082352

Carson, V. (2016). Cross-sectional and longitudinal associations between parental support and children's physical activity in the early years. *Journal of Physical Activity and Health*, *13*(6), 611–616. https://doi.org/10.1123/jpah.2015-0420

Carson, V., Chaput, J.-P., Janssen, I., & Tremblay, M. S. (2017). Health associations with meeting new 24-hour movement guidelines for Canadian children and youth. *Preventive Medicine*, *95*, 7–13. https://doi.org/10.1016/j.ypmed.2016.12.005

Carson, V., Lee, E.-Y., Hewitt, L., Jennings, C., Hunter, S., Kuzik, N., Stearns, J. A., Unrau, S. P., Poitras, V. J., Gray, C., Adamo, K. B., Janssen, I., Okely, A. D., Spence, J. C., Timmons, B. W., Sampson, M., & Tremblay, M. S. (2017). Systematic review of the relationships between physical activity and health indicators in the early

years (0-4 years). *BMC Public Health*, *17*(5), 854. https://doi.org/10.1186/s12889-017-4860-0

Carver, A., Timperio, A., & Crawford, D. (2008). Playing it safe: The influence of neighbourhood safety on children's physical activity—A review. *Health & Place*, *14*(2), 217–227. https://doi.org/10.1016/j.healthplace.2007.06.004

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, *100*(2), 126–131.

Champoux, J. E., & Peters, W. S. (1987). Form, effect size and power in moderated regression analysis. *Journal of Occupational Psychology*, *60*, 243–255. https://doi.org/10.1111/j.2044-8325.1987.tb00257.x

Chang, K.-T. (2019). Geographic information system. In *International Encyclopedia of Geography* (pp. 1–10). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118786352.wbieg0152.pub2

Chaput, J.-P., Carson, V., Gray, C. E., & Tremblay, M. S. (2014). Importance of all movement behaviors in a 24 hour period for overall health. *International Journal of Environmental Research and Public Health*, *11*(12), Article 12. https://doi.org/10.3390/ijerph111212575

Chaput, J.-P., Colley, R. C., Aubert, S., Carson, V., Janssen, I., Roberts, K. C., & Tremblay, M. S. (2017). Proportion of preschool-aged children meeting the Canadian 24-hour movement guidelines and associations with adiposity: Results from the

Canadian Health Measures Survey. *BMC Public Health*, *17*(5), 829. https://doi.org/10.1186/s12889-017-4854-y

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*(3), 464–504. https://doi.org/10.1080/10705510701301834

Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional problems in children. *Pediatrics*, *113*(4), 708–713. https://doi.org/10.1542/peds.113.4.708

Cleland, V., Timperio, A., Salmon, J., Hume, C., Baur, L. A., & Crawford, D. (2010). Predictors of time spent outdoors among children: 5-year longitudinal findings. *Journal of Epidemiology & Community Health*, *64*(5), 400–406. https://doi.org/10.1136/jech.2009.087460

Colley, R., & Watt, J. (2022). The unequal impact of the COVID-19 pandemic on the physical activity habits of Canadians. *Health Reports*, *33*(5), 22–33. https://www.doi.org/10.25318/82-003-x202200500003-eng

Contreras, D. A., Martoccio, T. L., Brophy-Herb, H. E., Horodynski, M., Peterson, K. E., Miller, A. L., Senehi, N., Sturza, J., Kaciroti, N., & Lumeng, J. C. (2021). Rural–urban differences in body mass index and obesity-related behaviors among low-income preschoolers. *Journal of Public Health*, *43*(4), e637–e644. https://doi.org/10.1093/pubmed/fdaa162

Cooper, T. V., Klesges, L. M., DeBon, M., Klesges, R. C., & Shelton, M. L. (2006). An assessment of obese and non obese girls' metabolic rate during television

viewing, reading, and resting. *Eating Behaviors*, *7*(2), 105–114. https://doi.org/10.1016/j.eatbeh.2005.08.007

Dauw, J. M. (2016). *Screen Time and the Effects on Development for Children Ages Birth to Five Years*. 49.

Davison, K. K., Mâsse, L. C., Timperio, A., Frenn, M. D., Saunders, J., Mendoza, J. A., Gobbi, E., Hanson, P., & Trost, S. G. (2013). Physical activity parenting measurement and research: Challenges, explanations, and solutions. *Childhood Obesity*, *9*(s1), S-103. https://doi.org/10.1089/chi.2013.0037

de Lannoy, L., MacDonald, L., Barbeau, K., & Tremblay, M. S. (2022). Environmental scan of child and youth outdoor play-based projects, programs, activities and services available in Canada during the COVID-19 pandemic. *Children, Youth and Environments*, *32*(1), 84–127.

de Lannoy, L., Rhodes, R. E., Moore, S. A., Faulkner, G., & Tremblay, M. S. (2020). Regional differences in access to the outdoors and outdoor play of Canadian children and youth during the COVID-19 outbreak. *Canadian Journal of Public Health*, *111*(6), 988–994. https://doi.org/10.17269/s41997-020-00412-4

Delisle Nyström, C., Barnes, J. D., Blanchette, S., Faulkner, G., Leduc, G., Riazi, N. A., Tremblay, M. S., Trudeau, F., & Larouche, R. (2019). Relationships between area-level socioeconomic status and urbanization with active transportation, independent mobility, outdoor time, and physical activity among Canadian children. *BMC Public Health*, *19*(1), 1082. https://doi.org/10.1186/s12889-019-7420-y

D'Haese, S., Gheysen, F., De Bourdeaudhuij, I., Deforche, B., Van Dyck, D., & Cardon, G. (2016). The moderating effect of psychosocial factors in the relation between neighborhood walkability and children's physical activity. *International Journal of Behavioral Nutrition and Physical Activity*, *13*(1), 128. https://doi.org/10.1186/s12966-016-0452-0

Diemer, M. A., Mistry, R. S., Wadsworth, M. E., López, I., & Reimers, F. (2013). Best practices in conceptualizing and measuring social class in psychological research. *Analyses of Social Issues and Public Policy*, *13*(1), 77–113. https://doi.org/10.1111/asap.12001

DMTI Spatial Inc. (2020a). *Park Sports Field Point* [Map]. DMTI Spatial Inc. ttp://geo.scholarsportal.info/#r/details/_uri@=41125589$DMTI_2020_CMCS_ParksSportsFieldPoint&_add:true_nozoom:true

DMTI Spatial Inc. (2020b). *Park Sports Field Region* [Map]. DMTI Spatial Inc. http://geo2.scholarsportal.info/#r/details/_uri@=11120733$DMTI_2020_CMCS_ParksSportsFieldRegion&_add:true_nozoom:true

Draper, C. E., Tomaz, S. A., Biersteker, L., Cook, C. J., Couper, J., de Milander, M., Flynn, K., Giese, S., Krog, S., Lambert, E. V., Liebenberg, T., Mendoza, C., Nunes, T., Pienaar, A., Priorieschi, A., Rae, D. E., Rahbeeni, N., Reilly, J. J., Reynolds, L., … Okely, A. D. (2020). The South African 24-hour movement guidelines for birth to 5 years: An integration of physical activity, sitting behavior, screen time, and sleep. *Journal of Physical Activity & Health*, *17*(1), 109–119. https://doi.org/10.1123/jpah.2019-0187

Drenowatz, C., Eisenmann, J. C., Pfeiffer, K. A., Welk, G., Heelan, K., Gentile, D., & Walsh, D. (2010). Influence of socio-economic status on habitual physical activity and sedentary behavior in 8- to 11-year old children. *BMC Public Health*, *10*, 214. https://doi.org/10.1186/1471-2458-10-214

Duncan, G. J., Magnuson, K., & Votruba-Drzal, E. (2015). Children and socioeconomic status. In *Handbook of Child Psychology and Developmental Science* (p. 1–40). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118963418.childpsy414

Dunton, G. F., Do, B., & Wang, S. D. (2020). Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the U.S. *BMC Public Health*, *20*(1), 1351. https://doi.org/10.1186/s12889-020-09429-3

Eime, R. M., Young, J. A., Harvey, J. T., Charity, M. J., & Payne, W. R. (2013). A systematic review of the psychological and social benefits of participation in sport for children and adolescents: Informing development of a conceptual model of health through sport. *International Journal of Behavioral Nutrition and Physical Activity*, *10*(1), 98. https://doi.org/10.1186/1479-5868-10-98

Eyler, A. A., Schmidt, L., Beck, A., Gilbert, A., Kepper, M., & Mazzucca, S. (2021). Children's physical activity and screen time during COVID-19 pandemic: A qualitative exploration of parent perceptions. *Health Behavior and Policy Review*, *8*(3), 236–246. https://doi.org/10.14485/hbpr.8.3.5

Farley, T. A., Meriwether, R. A., Baker, E. T., Watkins, L. T., Johnson, C. C., & Webber, L. S. (2007). Safe play spaces to promote physical activity in inner-city children:

Results from a pilot study of an environmental intervention. *American Journal of Public Health*, *97*(9), 1625–1631. https://doi.org/10.2105/AJPH.2006.092692

Faulkner, G., Mitra, R., Buliung, R., Fusco, C., & Stone, M. (2015). Children's outdoor playtime, physical activity, and parental perceptions of the neighbourhood environment. *International Journal of Play*, *4*(1), 84–97. https://doi.org/10.1080/21594937.2015.1017303

Fernandez-Jimenez, R., Al-Kazaz, M., Jaslow, R., Carvajal, I., & Fuster, V. (2018). Children present a window of opportunity for promoting health: JACC review topic of the week. *Journal of the American College of Cardiology*, *72*(25), 3310–3319. https://doi.org/10.1016/j.jacc.2018.10.031

Fleming, D. J. M., Dorsch, T. E., Serang, S., Hardiman, A. L., Blazo, J. A., Farrey, T., Lerner, J. B., & Solomon, J. (2023). The association of families' socioeconomic and demographic characteristics with parents' perceived barriers to returning to youth sport following the COVID-19 pandemic. *Psychology of Sport and Exercise*, *65*, 102348. https://doi.org/10.1016/j.psychsport.2022.102348

Fontenelle-Tereshchuk, D. (2021). 'Homeschooling' and the COVID-19 crisis: The insights of parents on curriculum and remote learning. *Interchange*, *52*(2), 167–191. https://doi.org/10.1007/s10780-021-09420-w

Gallagher-Mackay, K., Srivastava, P., Underwood, K., Dhuey, E., McCready, L., Born, K., Maltsev, A., Perkhun, A., Steiner, R., Barrett, K., & Sander, B. (2021). *COVID-19 and education disruption in Ontario: Emerging evidence on impacts*. Ontario COVID-19 Science Advisory Table. https://doi.org/10.47326/ocsat.2021.02.34.1.0

Garriguet, D., Colley, R., & Bushnik, T. (2017). Parent-child association in physical activity and sedentary behaviour. *Health Reports*, *28*(6), 3–12.

Gauvin, L., Barnett, T. A., Dea, C., Doré, I., Drouin, O., Frohlich, K. L., Henderson, M., & Sylvestre, M.-P. (2022). Quarantots, quarankids, and quaranteens: How research can contribute to mitigating the deleterious impacts of the COVID-19 pandemic on health behaviours and social inequalities while achieving sustainable change. *Canadian Journal of Public Health*, *113*(1), 53–60. Scopus. https://doi.org/10.17269/s41997-021-00569-6

Giannotti, F., & Cortesi, F. (2009). Family and cultural influences on sleep development. *Child and Adolescent Psychiatric Clinics of North America*, *18*(4), 849–861. https://doi.org/10.1016/j.chc.2009.04.003

Gorelick, N., Hancher, M., Dixon, M., Ilyushchenko, S., Thau, D., & Moore, R. (2017). Google Earth Engine: Planetary-scale geospatial analysis for everyone. *Remote Sensing of Environment*, *202*, 18–27. https://doi.org/10.1016/j.rse.2017.06.031

Government of Canada. (2020a, October 29). *Coronavirus disease (COVID-19): Canada's response* [Education and awareness]. https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/canadas-reponse.html

Government of Canada, H. (2020b, December 8). *COVID-19 vaccines: Authorized vaccines* [Navigation page - topic page]. https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines.html

Government of Ontario. (2020a). *Ontario releases COVID-19 response framework to help keep the province safe and open*. News.Ontario.Ca. https://news.ontario.ca/en/release/59051/ontario-releases-covid-19-response-framework-to-help-keep-the-province-safe-and-open

Government of Ontario. (2020b). *A Framework for Reopening our Province Stage 2* (p. 21). https://www.goderich.ca/en/stay-and-play/resources/Images/A-Framework-for-Reopening-Our-Province-Stage-2.pdf

Government of Ontario. (2021a). *Ontario Moving to Step Three of Roadmap to Reopen on July 16*. News.Ontario.Ca. https://news.ontario.ca/en/release/1000501/ontario-moving-to-step-three-of-roadmap-to-reopen-on-july-16

Government of Ontario. (2021b). *Roadmap to Reopen*. News.Ontario.Ca. https://news.ontario.ca/en/backgrounder/1000159/roadmap-to-reopen

Government of Ontario. (2022a). *Archived—COVID-19 variants*. Ontario.Ca. http://www.ontario.ca/page/covid-19-variants

Government of Ontario. (2022b). *Management of cases and contacts of COVID-19 in Ontario* (Version 15.1; p. 34). https://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/contact_mngmt/management_cases_contacts.pdf

Gray, C., Gibbons, R., Larouche, R., Sandseter, E. B. H., Bienenstock, A., Brussoni, M., Chabot, G., Herrington, S., Janssen, I., Pickett, W., Power, M., Stanger, N., Sampson, M., & Tremblay, M. S. (2015). What Is the Relationship between

outdoor time and physical activity, sedentary behaviour, and physical fitness in children? A systematic review. *International Journal of Environmental Research and Public Health*, *12*(6), 6455–6474. https://doi.org/10.3390/ijerph120606455

Grzywacz, J. G., & Fuqua, J. (2000). The social ecology of health: Leverage points and linkages. *Behavioral Medicine*, *26*(3), 101–115. https://doi.org/10.1080/08964280009595758

Gu, X., Keller, J., Zhang, T., Dempsey, D. R., Roberts, H., Jeans, K. A., Stevens, W., Borchard, J., VanPelt, J., & Tulchin-Francis, K. (2022). Disparity in built environment and its impacts on youths' physical activity behaviors during COVID-19 pandemic restrictions. *Journal of Racial and Ethnic Health Disparities*, 1–11. https://doi.org/10.1007/s40615-022-01341-3

Guan, H., Okely, A. D., Aguilar-Farias, N., Cruz, B. del P., Draper, C. E., Hamdouchi, A. E., Florindo, A. A., Jáuregui, A., Katzmarzyk, P. T., Kontsevaya, A., Löf, M., Park, W., Reilly, J. J., Sharma, D., Tremblay, M. S., & Veldman, S. L. C. (2020). Promoting healthy movement behaviours among children during the COVID-19 pandemic. *The Lancet Child & Adolescent Health*, *4*(6), 416–418. https://doi.org/10.1016/S2352-4642(20)30131-0

Guerrero, M. D., Vanderloo, L. M., Rhodes, R. E., Faulkner, G., Moore, S. A., & Tremblay, M. S. (2020). Canadian children's and youth's adherence to the 24-h movement guidelines during the COVID-19 pandemic: A decision tree analysis. *Journal of Sport and Health Science*, *9*(4), 313–321. https://doi.org/10.1016/j.jshs.2020.06.005

Harrington, D., Jarvis, J., & Manson, H. (2017). Parents' perceived barriers to accessing sports and recreation facilities in Ontario, Canada: Exploring the relationships between income, neighbourhood deprivation, and community. *International Journal of Environmental Research and Public Health*, *14*(10), 1272. https://doi.org/10.3390/ijerph14101272

Hazlehurst, M. F., Muqueeth, S., Wolf, K. L., Simmons, C., Kroshus, E., & Tandon, P. S. (2022). Park access and mental health among parents and children during the COVID-19 pandemic. *BMC Public Health*, *22*(1), 800. https://doi.org/10.1186/s12889-022-13148-2

Healy, M. A., & Gilliland, J. A. (2012). Quantifying the magnitude of environmental exposure misclassification when using imprecise address proxies in public health research. *Spatial and Spatio-Temporal Epidemiology*, *3*(1), 55–67. https://doi.org/10.1016/j.sste.2012.02.006

Herrington, S., & Brussoni, M. (2015). Beyond physical activity: The importance of play and nature-based play spaces for children's health and development. *Current Obesity Reports*, *4*(4), 477–483. https://doi.org/10.1007/s13679-015-0179-2

Hesketh, K. R., Lakshman, R., & van Sluijs, E. M. F. (2017). Barriers and facilitators to young children's physical activity and sedentary behaviour: A systematic review and synthesis of qualitative literature. *Obesity Reviews*, *18*(9), 987–1017. https://doi.org/10.1111/obr.12562

Hoekman, R., Breedveld, K., & Kraaykamp, G. (2017). Sport participation and the social and physical environment: Explaining differences between urban and rural areas

in the Netherlands. *Leisure Studies*, *36*(3), 357–370. https://doi.org/10.1080/02614367.2016.1182201

Hu, D., Zhou, S., Crowley-McHattan, Z. J., & Liu, Z. (2021). Factors that influence participation in physical activity in school-aged children and adolescents: A systematic review from the social ecological model perspective. *International Journal of Environmental Research and Public Health*, *18*(6), 3147. https://doi.org/10.3390/ijerph18063147

Jackman, F., & Way, R. (2020). *Impacts of COVID-19 on local sports organizations: nationwide survey results* (p. 38). Sport For Life. https://sportforlife.ca/wp-content/uploads/2020/06/National-Report-Impacts-of-COVID-19-on-Local-Sports-Organizations-1.pdf

Jago, R., Davison, K. K., Brockman, R., Page, A. S., Thompson, J. L., & Fox, K. R. (2011). Parenting styles, parenting practices, and physical activity in 10- to 11-year olds. *Preventive Medicine*, *52*(1), 44–47. https://doi.org/10.1016/j.ypmed.2010.11.001

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 40. https://doi.org/10.1186/1479-5868-7-40

Jelleyman, C., McPhee, J., Brussoni, M., Bundy, A., & Duncan, S. (2019). A cross-sectional description of parental perceptions and practices related to risky play and independent mobility in children: The New Zealand state of play survey.

International Journal of Environmental Research and Public Health, *16*(2), 262. https://doi.org/10.3390/ijerph16020262

Joens-Matre, R. R., Welk, G. J., Calabro, M. A., Russell, D. W., Nicklay, E., & Hensley, L. D. (2008). Rural-urban differences in physical activity, physical fitness, and overweight prevalence of children. *The Journal of Rural Health: Official Journal of the American Rural Health Association and the National Rural Health Care Association*, *24*(1), 49–54. https://doi.org/10.1111/j.1748-0361.2008.00136.x

Jumpstart. (2022). *2022 State of Sport Report reveals major barriers to sport remain* (p. 26). https://jumpstart.canadiantire.ca/blogs/news/2022-state-of-sport-report-reveals-major-barriers-to-sport-remain

Kamini, P. S. M. (2019). Inculcating resilience through physical activity among children. *Shanlax International Journal of Arts, Science and Humanities*, *6*(4), Article 4. https://doi.org/10.34293/sijash.v6i4.343

Kärmeniemi, M., Lankila, T., Ikäheimo, T., Koivumaa-Honkanen, H., & Korpelainen, R. (2018). The built environment as a determinant of physical activity: A systematic review of longitudinal studies and natural experiments. *Annals of Behavioral Medicine*, *52*(3), 239–251. https://doi.org/10.1093/abm/kax043

Kellstedt, D. K., Schenkelberg, M. A., Essay, A. M., Von Seggern, M. J., Rosenkranz, R. R., Welk, G. J., High, R., & Dzewaltowski, D. A. (2021). Youth sport participation and physical activity in rural communities. *Archives of Public Health*, *79*(1), 46. https://doi.org/10.1186/s13690-021-00570-y

Kelly, L. A., Reilly, J. J., Fisher, A., Montgomery, C., Williamson, A., McColl, J. H., Paton, J. Y., & Grant, S. (2006). Effect of socioeconomic status on objectively measured physical activity. *Archives of Disease in Childhood*, *91*(1), 35–38. https://doi.org/10.1136/adc.2005.080275

Kerr, M. L., Rasmussen, H. F., Fanning, K. A., & Braaten, S. M. (2021). Parenting during COVID-19: A study of parents' experiences across gender and income levels. *Family Relations*, *70*(5), 1327–1342. https://doi.org/10.1111/fare.12571

Khanijahani, A., Iezadi, S., Gholipour, K., Azami-Aghdash, S., & Naghibi, D. (2021). A systematic review of racial/ethnic and socioeconomic disparities in COVID-19. *International Journal for Equity in Health*, *20*(1), 248. https://doi.org/10.1186/s12939-021-01582-4

Kharel, M., Sakamoto, J. L., Carandang, R. R., Ulambayar, S., Shibanuma, A., Yarotskaya, E., Basargina, M., & Jimba, M. (2022). Impact of COVID-19 pandemic lockdown on movement behaviours of children and adolescents: A systematic review. *BMJ Global Health*, *7*(1), e007190. https://doi.org/10.1136/bmjgh-2021-007190

Khozaei, F., & Carbon, C.-C. (2022). On the parental influence on children's physical activities and mental health during the COVID-19 pandemic. *Frontiers in Psychology*, *13*. https://www.frontiersin.org/articles/10.3389/fpsyg.2022.675529

Kipping, R. R., Howe, L. D., Jago, R., Campbell, R., Wells, S., Chittleborough, C. R., Mytton, J., Noble, S. M., Peters, T. J., & Lawlor, D. A. (2014). Effect of intervention aimed at increasing physical activity, reducing sedentary behaviour, and increasing fruit and vegetable consumption in children: Active for Life Year 5

(AFLY5) school based cluster randomised controlled trial. *BMJ*, *348*(4), g3256–g3256. https://doi.org/10.1136/bmj.g3256

Knight, R. L., McNarry, M. A., Runacres, A. W., Shelley, J., Sheeran, L., & Mackintosh, K. A. (2022). Moving forward: Understanding correlates of physical activity and sedentary behaviour during COVID-19 in children and adolescents—An integrative review and socioecological approach. *International Journal of Environmental Research and Public Health*, *19*(3), 1044. https://doi.org/10.3390/ijerph19031044

Kristjansdottir, G., & Vilhjalmsson, R. (2001). Sociodemographic differences in patterns of sedentary and physically active behavior in older children and adolescents. *Acta Paediatrica (Oslo, Norway: 1992)*, *90*(4), 429–435.

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). Package "lmerTest": tests in linear mixed effects models. *Journal of Statistical Software*, *82*(13). https://doi.org/10.18637/jss.v082.i13

L K Muthén & B O Muthén. (2017). *Mplus user's guide (8th ed.).* (p. 950). : Muthén & Muthén. https://www.statmodel.com/download/usersguide/MplusUserGuideVer_8.pdf

Landsat. (2017). *Landsat 5 TM collection 1 tier 1 Landsat 5 TM collection 1 tier 1 annual greenest-pixel TOA reflectance composite | Earth Engine Data Catalog*. Google Developers. https://developers.google.com/earth-engine/datasets/catalog/LANDSAT_LT05_C01_T1_ANNUAL_GREENEST_TOA

Larouche, R., Mire, E. F., Belanger, K., Barreira, T. V., Chaput, J.-P., Fogelholm, M., Hu, G., Lambert, E. V., Maher, C., Maia, J., Olds, T., Onywera, V., Sarmiento, O. L., Standage, M., Tudor-Locke, C., Katzmarzyk, P. T., & Tremblay, M. S. (2019). Relationships between outdoor time, physical activity, sedentary time, and body mass index in children: A 12-country study. *Pediatric Exercise Science*, *31*(1), 118–129. https://doi.org/10.1123/pes.2018-0055

Lavrysen, A., Bertrands, E., Leyssen, L., Smets, L., Vanderspikken, A., & De Graef, P. (2017). Risky-play at school. Facilitating risk perception and competence in young children. *European Early Childhood Education Research Journal*, *25*(1), 89–105. https://doi.org/10.1080/1350293X.2015.1102412

LeBlanc, A. G., Spence, J. C., Carson, V., Connor Gorber, S., Dillman, C., Janssen, I., Kho, M. E., Stearns, J. A., Timmons, B. W., & Tremblay, M. S. (2012). Systematic review of sedentary behaviour and health indicators in the early years (aged 0-4 years). *Applied Physiology, Nutrition, and Metabolism*, *37*(4), 753–772. https://doi.org/10.1139/h2012-063

Lee, E.-Y., Bains, A., Hunter, S., Ament, A., Brazo-Sayavera, J., Carson, V., Hakimi, S., Huang, W. Y., Janssen, I., Lee, M., Lim, H., Silva, D. A. S., & Tremblay, M. S. (2021). Systematic review of the correlates of outdoor play and time among children aged 3-12 years. *International Journal of Behavioral Nutrition and Physical Activity*, *18*(1), 41. https://doi.org/10.1186/s12966-021-01097-9

Lee, H., Tamminen, K. A., Clark, A. M., Slater, L., Spence, J. C., & Holt, N. L. (2015). A meta-study of qualitative research examining determinants of children's

independent active free play. *International Journal of Behavioral Nutrition and Physical Activity*, *12*(1), 5. https://doi.org/10.1186/s12966-015-0165-9

Lees, C., & Hopkins, J. (2013). Effect of aerobic exercise on cognition, academic achievement, and psychosocial function in children: A systematic review of randomized control trials. *Preventing Chronic Disease*, *10*, 130010. https://doi.org/10.5888/pcd10.130010

Lesser, I. A., & Nienhuis, C. P. (2020). The impact of COVID-19 on physical activity behavior and well-being of Canadians. *International Journal of Environmental Research and Public Health*, *17*(11), 3899. https://doi.org/10.3390/ijerph17113899

Love, R., Adams, J., Atkin, A., & van Sluijs, E. (2019). Socioeconomic and ethnic differences in children's vigorous intensity physical activity: A cross-sectional analysis of the UK Millennium Cohort Study. *BMJ Open*, *9*(5), e027627. https://doi.org/10.1136/bmjopen-2018-027627

MacDonald, M., & Hill, C. (2022). The educational impact of the Covid-19 rapid response on teachers, students, and families: Insights from British Columbia, Canada. *PROSPECTS*, *51*(4), 627–641. https://doi.org/10.1007/s11125-020-09527-5

Maher, C. A., & Olds, T. S. (2011). Minutes, MET minutes, and METs: Unpacking socio-economic gradients in physical activity in adolescents. *Journal of Epidemiology & Community Health*, *65*(2), 160–165. https://doi.org/10.1136/jech.2009.099796

Martínez-Andrés, M., Bartolomé-Gutiérrez, R., Rodríguez-Martín, B., Pardo-Guijarro, M. J., Garrido-Miguel, M., & Martínez-Vizcaíno, V. (2020). Barriers and facilitators to

leisure physical activity in children: A qualitative approach using the socio-ecological model. *International Journal of Environmental Research and Public Health*, *17*(9), 3033. https://doi.org/10.3390/ijerph17093033

McCormack, G. R., Doyle-Baker, P. K., Petersen, J. A., & Ghoneim, D. (2020). Parent anxiety and perceptions of their child's physical activity and sedentary behaviour during the COVID-19 pandemic in Canada. *Preventive Medicine Reports*, *20*, 101275. https://doi.org/10.1016/j.pmedr.2020.101275

McCormack, L. A., & Meendering, J. (2016). Diet and physical activity in rural vs urban children and adolescents in the United States: A narrative review. *Journal of the Academy of Nutrition and Dietetics*, *116*(3), 467–480. https://doi.org/10.1016/j.jand.2015.10.024

McGrath, L. J., Hopkins, W. G., & Hinckson, E. A. (2015). Associations of objectively measured built-environment attributes with youth moderate–vigorous physical activity: A systematic review and meta-analysis. *Sports Medicine*, *45*(6), 841–865. https://doi.org/10.1007/s40279-015-0301-3

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, *15*(4), 351–377. https://doi.org/10.1177/109019818801500401

Mitchell, C. A., Clark, A. F., & Gilliland, J. A. (2016). Built environment influences of children's physical activity: examining differences by neighbourhood size and sex. *International Journal of Environmental Research and Public Health*, *13*(1). https://doi.org/10.3390/ijerph13010130

Mitra, R., Cantello, I. D., Buliung, R. N., & Faulkner, G. E. J. (2017). Children's activity-transportation lifestyles, physical activity levels and social-ecological correlates in Toronto, Canada. *Journal of Transport & Health*, *6*, 289–298. https://doi.org/10.1016/j.jth.2017.03.010

Mitra, R., Moore, S. A., Gillespie, M., Faulkner, G., Vanderloo, L. M., Chulak-Bozzer, T., Rhodes, R. E., Brussoni, M., & Tremblay, M. S. (2020). Healthy movement behaviours in children and youth during the COVID-19 pandemic: Exploring the role of the neighbourhood environment. *Health & Place*, *65*, 102418. https://doi.org/10.1016/j.healthplace.2020.102418

Mitra, R., Waygood, E. O. D., & Fullan, J. (2021). Subjective well-being of Canadian children and youth during the COVID-19 pandemic: The role of the social and physical environment and healthy movement behaviours. *Preventive Medicine Reports*, *23*, 101404. https://doi.org/10.1016/j.pmedr.2021.101404

Moore, J. B., Brinkley, J., Crawford, T. W., Evenson, K. R., & Brownson, R. C. (2013). Association of the built environment with physical activity and adiposity in rural and urban youth. *Preventive Medicine*, *56*(2), 145–148. https://doi.org/10.1016/j.ypmed.2012.11.019

Moore, S. A., Faulkner, G., Rhodes, R. E., Brussoni, M., Chulak-Bozzer, T., Ferguson, L. J., Mitra, R., O'Reilly, N., Spence, J. C., Vanderloo, L. M., & Tremblay, M. S. (2020). Impact of the COVID-19 virus outbreak on movement and play behaviours of Canadian children and youth: A national survey. *International Journal of*

Behavioral Nutrition and Physical Activity, *17*(1), 85. https://doi.org/10.1186/s12966-020-00987-8

Moore, S. A., Faulkner, G., Rhodes, R. E., Vanderloo, L. M., Ferguson, L. J., Guerrero, M. D., Brussoni, M., Mitra, R., O'Reilly, N., Spence, J. C., Chulak-Bozzer, T., & Tremblay, M. S. (2021). Few Canadian children and youth were meeting the 24-hour movement behaviour guidelines 6-months into the COVID-19 pandemic: Follow-up from a national study. *Applied Physiology, Nutrition, and Metabolism*, *46*(10), 1225–1240. https://doi.org/10.1139/apnm-2021-0354

Moulin, F., Bailhache, M., Monnier, M., Thierry, X., Vandentorren, S., Côté, S. M., Falissard, B., Simeon, T., Geay, B., Marchand, L., Dufourg, M.-N., Ancel, P.-Y., Charles, M.-A., Rouquette, A., Melchior, M., Galéra, C., & on behalf of the SAPRIS study group. (2022). Longitudinal impact of psychosocial status on children's mental health in the context of COVID-19 pandemic restrictions. *European Child & Adolescent Psychiatry*. https://doi.org/10.1007/s00787-022-02010-w

Nathan, A., George, P., Ng, M., Wenden, E., Bai, P., Phiri, Z., & Christian, H. (2021). Impact of COVID-19 restrictions on Western Australian children's physical activity and screen time. *International Journal of Environmental Research and Public Health*, *18*(5). https://doi.org/10.3390/ijerph18052583

National Health Service. (2018, April 26). *Physical activity guidelines for adults aged 19 to 64*. NHS. https://www.nhs.uk/live-well/exercise/

Nelson, M. C., Gordon-Larsen, P., Song, Y., & Popkin, B. M. (2006). Built and social environments: Associations with adolescent overweight and activity. *American*

Journal of Preventive Medicine, *31*(2), 109–117. https://doi.org/10.1016/j.amepre.2006.03.026

Neshteruk, C. D., Nezami, B. T., Nino-Tapias, G., Davison, K. K., & Ward, D. S. (2017). The influence of fathers on children's physical activity: A review of the literature from 2009 to 2015. *Preventive Medicine*, *102*, 12–19. https://doi.org/10.1016/j.ypmed.2017.06.027

Ng, K., Cooper, J., McHale, F., Clifford, J., & Woods, C. (2020a). Barriers and facilitators to changes in adolescent physical activity during COVID-19. *BMJ Open Sport & Exercise Medicine*, *6*(1), e000919. https://doi.org/10.1136/bmjsem-2020-000919

Ng, K., Cooper, J., McHale, F., Clifford, J., & Woods, C. (2020b). Barriers and facilitators to changes in adolescent physical activity during COVID-19. *BMJ Open Sport & Exercise Medicine*, *6*(1), e000919. https://doi.org/10.1136/bmjsem-2020-000919

Nielson, K. (2021, May 10). *A timeline of COVID-19 in Ontario | Globalnews.ca*. Global News. https://globalnews.ca/news/6859636/ontario-coronavirus-timeline/

Oliveira, A. F., Moreira, C., Abreu, S., Mota, J., & Santos, R. (2014). Environmental determinants of physical activity in children: A systematic review. *Archives of Exercise in Health & Disease*, *4*(2), 254–261. https://doi.org/10.5628/aehd.v4i2.158

Ontario Council of University Libraries. (2022). *Scholars GeoPortal*. http://geo2.scholarsportal.info/#

Orton, L., Halliday, E., Collins, M., Egan, M., Lewis, S., Ponsford, R., Powell, K., Salway, S., Townsend, A., Whitehead, M., & Popay, J. (2017). Putting context centre stage:

Evidence from a systems evaluation of an area based empowerment initiative in England. *Critical Public Health*, *27*(4), 477–489. https://doi.org/10.1080/09581596.2016.1250868

Ostermeier, E., Tucker, P., Clark, A., Seabrook, J. A., & Gilliland, J. (2021). Parents' report of Canadian elementary school children's physical activity and screen time during the COVID-19 pandemic: A longitudinal study. *International Journal of Environmental Research and Public Health*, *18*(23). https://doi.org/10.3390/ijerph182312352

Ostermeier, E., Tucker, P., Tobin, D., Clark, A., & Gilliland, J. (2022). Parents' perceptions of their children's physical activity during the COVID-19 pandemic. *BMC Public Health*, *22*(1), 1459. https://doi.org/10.1186/s12889-022-13829-y

Owen, K. B., Nau, T., Reece, L. J., Bellew, W., Rose, C., Bauman, A., Halim, N. K., & Smith, B. J. (2022). Fair play? Participation equity in organised sport and physical activity among children and adolescents in high income countries: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *19*(1). https://doi.org/10.1186/s12966-022-01263-7

Padial-Ruz, R., Puga-González, M. E., Céspedes-Jiménez, Á., & Cabello-Manrique, D. (2021). Determining factors in the use of urban parks that influence the practice of physical activity in children: A systematic review. *International Journal of Environmental Research and Public Health*, *18*(7). https://doi.org/10.3390/ijerph18073648

ParticipACTION. (2020). *The Role of the Family in the Physical Activity, Sedentary and Sleep Behaviours of Children and Youth. The 2020 ParticipACTION Report Card on Physical Activity for Children and Youth*. https://www.participaction.com/wp-content/uploads/2022/09/2020-Children-and-Youth-Report-Card.pdf

ParticipACTION. (2022). *2022 ParticipACTION Report Card on Physical Activity for Children and Youth*. https://www.participaction.com/wp-content/uploads/2022/10/2022-Children-and-Youth-Report-Card.pdf

Patel, J. A., Nielsen, F. B. H., Badiani, A. A., Assi, S., Unadkat, V. A., Patel, B., Ravindrane, R., & Wardle, H. (2020). Poverty, inequality and COVID-19: The forgotten vulnerable. *Public Health*, *183*, 110–111. https://doi.org/10.1016/j.puhe.2020.05.006

Paterson, D. C., Ramage, K., Moore, S. A., Riazi, N., Tremblay, M. S., & Faulkner, G. (2021). Exploring the impact of COVID-19 on the movement behaviors of children and youth: A scoping review of evidence after the first year. *Journal of Sport and Health Science*, S2095254621000727. https://doi.org/10.1016/j.jshs.2021.07.001

Pavlovic, A., DeFina, L. F., Natale, B. L., Thiele, S. E., Walker, T. J., Craig, D. W., Vint, G. R., Leonard, D., Haskell, W. L., & Kohl, H. W. (2021). Keeping children healthy during and after COVID-19 pandemic: Meeting youth physical activity needs. *BMC Public Health*, *21*(1), 485. https://doi.org/10.1186/s12889-021-10545-x

Pelletier, C. A., Cornish, K., & Sanders, C. (2021). Children's independent mobility and physical activity during the COVID-19 pandemic: A qualitative study with families.

International Journal of Environmental Research and Public Health, *18*(9), 4481. https://doi.org/10.3390/ijerph18094481

Poitras, V. J., Gray, C. E., Borghese, M. M., Carson, V., Chaput, J.-P., Janssen, I., Katzmarzyk, P. T., Pate, R. R., Connor Gorber, S., Kho, M. E., Sampson, M., & Tremblay, M. S. (2016). Systematic review of the relationships between objectively measured physical activity and health indicators in school-aged children and youth. *Applied Physiology, Nutrition, and Metabolism*, *41*(6 (Suppl. 3)), S197–S239. https://doi.org/10.1139/apnm-2015-0663

Post, E. G., Rivera, M. J., Doss, D., & Eberman, L. E. (2022). Parent decision-making regarding youth sport participation during the COVID-19 pandemic. *Journal of Community Health*, *47*(4), 687–696. https://doi.org/10.1007/s10900-022-01078-4

Poulain, T., Meigen, C., Sobek, C., Ober, P., Igel, U., Körner, A., Kiess, W., & Vogel, M. (2021). Loss of childcare and classroom teaching during the Covid-19-related lockdown in spring 2020: A longitudinal study on consequences on leisure behavior and schoolwork at home. *PLOS ONE*, *16*(3), e0247949. https://doi.org/10.1371/journal.pone.0247949

Power, C., Graham, H., Due, P., Hallqvist, J., Joung, I., Kuh, D., & Lynch, J. (2005). The contribution of childhood and adult socioeconomic position to adult obesity and smoking behaviour: An international comparison. *International Journal of Epidemiology*, *34*(2), 335–344. https://doi.org/10.1093/ije/dyh394

Public Health Ontario. (2021). *Coronavirus Disease 2019 (COVID-19)*. Public Health Ontario. https://www.publichealthontario.ca/en/diseases-and-conditions/infectious-diseases/respiratory-diseases/novel-coronavirus

Public Health Ontario. (2022a). *(ARCHIVED) Early Dynamics of Omicron in Ontario, November 1 to December 9, 2021* (p. 1–5). September 2023. https://www.publichealthontario.ca/-/media/documents/ncov/epi/covid-19-early-dynamics-omicron-ontario-epi-summary.pdf

Public Health Ontario. (2022b). *COVID-19 Variants of Concern (VOCs)*. Public Health Ontario. https://www.publichealthontario.ca/en/Diseases-and-Conditions/Infectious-Diseases/Respiratory-Diseases/Novel-Coronavirus/Variants

Pyper, E., Harrington, D., & Manson, H. (2017). Do parents' support behaviours predict whether or not their children get sufficient sleep? A cross-sectional study. *BMC Public Health*, *17*(1), 432. https://doi.org/10.1186/s12889-017-4334-4

Ravensbergen, L., Buliung, R. N., Wilson, K., & Faulkner, G. (2016). Socioeconomic discrepancies in children's access to physical activity facilities: Activity space analysis. *Transportation Research Record*, *2598*(1), 11–18. https://doi.org/10.3141/2598-02

Rhodes, R. E., Guerrero, M. D., Vanderloo, L. M., Barbeau, K., Birken, C. S., Chaput, J.-P., Faulkner, G., Janssen, I., Madigan, S., Mâsse, L. C., McHugh, T.-L., Perdew, M., Stone, K., Shelley, J., Spinks, N., Tamminen, K. A., Tomasone, J. R., Ward, H., Welsh, F., & Tremblay, M. S. (2020). Development of a consensus statement on

the role of the family in the physical activity, sedentary, and sleep behaviours of children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, *17*(1), 74. https://doi.org/10.1186/s12966-020-00973-0

Rhodes, R. E., Spence, J. C., Berry, T., Faulkner, G., Latimer-Cheung, A. E., O'Reilly, N., Tremblay, M. S., & Vanderloo, L. (2019). Parental support of the Canadian 24-hour movement guidelines for children and youth: Prevalence and correlates. *BMC Public Health*, *19*(1), 1385. https://doi.org/10.1186/s12889-019-7744-7

Riazi, N. A., Wunderlich, K., Gierc, M., Brussoni, M., Moore, S. A., Tremblay, M. S., & Faulkner, G. (2021). "You can't go to the park, you can't go here, you can't go there": Exploring parental experiences of COVID-19 and its impact on their children's movement behaviours. *Children*, *8*(3). https://doi.org/10.3390/children8030219

Rittsteiger, L., Hinz, T., Oriwol, D., Wäsche, H., Santos-Hövener, C., & Woll, A. (2021). Sports participation of children and adolescents in Germany: Disentangling the influence of parental socioeconomic status. *BMC Public Health*, *21*(1), 1446. https://doi.org/10.1186/s12889-021-11284-9

Ross, P. N., Wasfi, D. R., Herrmann, T., & Gleckner, W. (2018). *Canadian active living environments database Can-ALE user manual & technical document* (p. 23). Public Health Agency of Canada. http://canue.ca/wp-content/uploads/2018/03/CanALE_UserGuide.pdf

Rossi, L., Behme, N., & Breuer, C. (2021). Physical activity of children and adolescents during the COVID-19 pandemic—A scoping review. *International Journal of*

Environmental Research and Public Health, *18*(21), 11440. https://doi.org/10.3390/ijerph182111440

Rothman, L., Hagel, B., Howard, A., Cloutier, M. S., Macpherson, A., Aguirre, A. N., McCormack, G. R., Fuselli, P., Buliung, R., HubkaRao, T., Ling, R., Zanotto, M., Rancourt, M., & Winters, M. (2021). Active school transportation and the built environment across Canadian cities: Findings from the child active transportation safety and the environment (CHASE) study. *Preventive Medicine*, *146*, 106470. https://doi.org/10.1016/j.ypmed.2021.106470

RStudio Team. (2020). *RStudio: Integrated development for R. RStudio, PBC, Boston, MA URL http://www.rstudio.com/.* https://posit.co/

Sandalack, B. A., Alaniz Uribe, F. G., Eshghzadeh Zanjani, A., Shiell, A., McCormack, G. R., & Doyle-Baker, P. K. (2013). Neighbourhood type and walkshed size. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, *6*(3), 236–255. https://doi.org/10.1080/17549175.2013.771694

Sandercock, G., Angus, C., & Barton, J. (2010). Physical activity levels of children living in different built environments. *Preventive Medicine*, *50*(4), 193–198. https://doi.org/10.1016/j.ypmed.2010.01.005

Saunders, T. J., Gray, C. E., Poitras, V. J., Chaput, J.-P., Janssen, I., Katzmarzyk, P. T., Olds, T., Connor Gorber, S., Kho, M. E., Sampson, M., Tremblay, M. S., & Carson, V. (2016). Combinations of physical activity, sedentary behaviour and sleep: Relationships with health indicators in school-aged children and youth. *Applied*

Physiology, Nutrition, and Metabolism, *41*(6 (Suppl. 3)), S283–S293. https://doi.org/10.1139/apnm-2015-0626

Schaefer, L., Plotnikoff, R. C., Majumdar, S. R., Mollard, R., Woo, M., Sadman, R., Rinaldi, R. L., Boulé, N., Torrance, B., Ball, G. D. C., Veugelers, P., Wozny, P., McCargar, L., Downs, S., Lewanczuk, R., Gleddie, D., & McGavock, J. (2014). Outdoor time Is associated with physical activity, sedentary time, and cardiorespiratory fitness in youth. *The Journal of Pediatrics*, *165*(3), 516–521. https://doi.org/10.1016/j.jpeds.2014.05.029

Schmidt, S. C. E., Anedda, B., Burchartz, A., Eichsteller, A., Kolb, S., Nigg, C., Niessner, C., Oriwol, D., Worth, A., & Woll, A. (2020). Physical activity and screen time of children and adolescents before and during the COVID-19 lockdown in Germany: A natural experiment. *Scientific Reports*, *10*(1), 21780. https://doi.org/10.1038/s41598-020-78438-4

Shahid, R., & Bertazzon, S. (2015). Local spatial analysis and dynamic simulation of childhood obesity and neighbourhood walkability in a major Canadian city. *AIMS Public Health*, *2*(4), 616–637. https://doi.org/10.3934/publichealth.2015.4.616

Sheldrick, M. P. R., Swindell, N. J., Richards, A. B., Fairclough, S. J., & Stratton, G. (2022). Homes became the “everything space” during COVID-19: Impact of changes to the home environment on children’s physical activity and sitting. *International Journal of Behavioral Nutrition and Physical Activity*, *19*(1), 134. https://doi.org/10.1186/s12966-022-01346-5

Sluijs, E. M. F. van, & McMinn, A. (2010). Preventing obesity in primary schoolchildren. *BMJ*, *340*, c819. https://doi.org/10.1136/bmj.c819

Springer, A. E., Hoelscher, D. M., Kelder, S. H., Castrucci, B., & Perez, A. (2008). Prevalence of physical activity and sedentary behaviors by metropolitan status in 4th-, 8th-, and 11th-grade students in Texas, 2004-2005. *Preventing Chronic Disease*, *6*(1), A21.

Statistics Canada. (2017, January 30). *Population centre and rural area classification 2016*. https://www.statcan.gc.ca/en/subjects/standard/pcrac/2016/introduction

Statistics Canada. (2021). *Dissemination block boundary files*. https://www150.statcan.gc.ca/n1/en/catalogue/92-163-X

Stearns, J. A., Rhodes, R., Ball, G. D. C., Boule, N., Veugelers, P. J., Cutumisu, N., & Spence, J. C. (2016). A cross-sectional study of the relationship between parents' and children's physical activity. *BMC Public Health*, *16*(1), 1129. https://doi.org/10.1186/s12889-016-3793-3

Stone, M. R., Faulkner, G. E., Mitra, R., & Buliung, R. N. (2012). Physical activity patterns of children in Toronto: The relative role of neighbourhood type and socio-economic status. *Canadian Journal of Public Health*, *103*(6), S9–S9.

Szpunar, M., Saravanamuttoo, K., Vanderloo, L. M., Bruijns, B. A., Truelove, S., Burke, S. M., Gilliland, J., Irwin, J. D., & Tucker, P. (2022). Children's physical activity during COVID-19 in Ontario, Canada: Parents' perspectives. *International Journal of Environmental Research and Public Health*, *19*(22), Article 22. https://doi.org/10.3390/ijerph192215061

Szpunar, M., Vanderloo, L. M., Bruijns, B. A., Truelove, S., Burke, S. M., Gilliland, J., Irwin, J. D., & Tucker, P. (2021). Children and parents' perspectives of the impact of the COVID-19 pandemic on Ontario children's physical activity, play, and sport behaviours. *BMC Public Health*, *21*(1), 2271. https://doi.org/10.1186/s12889-021-12344-w

Szpunar, M., Vanderloo, L. M., Bruijns, B. A., Truelove, S., Burke, S. M., Gilliland, J., Irwin, J. D., & Tucker, P. (2022). Attitudes regarding their children's return to play and sport following COVID-19. *Manuscript Submitted to Health Education and Behavior.*

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2019). *Using multivariate statistics* (Seventh edition). Pearson.

Tam, T. (2020). *From risk to resilience: An equity approach to COVID-19 – The chief public health officer of Canada's report on the state of public health in Canada 2020* (p. 86) [Education and awareness]. https://www.canada.ca/en/public-health/corporate/publications/chief-public-health-officer-reports-state-public-health-canada/from-risk-resilience-equity-approach-covid-19.html

Taylor, L. G. (2018). *Examining geographic variation in children's perceived barriers to physical activity and the implications on behaviour*. 161.

Taylor, L. G., Clark, A. F., & Gilliland, J. A. (2018). Context matters: Examining children's perceived barriers to physical activity across varying Canadian environments. *Health & Place*, *54*, 221–228. https://doi.org/10.1016/j.healthplace.2018.10.002

Taylor, R. W., Haszard, J. J., Healey, D., Meredith-Jones, K. A., Taylor, B. J., & Galland, B. C. (2021). Adherence to 24-h movement behavior guidelines and psychosocial functioning in young children: A longitudinal analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *18*(1), 110. https://doi.org/10.1186/s12966-021-01185-w

Telama, R., Yang, X., Viikari, J., Välimäki, I., Wanne, O., & Raitakari, O. (2005). Physical activity from childhood to adulthood: A 21-year tracking study. *American Journal of Preventive Medicine*, *28*(3), 267–273. https://doi.org/10.1016/j.amepre.2004.12.003

Timmons, B. W., LeBlanc, A. G., Carson, V., Gorber, S. C., Dillman, C., Janssen, I., Kho, M. E., Spence, J. C., Stearns, J. A., & Tremblay, M. S. (2012). Systematic review of physical activity and health in the early years (aged 0-4 years). *Applied Physiology, Nutrition, and Metabolism*, *37*(4), 773–793. https://doi.org/10.1139/H2012-070

Townsend, N., & Foster, C. (2013). Developing and applying a socio-ecological model to the promotion of healthy eating in the school. *Public Health Nutrition*, *16*(6), 1101–1108. https://doi.org/10.1017/S1368980011002655

Tremblay, Gray, C., Babcock, S., Barnes, J., Bradstreet, C., Carr, D., Chabot, G., Choquette, L., Chorney, D., Collyer, C., Herrington, S., Janson, K., Janssen, I., Larouche, R., Pickett, W., Power, M., Sandseter, E., Simon, B., & Brussoni, M. (2015). Position statement on active outdoor play. *International Journal of*

Environmental Research and Public Health, *12*(6), 6475–6505. https://doi.org/10.3390/ijerph120606475

Tremblay, M. S., Aubert, S., Barnes, J. D., Saunders, T. J., Carson, V., Latimer-Cheung, A. E., Chastin, S. F. M., Altenburg, T. M., Chinapaw, M. J. M., Altenburg, T. M., Aminian, S., Arundell, L., Atkin, A. J., Aubert, S., Barnes, J., Barone Gibbs, B., Bassett-Gunter, R., Belanger, K., Biddle, S., … on behalf of SBRN Terminology Consensus Project Participants. (2017). Sedentary Behavior Research Network (SBRN) – terminology consensus project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 75. https://doi.org/10.1186/s12966-017-0525-8

Tremblay, M. S., Carson, V., Chaput, J.-P., Connor Gorber, S., Dinh, T., Duggan, M., Faulkner, G., Gray, C. E., Gruber, R., Janson, K., Janssen, I., Katzmarzyk, P. T., Kho, M. E., Latimer-Cheung, A. E., LeBlanc, C., Okely, A. D., Olds, T., Pate, R. R., Phillips, A., Zehr, L. (2016). Canadian 24-Hour Movement Guidelines for Children and Youth: An integration of physical activity, sedentary behaviour, and sleep. *Applied Physiology, Nutrition, and Metabolism*, *41*(6 (Suppl. 3)), S311–S327. https://doi.org/10.1139/apnm-2016-0151

Tremblay, M. S., LeBlanc, A. G., Kho, M. E., Saunders, T. J., Larouche, R., Colley, R. C., Goldfield, G., & Gorber, S. C. (2011). Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *The International Journal of Behavioral Nutrition and Physical Activity*, *8*, 98. https://doi.org/10.1186/1479-5868-8-98

Trogen, B., & Caplan, A. (2021). Risk compensation and COVID-19 vaccines. *Annals of Internal Medicine*, M20-8251. https://doi.org/10.7326/M20-8251

Trost, S. G., & Loprinzi, P. D. (2011). Parental influences on physical activity behavior in children and adolescents: A brief review. *American Journal of Lifestyle Medicine*, *5*(2), 171–181. https://doi.org/10.1177/1559827610387236

Trost, S. G., Sallis, J. F., Pate, R. R., Freedson, P. S., Taylor, W. C., & Dowda, M. (2003). Evaluating a model of parental influence on youth physical activity. *American Journal of Preventive Medicine*, *25*(4), 277–282. https://doi.org/10.1016/s0749-3797(03)00217-4

Truelove, S., Vanderloo, L. M., & Tucker, P. (2017). Defining and measuring active play among young children: A systematic review. *Journal of Physical Activity and Health*, *14*(2), 155–166. https://doi.org/10.1123/jpah.2016-0195

Twisk, J. W. R. (2006). *Applied multilevel analysis: A practical guide for medical researchers*. Cambridge University Press.

United Nations. (1990). *OHCHR | Convention on the rights of the child*. https://www.ohchr.org/EN/ProfessionalInterest/Pages/CRC.aspx

USGS. (2017). *USGS Landsat 5 TM collection 2 Tier 1 TOA reflectance | Earth Engine Data Catalog*. Earth Engine Data Catalog. https://explorer.earthengine.google.com/detail/LANDSAT/LT5_L1T_TOA.

Vanderloo, L. M., Tucker, P., Johnson, A. M., & Holmes, J. D. (2013). Physical activity among preschoolers during indoor and outdoor childcare play periods. *Applied*

Physiology, Nutrition, and Metabolism, *38*(11), 1173–1175. https://doi.org/10.1139/apnm-2013-0137

Velde, G., Lubrecht, J., Arayess, L., van Loo, C., Hesselink, M., Reijnders, D., & Vreugdenhil, A. (2021). Physical activity behaviour and screen time in Dutch children during the COVID-19 pandemic: Pre-, during- and post-school closures. *Pediatric Obesity*, *16*(9), e12779. https://doi.org/10.1111/ijpo.12779

Vlahov, D., & Galea, S. (2002). Urbanization, urbanicity, and health. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *79*(90001), 1S – 12. https://doi.org/10.1093/jurban/79.suppl_1.S1

Voss, L. D., Hosking, J., Metcalf, B. S., Jeffery, A. N., & Wilkin, T. J. (2008). Children from low-income families have less access to sports facilities, but are no less physically active: Cross-sectional study (EarlyBird 35). *Child: Care, Health and Development*, *34*(4), 470–474. https://doi.org/10.1111/j.1365-2214.2008.00827.x

Wanberg, C. R., Csillag, B., Douglass, R. P., Zhou, L., & Pollard, M. S. (2020). Socioeconomic status and well-being during COVID-19: A resource-based examination. *Journal of Applied Psychology*, *105*, 1382–1396. https://doi.org/10.1037/apl0000831

Wang, X., Conway, T. L., Cain, K. L., Frank, L. D., Saelens, B. E., Geremia, C., Kerr, J., Glanz, K., Carlson, J. A., & Sallis, J. F. (2017). Interactions of psychosocial factors with built environments in explaining adolescents' active transportation. *Preventive Medicine*, *100*, 76–83. https://doi.org/10.1016/j.ypmed.2017.04.008

Watchman, T., & Spencer-Cavaliere, N. (2017). Times have changed: Parent perspectives on children's free play and sport. *Psychology of Sport and Exercise*, *32*, 102–112. https://doi.org/10.1016/j.psychsport.2017.06.008

White, P., & McTeer, W. (2012). Socioeconomic status and sport participation at different developmental stages during childhood and youth: Multivariate analyses using Canadian national survey data. *Sociology of Sport Journal*, *29*(2), 186–209. https://doi.org/10.1123/ssj.29.2.186

Wijtzes, A. I., Jansen, W., Bouthoorn, S. H., Pot, N., Hofman, A., Jaddoe, V. W. V., & Raat, H. (2014). Social inequalities in young children's sports participation and outdoor play. *The International Journal of Behavioral Nutrition and Physical Activity*, *11*, 155. https://doi.org/10.1186/s12966-014-0155-3

World Health Organization. (2018). *Global action plan on physical activity 2018–2030: More active people for a healthier world*. World Health Organization. https://apps.who.int/iris/handle/10665/272722

World Health Organization. (2019). *Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age* (p. 33). https://www.who.int/publications-detail-redirect/9789241550536

World Health Organization. (2020a). *WHO characterizes COVID-19 as a pandemic*. World Health Organization. https://www.who.int/westernpacific/health-topics/coronavirus

World Health Organization. (2020b). *WHO guidelines on physical activity and sedentary behaviour*. https://www.who.int/publications-detail-redirect/9789240015128

World Health Organization. (2021). *Coronavirus disease (COVID-19)*. https://www.who.int/westernpacific/health-topics/coronavirus

World Health Organization. (2022a). *Social determinants of health*. https://www.who.int/health-topics/social-determinants-of-health

World Health Organization. (2022b). *Global status report on physical activity 2022* (p. 112). World Health Organization. https://www.who.int/publications-detail-redirect/9789240059153

Wunsch, K., Nigg, C., Niessner, C., Schmidt, S. C. E., Oriwol, D., Hanssen-Doose, A., Burchartz, A., Eichsteller, A., Kolb, S., Worth, A., & Woll, A. (2021). The impact of COVID-19 on the interrelation of physical activity, screen time and health-related quality of life in children and adolescents in Germany: Results of the Motorik-Modul study. *Children*, *8*(2), Article 2. https://doi.org/10.3390/children8020098

Xia, Y., Ma, H., Moloney, G., García, H. A. V., Sirski, M., Janjua, N. Z., Vickers, D., Williamson, T., Katz, A., Yiu, K., Kustra, R., Buckeridge, D. L., Brisson, M., Baral, S. D., Mishra, S., & Maheu-Giroux, M. (2022). Geographic concentration of SARS-CoV-2 cases by social determinants of health in metropolitan areas in Canada: A cross-sectional study. *CMAJ*, *194*(6), E195–E204. https://doi.org/10.1503/cmaj.211249

Yomoda, K., & Kurita, S. (2021). Influence of social distancing during the COVID-19 pandemic on physical activity in children: A scoping review of the literature. *Journal of Exercise Science & Fitness*, *19*(3), 195–203. https://doi.org/10.1016/j.jesf.2021.04.002

Yousefian, A., Ziller, E., Swartz, J., & Hartley, D. (2009). Active living for rural youth: Addressing physical inactivity in rural communities. *Journal of Public Health Management and Practice*, *15*(3), 223–231. https://doi.org/10.1097/PHH.0b013e3181a11822

Zeng, N., Ayyub, M., Sun, H., Wen, X., Xiang, P., & Gao, Z. (2017). Effects of physical activity on motor skills and cognitive development in early childhood: A systematic review. *BioMed Research International*, *2017*. https://doi.org/10.1155/2017/2760716

Zenic, N., Taiar, R., Gilic, B., Blazevic, M., Maric, D., Pojskic, H., & Sekulic, D. (2020). Levels and changes of physical activity in adolescents during the COVID-19 pandemic: Contextualizing urban vs. rural living environment. *Applied Sciences*, *10*(11). https://doi.org/10.3390/app10113997

Appendices

Appendix A

Return to Play Survey 1 [Questions Involved in this Thesis]

Parents' Perspectives of their Child(ren)'s "Return to Play" Post-COVID-19 Pandemic

Start of Block: Block 9

Start of Block: SECTION 1: Eligibility

Q2.1 Are you the parent or legal guardian of a child 12 years of age or under?

- Yes (1)
- No (2)

Skip To: End of Block If Are you the parent or legal guardian of a child 12 years of age or under? = No

Q2.2 Are you an Ontario resident?

- Yes (1)
- No (2)

Skip To: End of Block If Are you an Ontario resident? = No

Q2.3 Can you read and write in English?

- Yes (1)
- No (2)

Skip To: End of Block If Can you read and write in English? = No

Q2.4 Do you provide care for, and live with your child(ren) at least 50% of the time?

- ○ Yes (1)
- ○ No (2)

Skip To: End of Block If Do you provide care for, and live with your child(ren) at least 50% of the time? = No

End of Block: SECTION 1: Eligibility

Start of Block: Block 8

Start of Block: SECTION 2: Participant ID

Q4.1 By answering the following questions, you are creating a **unique participant ID for yourself**. This is necessary for the research team to link your data from baseline (Survey 1) to follow-up (Survey 2). **The information that you provide will be kept confidential and will only be available to the research team.** You will be asked to submit the **exact same** responses in the follow-up survey.

Q4.2 What is the **first letter** of your first name? (E.g., if your name is Sam, select "S").
Select Letter (1)

▼ A (1) ... Z (26)

Q4.3 What is the **date** of your birth? (E.g., If your birthday is June 20th, select "20").
Select Date (1)

▼ 1 (1) ... 31 (31)

Q4.4 What is the **first letter** of the town/city that you were born (E.g., if you were born in Toronto, select "T").
Select Letter (1)

▼ A (1) ... Z (26)

Q4.5 What are the **last two digits** of your phone number? (E.g., if your phone number is 905-555-1234, select "3" and then "4")
Digit 1 (1)
Digit 2 (2)

▼ 0 (1) ... 9 ~ 9 (110)

End of Block: SECTION 2: Participant ID

Start of Block: SECTION 3: Demographic Information

Q5.1 Please answer the following questions to provide some information about yourself.

Q5.2 What gender do you identify with? (Refers to **current gender** which may be different from sex assigned at birth and may be different from what is indicated on legal documents.)

- ○ Male (1)
- ○ Female (2)
- ○ Prefer not to say (3)
- ○ Prefer to self-describe: (4) _____

Q5.3 What is **your age** (in years)?

_____

Q5.4 What is your postal code? (e.g., 1A1 A1A)?

_____

Q5.5 Which of the following best describes the area you live?

- Rural (1)
- Suburban (2)
- Urban (3)

Q5.6 What is your racial background/ethnicity?

- Caucasian (1)
- African Canadian (2)
- South Asian (3)
- East Asian (4)
- Middle Eastern (5)
- First Nations/Aboriginal (6)
- Latin American (7)
- Other: (8) _____
- Prefer not to answer (9)

Q5.7 What is your current employment status?

- Full-time (1)
- Part-time (2)
- Occasional/Support (3)
- Unemployed (4)
- Prefer not to answer (5)

Q5.8 What is your family situation?

- Single-parent (1)
- Double-parent (2)
- Guardian-led (3)
- Other: (4) _____
- Prefer not to answer (5)

Q5.9 What is your highest level of education?

- High school (1)
- College (2)
- University (3)
- Graduate school (4)
- Prefer not to answer (5)

Q5.10 In what housing type do you live (during the COVID-19 pandemic)?

- Apartment (1)
- Condominium (2)
- Townhouse (3)
- Semi-detached house (4)
- Detached house (5)
- Other housing? Please describe: (6) _____

Q5.11 Do you have a dog?

- Yes (1)
- No (2)

Q5.12 What is your approximate **yearly total household income (before taxes)**?

- Less than $20,000 (1)
- $20,000 - $39,000 (2)
- $40,000 - $ 59,000 (3)
- $60,000 - $79,000 (4)
- $80,000 - $99,000 (5)
- $100,000 - $119,000 (6)
- $120,000 - $139,000 (7)
- More than $140,000 (8)

○ Prefer not to answer (9)

Q5.13 Ontario is re-opening public spaces in three stages. What phase of re-opening are you **currently** in?

○ Phase 1 re-opening (1)

○ Phase 2 re-opening (2)

○ Phase 3 re-opening (3)

Q5.14 How many children aged 0-12 years do you currently provide care for?
Click to write Choice 1 (1)

▼ 1 (1) ... 10 (10)

Display This Question:
If How many children aged 0-12 years do you currently provide care for? = 1

Q5.15 What is the current age (0-12 years) and sex at birth of your child?

	Male (1)	Female (2)
Age of child: (1)	☐	☐

Display This Question:
If How many children aged 0-12 years do you currently provide care for? = 1

Q5.25 Does your child have a diagnosed disability or chronic condition?

○ Yes (1)

○ No (2)

Q7.15 What are your active play opportunity plans for your child **post-pandemic?** Please specify what you intend to do once Ontario's restrictions have been **completely lifted** (e.g., in guidance with provincial directions of re-opening).

- ☐ Will resume their original/previous programming as soon as possible (1)
- ☐ Might resume, if public health measures allow for my child(ren)'s return/re-open (2)
- ☐ Might resume, if I know public health measures can be enforced at all times (3)
- ☐ Planning to enroll them in new activities that naturally promote physical distancing because of COVID-19 (4)
- ☐ Planning to withdraw completely (5)
- ☐ Unsure (6)

Q7.25 **To help increase our understanding,** please explain **your plan to return** your child(ren) to their active play/sports programming (e.g., how you are (or not) planning to return your child(ren) to activities they engaged in prior to COVID-19).

_____

_____

_____

_____

_____

Display This Question:

If How many children aged 0-12 years do you currently provide care for? = 1

Q7.26 **In order to capture a more specific view of your plan to return your child** to their previous active play programming (e.g., prior to COVID-19), please **complete the following chart** by selecting which activities you are **planning** to return your child to once Ontario's

physical distancing measures have been completely lifted (e.g., in guidance with provincial directions of re-opening). **Please select all that apply.**

- [ ] Archery (1)
- [ ] Ball/Ice/Field Hockey (2)
- [ ] Baseball/Softball (3)
- [ ] Basketball (4)
- [ ] Cricket (5)
- [ ] Dance (6)
- [ ] Football (7)
- [ ] Gymnastics (8)
- [ ] Horseback Riding (9)
- [ ] Volleyball (10)
- [ ] Martial Arts (Karate, Tae Kwon Do, Judo) (11)
- [ ] Playgroups (12)
- [ ] Play in neighbourhood (parks, community centres) (13)
- [ ] Rugby (14)
- [ ] Skating (15)
- [ ] Skiing/Snowboarding (16)
- [ ] Soccer (17)

- [ ] Sports Camps (18)
- [ ] Swimming/Diving (19)
- [ ] Tennis/Badminton/Squash (20)
- [ ] Track and Field (21)
- [ ] Yoga/Pilates (22)
- [ ] Other (please specify): (23) _____
- [ ] Not applicable (24)

End of Block: SECTION 5: Parents' Perceptions of Their Child(ren)'s Return to Play POST-COVID.

The following statements are aimed towards understanding your **intentions, beliefs, and comfort** regarding your child's eventual return to active play/sports programming post-COVID. **Keeping in mind your personal opinions, please respond with the degree** to which you **agree** with the following.

	Strongly Disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I feel willing to return my child to active play opportunities where they can following physical distancing guidelines (1)	○	○	○	○	○
I feel that having my child at home with me during the pandemic makes **me** feel safe (2)	○	○	○	○	○
I feel that having my child at home with me during the pandemic makes **them** feel safe (3)	○	○	○	○	○
Even if my child can follow physical distancing guidelines, I am still hesitant to return them to active play programming (4)	○	○	○	○	○

I am confident that if I return my child to active play, my child will follow Ontario's public health guidelines (e.g., hand sanitizing) (5)	○	○	○	○	○
I am looking forward to allowing my child to interact with others (6)	○	○	○	○	○
I prefer to allow my child to interact with people via social networking sites and screen-based technology than in person (7)	○	○	○	○	○
My child has missed out on health benefits of extracurricular activities due to the COVID-19 pandemic (8)	○	○	○	○	○
I have enough skills to support my child's active play at home (9)	○	○	○	○	○
I have access to what I need at home to support my	○	○	○	○	○

child's active play (10)					
I have the ability to support my child's physical activity/active play at home without engagement in extra-curricular activities (11)	○	○	○	○	○
I have enough access to resources (i.e., space, time, toys) that allow me to support my child's active play (12)	○	○	○	○	○
I reserve time out of my day to support my child's active play (13)	○	○	○	○	○
I feel worried that I will no longer be able to afford my child's extracurricular activities post-pandemic (14)	○	○	○	○	○

End of Block: SECTION 7: Parents' Feelings about Active Play During and After COVID-19

Start of Block: SECTION 8: Tolerance of Risk in Play Scale

Appendix B

Return to Play Survey 2 [Questions Involved in this Thesis]

1-Year Follow-Up "Return to Play" Post-COVID-19 Survey

Start of Block: Block 8

Q1.1 Thank you for participating in our follow-up survey. Please follow the instructions ahead to record your response.

End of Block: Block 8

Start of Block: SECTION 2: Participant ID

Q3.1 By answering the following questions, you are creating a **unique participant ID for yourself**. This is necessary for the research team to link your data from baseline (Survey 1) to follow-up (Survey 2). The information that you provide will be kept confidential and will only be available to the research team. **You are required to submit the exact same responses that you did in your initial survey.**

Q3.2 What is the **first letter** of your first name? (E.g., if your name is Sam, select "S").
Select Letter (1)

▼ A (1) ... Z (26)

Q3.3 What is the **date** of your birth? (E.g., If your birthday is June 20th, select "20").
Select Date (1)

▼ 1 (1) ... 31 (31)

Q3.4 What is the **first letter** of the town/city that you were born (E.g., if you were born in Toronto, select "T").
Select Letter (1)

▼ A (1) ... Z (26)

Q3.5 What are the **last two digits** of your phone number? (E.g., if your phone number is 905-555-1234, select "3" and then "4")
Digit 1 (1)
Digit 2 (2)

▼ 0 (1) ... 9 ~ 9 (110)

End of Block: SECTION 2: Participant ID

Start of Block: Block 6

Q4.1 **By proceeding to the next question, you are consenting to your de-identified survey responses being archived with the understanding that they may be used in further research. Any personal information that could identify you will be removed or changed before files are shared. By continuing, you are providing your consent to publicly sharing your de-identified survey responses.**

End of Block: Block 6

Start of Block: Block 7

Q5.1 How many children aged 0-13 years do you currently provide care for?
1 (1)

▼ 1 (1) ... 10 (10)

Display This Question:
If How many children aged 0-13 years do you currently provide care for? = 1

Q5.2 What is the current age and sex at birth of your child?

	Male (1)	Female (2)
Age (#) of child: (1)	○	○

Display This Question:

If At this moment, do you feel comfortable with your child(ren) returning to unstructured (i.e., pla... = No

Or At this moment, do you feel comfortable with your child(ren) returning to unstructured (i.e., pla... = I feel comfortable returning them to some activities, but not all. Please describe:

Or At this moment, do you feel comfortable with your child(ren) returning to unstructured (i.e., pla... = I feel comfortable returning some of my children, but not all. Please describe:

Or At this moment, do you feel comfortable with your child(ren) returning to unstructured (i.e., pla... = Unsure

Q6.5 What are your active play opportunity plans for your child(ren) **post-pandemic?** Specifically, **what do you plan to do with regard to their physical activity and/or sport programming once the pandemic is deemed "over" by the Ontario government?**

- Plan to resume their original/previous programming as soon as possible (1)
- Plan to enroll them in new activities that naturally promote physical distancing because of COVID-19 (2)
- Plan to withdraw completely (3)
- Unsure (4)
- I have different plans for each of my children. Please describe: (5) _____

Q6.6 **In order to capture a more specific view of your child(ren)'s current active play programming,** please **complete the following chart** by selecting which activities you

have returned your child(ren) to at this moment in time (i.e., at this point during the pandemic in Ontario).

- [ ] Archery (1)
- [ ] Ball/Ice/Field Hockey (2)
- [ ] Baseball/Softball (3)
- [ ] Basketball (4)
- [ ] Cricket (5)
- [ ] Dance (6)
- [ ] Football (7)
- [ ] Gymnastics (8)
- [ ] Horseback Riding (9)
- [ ] Volleyball (10)
- [ ] Martial Arts (Karate, Tae Kwon Do, Judo) (11)
- [ ] Playgroups (12)
- [ ] Play in neighbourhood (parks, community centres) (13)
- [ ] Rugby (14)
- [ ] Skating (15)
- [ ] Skiing/Snowboarding (16)
- [ ] Soccer (17)

- [ ] Sports Camps (18)
- [ ] Swimming/Diving (19)
- [ ] Tennis/Badminton/Squash (20)
- [ ] Track and Field (21)
- [ ] Yoga/Pilates (22)
- [ ] Other (please specify): (23)
- [ ] Not applicable (24)
- [ ] Other. Please specify: (25) _____

Display This Question:

If Have you enrolled your child(ren) to attend any sports or extracurricular activities scheduled to... = Yes

Or Have you enrolled your child(ren) to attend any sports or extracurricular activities scheduled to... = I have enrolled some of my children, but not all.

End of Block: SECTION 5: Parents' Perceptions of Their Child(ren)'s Return to Play POST-COVID.

Q41 The following statements are aimed towards understanding your **intentions, beliefs, and comfort** regarding your child's return (or not) to their active play/sports programming post-COVID. **Keeping in mind your personal opinions, please respond with the degree** to which you **agree** with the following.

	Strongly Disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I feel willing to return my child to active play opportunities where they can following physical distancing guidelines (1)	○	○	○	○	○
I feel that having my child at home with me makes **me** feel safe (2)	○	○	○	○	○
I feel that having my child at home with me makes **them** feel safe (3)	○	○	○	○	○
Even if my child can follow physical distancing guidelines, I am still hesitant to return them to active play programming (4)	○	○	○	○	○
I am confident that if I return my child to active play, my child will	○	○	○	○	○

follow Ontario's public health guidelines (e.g., hand sanitizing) (5)					
I am looking forward to allowing my child to interact with others (6)	○	○	○	○	○
I prefer to allow my child to interact with people via social networking sites and screen-based technology than in person (7)	○	○	○	○	○
My child has missed out on health benefits of extracurricular activities due to the COVID-19 pandemic (8)	○	○	○	○	○
I have enough skills to support my child's active play at home (9)	○	○	○	○	○
I have access to what I need at home to support my child's active play (10)	○	○	○	○	○
I have the ability to	○	○	○	○	○

support my child's physical activity/active play at home without engagement in extra-curricular activities (11)					
I have enough access to resources (i.e., space, time, toys) that allow me to support my child's active play (12)	○	○	○	○	○
I reserve time out of my day to support my child's active play (13)	○	○	○	○	○
I feel worried that I will no longer be able to afford my child's extracurricular activities post-pandemic (14)	○	○	○	○	○
I feel worried about ventilation in indoor spaces (15)	○	○	○	○	○

End of Block: SECTION 7: Parents' Feelings about Active Play During and After COVID-19

Start of Block: Block 5

Appendix C

Non-Medical Research Ethics Board Approval Letter

Western Research

Date: 26 August 2020

To: Dr. Patricia Tucker

Project ID: 116331

Study Title: An Examination of Parents' Perspectives of their Child(ren)'s "Return to Play" Post-COVID-19 Pandemic

Short Title: Parents' Perspectives of their Child(ren)'s Return to Play Post-COVID

Application Type: NMREB Initial Application

Review Type: Delegated

Full Board Reporting Date: September 4 2020

Date Approval Issued: 26/Aug/2020

REB Approval Expiry Date: 26/Aug/2021

Dear Dr. Patricia Tucker

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:

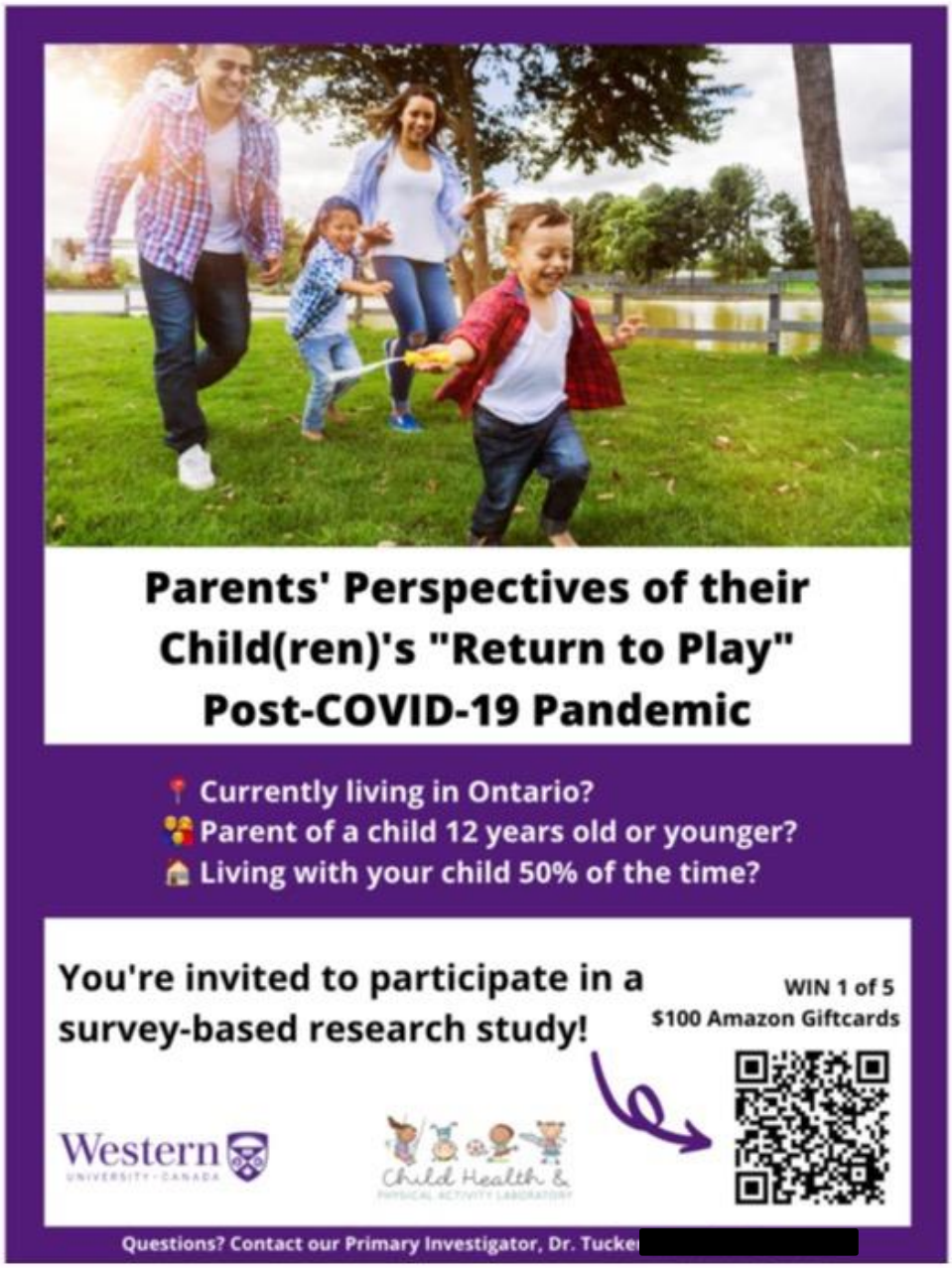
Document Name	Document Type	Document Date	Document Version
Volition to Enter Draw Survey-August12,2020	Online Survey	12/Aug/2020	
Appendix B-Telephone Interview Guide-Aug12	Interview Guide	12/Aug/2020	
Recruitment1-August12	Recruitment Materials	12/Aug/2020	
Recruitment2-August12	Recruitment Materials	12/Aug/2020	
Recruitment3-August12	Recruitment Materials	12/Aug/2020	
Verbal Consent-Telephone Interview-August12	Verbal Consent/Assent	12/Aug/2020	
6Month-Survey-Qualtrics.August12,2020	Online Survey	13/Aug/2020	
Appendix A-Baseline-Survey-Qualtrics.August12,2020	Online Survey	13/Aug/2020	
Appendix C- Letter of Information.August 12,2020	Implied Consent/Assent	13/Aug/2020	
Appendix D - Letter of Information for Telephone Interviews.August 12, 2020	Implied Consent/Assent	13/Aug/2020	
Recruitment4-August12	Recruitment Materials	13/Aug/2020	

Documents Acknowledged:

Document Name	Document Type	Document Date	Document Version
qualtrics-western-procedures	Other Materials	15/Jul/2020	
Appendix E- Eligibility-August12,2020	Screening Form/Questionnaire	13/Aug/2020	

Appendix D

Social Media Recruitment



Western

Parents' Perspectives of their Child(ren)'s "Return to Play" Post-COVID-19 Pandemic

IF YOU...

- are a **parent/guardian** of children 12 and under
- live with your child(ren) **50%** of the time
- live in **Ontario**

You are invited to participate in an **Online Survey** assessing parents' opinions, fears, and intent to return their child(ren) to active play/sport programming following COVID-19.

Survey Link:
https://uwo.eu.qualtrics.com/jfe/form/SV_8vOvtWy1cOiUxIp

Questions? Contact the primary investigator, Dr. Tucker at [redacted]

PARTICIPANTS NEEDED

📍 **Currently living in Ontario?**
👪 **Parent of a child 12 years old or younger?**
🏠 **Living with your child 50% of the time?**

ENTER TO WIN $100

Parents' Perspectives of their Child(ren)'s "Return to Play" Post-COVID-19 Pandemic

Child Health & PHYSICAL ACTIVITY LABORATORY

Western

Questions? [redacted]

Appendix E

Letter of Information for Parents

Letter of Information

Study Title: Parents' Perspectives of their Child(ren)'s "Return to Play" Post-COVID-19 Pandemic

Principal Investigator: Trish Tucker, PhD, Faculty of Health Sciences, Western University

Co-Investigators: Monika Szpunar, MSc; Stephanie Truelove, MSc; Brianne Bruijns, MSc; Jason Gilliland, PhD; Leigh Vanderloo, PhD; Jennifer Irwin, PhD; & Shauna Burke, PhD

Invitation to participate: This study aims to explore parents' perspectives of their child(ren)'s "return to play", defined for the purpose of this study as encompassing both unstructured (i.e., playing in the neighbourhood) and structured (i.e., organized sport) activity post-COVID-19 pandemic. You are being invited to participate because you have a child or children 12 years of age or under and live in Ontario.

Purpose of this letter: The purpose of this letter is to provide you with the information needed to make an informed decision regarding your participation in the present study.

Background: Researchers highlight the importance of play in children's overall development and well-being. Play (i.e., engaging in activities that foster movement or creativity), from a young age promotes self-confidence, and cognitive functioning among young children. In recent years, an observed decline of children's engagement in active play has been noted, and this may be due to an increase in technology use (e.g., screen-viewing). In light of the current COVID-19 pandemic, many children's opportunities for active play have largely diminished (or changed). Schools, outdoor

playgrounds, camps and sports facilities that previously supported active play opportunities have been deemed largely inaccessible. The purpose of this study is to explore parents' perspectives and intent (or not) to return their child(ren) to opportunities that support active play, following the pandemic. The findings from this work will have important implications for young children and for parents as COVID-19 restrictions ease and society adjusts to new parameters and norms.

Inclusion criteria: You are eligible to participate in this study if you are: (1) an Ontario resident; (2) a parent/guardian of a child or children 12 years of age or under with custody at least 50% of the time; (3) able to read and write in English; and (4) have access to the internet.

Exclusion criteria: Individuals will be excluded from this study: (1) if they are not an Ontario resident; (2) if they do not have a child 12 years of age or under; (3) if they do not provide care for their child at least 50% of the time; (4) if they are unable to read and write in English; and/or (5) do not have access to the internet.

Study procedures: If you are willing to participate, you will be asked to fill out an online survey (via Qualtrics), and you will receive an invitation to complete a survey again via email approximately 6 months after physical distancing measures are entirely lifted (i.e., with directions from the provincial re-opening plan). The online surveys will take approximately 20 minutes to complete.

Costs and compensation: There are no costs to you for participating in the study. At the end of the survey, you will be invited to follow a link to submit your email address for a chance to win 1 of 5, $100 Amazon gift cards.

Voluntary participation: Participation in this study is voluntary. You may refuse to participate, skip any survey questions, or withdraw from the study at any time (prior to the submission of your survey). You do not waive any legal rights by consenting to this study.

Consent: Completion of the survey indicates your consent to participate.

Possible benefits and risks: There are no known physical, social, or economic risks due to participation in this study. While there are no personal benefits to you, the results may help researchers and community stakeholders understand parents' level of comfort with their child's return to play. In turn, this research will increase our collective understanding of the long-term impacts that COVID-19 will have for Ontario children, and may provide direction for implementing increased supports for young children's active play opportunities.

Confidentiality: We will keep your survey data confidential and secure. Only the research team and Western University's Non-Medical Research Ethics Board will have

access to these data. Your survey responses will be collected through a secure online survey platform called Qualtrics. Qualtrics uses encryption technology and restricted access authorizations to protect all data collected. In addition, Western's Qualtrics server is in Ireland, where privacy standards are maintained under the European Union Safe Harbor Framework. The data will then be exported from Qualtrics and securely stored on Western University's server. All data obtained will be stored in secured computer files (password encrypted) and in locked filing cabinets at Wester University. All survey data will be retained for 7 years after the results of the study have been published. After this period, all data will be destroyed (i.e., the computer data will be erased). At the end of the first survey, you will be asked to submit your email address. Your email will not be linked to your survey responses and will be used only for the purposes of notifying you of winning the Amazon gift card, and for contacting you for the second survey.

Contacts for further information: If you have any questions about the conduct of this study or your rights as a research participant you may contact the Office of Human Research Ethics at Western University, [redacted]. If you have any questions about this study, please contact [redacted]

Publication of the results: All data will be grouped with other participants for the purposes of publication. If you would like to receive a copy of the results of the study, please indicate so by following the link at the end of the survey.

Appendix F

Letter of Information for Parents – 1 Year Follow Up

Letter of Information – 1 Year Follow-Up

Study Title: Parents' Perspectives of their Child(ren)'s "Return to Play" Post-COVID-19 Pandemic – 1 Year Follow-Up

Principal Investigator: Trish Tucker, PhD, Faculty of Health Sciences, Western University

Co-Investigators: Monika Szpunar, MSc; Stephanie Truelove, MSc; Brianne Bruijns, MSc; Jason Gilliland, PhD; Leigh Vanderloo, PhD; Jennifer Irwin, PhD; & Shauna Burke, PhD

Invitation to participate: This study aims to explore parents' perspectives of their child(ren)'s "return to play", defined for the purpose of this study as encompassing both unstructured (i.e., playing in the neighbourhood) and structured (i.e., organized sport) activity post-COVID-19 pandemic. You are being contacted because you participated in our study by filling out our initial survey, titled "Parents' Perspectives of their Child(ren)'s "Return to Play" Post-COVID-19 Pandemic"

Purpose of this letter: The purpose of this letter is to provide you with the information needed to make an informed decision regarding your participation in the follow-up survey.

Background: Researchers highlight the importance of play in children's overall development and well-being. Play (i.e., engaging in activities that foster movement or creativity), from a young age promotes self-confidence, and cognitive functioning among young children. In recent years, an observed decline of children's engagement in active play has been noted, and this may be due to an increase in technology use (e.g., screen-viewing). In light of the current COVID-19 pandemic, many children's opportunities for active play have largely diminished (or changed). Schools, outdoor

playgrounds, camps and sports facilities that previously supported active play opportunities have been deemed largely inaccessible. The purpose of this study is to explore parents' perspectives and intent (or not) to return their child(ren) to opportunities that support active play, following the pandemic. The findings from this work will have important implications for young children and for parents as COVID-19 restrictions ease and society adjusts to new parameters and norms.

Inclusion criteria: You are eligible to participate in this study if you are: (1) an Ontario resident; (2) a parent/guardian of a child or children 13 years old or under with custody at least 50% of the time; (3) able to read and write in English; and, (4) participated in our baseline (i.e., initial) survey.

Exclusion criteria: Individuals will be excluded from this study: (1) if they are not an Ontario resident; (2) if they do not have a child 13 years old or under; (3) if they do not provide care for their child at least 50% of the time; (4) if they did not participate in our baseline (i.e., initial) survey; and/or (5) if they are unable to read and write in English.

Study procedures: You are receiving an invitation to complete this survey again because it has been approximately 1-year since you participated in our initial survey.

Costs and compensation: There are no costs to you for participating in this follow up survey.

Voluntary participation: Participation in this study is voluntary. You may refuse to participate, skip any survey questions, or withdraw from the study at any time (prior to the submission of your survey). You do not waive any legal rights by consenting to this study.

Consent: Completion of the survey indicates your consent to participate.

Possible benefits and risks: There are no known physical, social, or economic risks due to participation in this study. While there are no personal benefits to you, the results may help researchers and community stakeholders understand parents' level of comfort with their child's return to play. In turn, this research will increase our collective understanding of the long-term impacts that COVID-19 will have for Ontario children, and may provide direction for implementing increased supports for young children's active play opportunities.

Confidentiality: We will keep your original survey responses confidential and secure. Only the research team and Western University's Non-Medical Research Ethics Board will have access to these data. Your survey responses will be collected through a secure online survey platform called Qualtrics. Qualtrics uses encryption technology and restricted access authorizations to protect all data collected. In addition, Western's Qualtrics server is in Ireland, where privacy standards are maintained under the

European Union Safe Harbor Framework. The data will then be exported from Qualtrics and securely stored on Western University's server. These data obtained will be stored in secured computer files (password encrypted) and in locked filing cabinets at Wester University. Original survey responses will be retained in this secure environment for 7 years after the results of the study have been published, and after this period any information that could identify you will be destroyed (i.e., the computer data will be erased). Any personal information that could identify you will be removed or changed before any data from this survey are shared with other researchers or results are made public. The information in this study will be used only for research purposes and in ways that will not reveal who you are.

Contacts for further information: If you have any questions about the conduct of this study or your rights as a research participant you may contact the Office of Human Research Ethics at Western University, [redacted]. If you have any questions about this study, please contact [redacted].

Publication of the results: All data will be grouped with other participants for the purposes of publication. If you would like to receive a copy of the results of the study, please indicate so by following the link at the end of the survey.

Consent Statement: By proceeding to the next question, you are consenting to your de-identified survey responses being archived with the understanding that they may be used in further research. Any personal information that could identify you will be removed or changed before files are shared. By continuing, you are providing your consent to publicly sharing your de-identified survey responses.

Curriculum Vitae

Name:	Kendall Saravanamuttoo
Post-secondary Education and Degrees:	Western University London, Ontario, Canada 2021-Present, Master of Science
	Western University London, Ontario, Canada 2017-2021, Bachelor of Health Sciences, Honours Specialization
Honours and Awards:	Children's Health Research Institute (CHRI) Trainee Award ($10,000) 2021-2022
	Western University Dean's Honour List 2019-2021
	Western University Scholarship of Distinction 2017-2018
Related Work Experience	Research Assistant Children's Health and Physical Activity Laboratory Western University 2021-2023
	Teaching Assistant Western University HS 1001: Personal Determinants of Health (2021-2022) HS 2110: Creation of Wellbeing (2022) HS 2700: Health Issues in Childhood and Adolescence (2022-2023)
	Junior Policy Analyst Public Health Agency of Canada Health Promotion Branch, Division of Children and Youth 2021-2023

Publications:

A. Accepted or in Press Papers

1. Szpunar, M., Saravanamuttoo, K., Vanderloo, L. M., Bruijns, B. A., Truelove, S., Burke, S. M., Gilliland, J., Irwin, J. D., & Tucker, P. (2022). Children's Physical Activity during COVID-19 in Ontario, Canada: Parents' Perspectives. *International Journal of Environmental Research and Public Health*, *19*(22), 15061. https://doi.org/10.3390/ijerph192215061

B. Submitted Papers

1. Saravanamuttoo, K., Bourke, M., Szpunar, M., & Tucker, P. (Submitted September 2022). The Effectiveness of Physical Activity Policies in Centre-Based Childcare: A Systematic Review and Meta-Analysis. *Research Quarterly for Exercise and Sport.*

2. Bourke, M., Haddara A., Loh, A., Saravanamuttoo, K., Bruijns, B.A., Tucker, P. Effect of Capacity Building Interventions on Classroom Teacher and Early Childhood Educator Perceived Capabilities, Knowledge, and Attitudes Relating to Physical Activity and Fundamental Movement Skills: A Systematic Review and Meta-Analysis. *Educational Research Review.*

Conferences:

A. Oral Presentation

1. Western Health Sciences Graduate Research Conference
   'Return to Play: Impacts of Urbanicity & Socioeconomic Status on Parents' Perspective to Return Children to Play Post-COVID-19 Impact'
   Western University, February 2022
   Top Master's Oral Presentation