CHILDHOOD PHYSICAL ACTIVITY ENGAGEMENT: A QUALITATIVE BIOECOLOGICAL INVESTIGATION OF CHILDREN AND THEIR PARENTS' PERCEPTIONS AND EXPERIENCES

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DEDICATION

To my sons Luca and Max who were and continue to be a source of inspiration for my research.

ABSTRACT

Many Canadian children are not meeting the minimum physical activity guidelines that are associated with healthy growth and development. The mechanisms that underpin childhood physical activity are complex and vary by child. Few researchers have broached this complexity through bioecological approaches that directly source children and their parents. I sought to hear directly from children and their parents about the factors they feel are important in promoting and deterring childhood physical activity; and to learn about the mechanisms by which these factors promote and deter childhood physical activity. The 16 children and 11 parents that participated commented extensively about the importance of coactivity; that is, physical activity with others. Their perceptions and experiences suggest that personal, contextual, and temporal factors affect physical activity by way of promoting or deterring coactivity. Childhood physical activity research should strive to further incorporate coactivity-oriented, bioecological perspectives.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Researchers have long regarded childhood physical activity as an important aspect of healthy growth and development (Carson et al., 2017). Regular physical activity ensures that children develop important motor and cognitive skills (Carson et al., 2017). Children who regularly engage in physical activity are much less likely to be overweight or obese. They are also less likely to suffer from high blood cholesterol, high blood pressure, metabolic syndrome, and low bone density (Janssen & Leblanc, 2010). Physical activity is much more than a path to physical wellbeing. It is a vehicle for childhood development. Through regular engagement, children learn about the world around them (Whitehead, 2001). An infant might learn about gravity by dropping or throwing objects, while an adolescent might learn important social skills in their participation in organized sport. Despite the benefits of regular physical activity, the vast majority of Canadian children do not meet Canada's minimum guidelines for physical activity, which has experts concerned about the future wellbeing of Canadians (Cameron et al., 2016; Colley et al., 2017).

1.2 THE PROBLEM

Researchers have pointed out many factors that contribute to childhood physical activity engagement (e.g., Pereira et al., 2017; Sterdt et al., 2014). However, only a handful of studies have explored the mechanisms by which these factors exert their influence on physical activity engagement. No studies have attempted to situate childhood physical activity engagement within a bioecologically-oriented developmental framework, with physical activity engagement as the primary developmental outcome. As a result, researchers know very little about the nature of the interactions that occur during

physical activity and how those interactions promote or deter physical activity engagement; and, most of what researchers do know is limited to post-positivistic descriptive, causal-comparative, correlational, and experimental research. Researchers have yet to meaningfully incorporate children's perceptions and experiences into their understanding of this important aspect of childhood development.

1.3 PURPOSE AND RESEARCH QUESTIONS

The purpose of my research is to document children's perceptions and experiences and learn about the bioecological mechanisms that promote and deter childhood physical activity engagement. More specifically, how do the developmental processes related to childhood physical activity engagement take shape; and, how do bioecological factors promote or deter the developmental processes related to physical activity engagement?

1.4 RATIONALE AND STAKEHOLDERS

Developmental research on childhood physical activity is more important now than ever considering that physical activity in Canadian children is at an unprecedented low (e.g., Cameron et al., 2016; Colley et al., 2017). There are many stakeholders in Canada who are interested in learning why children do not engage in more physical activity. Examples of stakeholders include school administrators and representatives from provincial and national governing bodies for sports (e.g., basketball, hockey, gymnastics). Pan-Canadian organizations in sport, education, and health influence policy related to childhood physical activity. In sport, Canadian Sport for Life (CS4L) tasks itself with long-term sport development, and promoting participation in sport across the lifespan (Sport for Life, 2019). In education, Physical and Health Education (PHE) Canada promotes and advances physical and health education opportunities that inspire children in Canada to live physically active and healthy lives. PHE Canada offers programs and

professional development services across Canada (PHE Canada, 2019). In health, the Canadian Society for Exercise Physiology (CSEP) aims to be the national voice for exercise science and exercise prescription. CSEP offers comprehensive physical guidelines for children and adults (Canadian Society for Exercise Physiology, 2019).

1.5 RESEARCHER'S PERSPECTIVE

The purpose of my research is to learn about children's perceptions and experiences related to physical activity. I need to be careful that the data I collect is authentically that of the children and not simply their attempts to accommodate or verify my own perceptions and experiences. For that reason, I must meaningfully reflect on my own perceptions and experiences related to physical activity. Understanding how I came to the research questions will provide some insight. In the beginning stages of my doctoral research, a colleague asked me why I am interested in learning about children's physical activity engagement. At that point, I answered the question by offering the latest statistics on childhood physical activity. My colleague accepted the answer and we continued to converse about other things. It was only after our conversation that I realized that my response failed to truly answer the question. I had provided a rationale for why the research is important, but I had not addressed the motivation behind my research. Over the next days and weeks, I thought about my colleague's question and produced a much better response. Because physical activity is such a fundamental aspect of my own life, I wish to advocate for the positive benefits of physical activity for others.

Physical activity is a form of self-expression; it is a vehicle for exploring the world around us; and, a path to long-term health and wellbeing. At least this has been the case for me. When I was young, I was quite shy and introverted. Participating in soccer,

skiing, and playing various games during recess helped me interact with other children. It instilled in me a sense of confidence that transcended into other facets of life.

When I started to play sports at higher levels during high school, regular and structured engagement in physical activity taught me the value of discipline and commitment. These attributes helped me excel in school and offered me the opportunity to attend university. During university, I competed in track and field, cross-country running, and triathlon. Being on a university team had a big impact on my life. The scholarships that I received during my five years of competition helped offset the cost of post-secondary education. I had the privilege of traveling to competitions in many parts of Canada and the world. For instance, I represented the University of Regina at the World sniversity Triathlon championships in Taiwan in 2012. During my time competing, I formed many life-long friendships and even met my life-partner.

Everyone may not necessarily share my positive experiences related to physical activity and sport. I must acknowledge that privileges related to class, gender, ability, and race have and continue to influence my physical activity experiences and perceptions. For instance, my parents had the financial means to buy sporting equipment and pay for organized sports registrations. For many children of lower socioeconomic status, this may not be the case. Furthermore, my experiences and perceptions are those of an able-bodied person. If I had to navigate the world with a physical impairment, my perceptions and experiences related to physical activity would likely be quite different. My point is that while my own experiences related to physical activity have been very positive, for many others, the opposite may well be true.

I consider myself to be a very healthy individual. I feel confident in overcoming difficult tasks and I feel I have the necessary tools to cope with many of the stressors that

I encounter. I attribute this sense of vitality and resiliency to regular physical activity. I know that when I am physically inactive for long periods of time, it is much more difficult for me to feel good about myself and deal with challenging situations. As a father of two young boys, the dire state of childhood physical activity in Canada has been especially troublesome. I believe that my research will give me the knowledge and understanding to be the best parent to my children.

The importance of physical activity in my life is the reason that I started my doctoral research. In fact, my physically active lifestyle motivated me to make physical activity and sport the focal point of my post-secondary studies. I completed and undergraduate degree in kinesiology and later a master's degree in exercise physiology. My master's thesis left me with more questions than answers, which compelled me to learn more. I felt that my quantitative research design left no room to learn about the impact of the children's perceptions and experiences. This holds true for the current childhood physical activity discourse. Countless studies have correlated dozens of factors with childhood physical activity, but few of them have collected the children's voices. Virtually none of them have asked the question: how have you become the way that you are? Considering that only a small percentage of children engage in enough daily physical activity to meet Canada's minimum guidelines, I believe that we can learn a great deal from posing such questions.

As a researcher, it is important that I understand that my experiences have led to potential biases. Physical activity is an important part of my identity and my experiences have been overwhelmingly positive. The competitive aspect that sports offer has appealed to me from a young age. To that end, I must acknowledge the fact that I view physical activity and sport from a positive perspective. In an interview with a child, this may lead

to partiality in the way that I articulate questions based on what I believe the child's response might be. For example, in a follow-up question, I might probe a child about their experiences with organized sport. In so doing, I might miss the opportunity to learn more about experiences that that child perceives as more meaningful, such as unstructured recess play or physical activity with family. My beliefs about physical activity might also affect the data analysis. During the coding and theming phases, there is a chance that I might interpret certain comment extracts as confirmation of my own perceptions and experiences. I am and have been personally involved in the phenomenon under investigation. My perceptions, experiences, and biases make me an implicated researcher. To mitigate the potentially deleterious effects of my biases, I will bracket my beliefs by iteratively and reflexively journaling about how they influence my research decisions (for an excerpt from my journal, please refer to Appendix 1).

1.6 OPERATIONAL DEFINITIONS

Child

Childhood physical activity researchers (e.g., Cameron et al., 2016; Carson et al., 2017; Colley et al., 2017) typically refer to the following chronological age stages when defining children: Infants (0-12 months of age), toddlers (13 months to 3 years of age), children (4 to 12 years of age), prepubescent children (10 to 13 years of age), and adolescents or youth (13 to 17 years of age). These age ranges align with significant developmental benchmarks. For instance, a child's *peak-height-velocity* represents the period of maximal growth during the growth spurt (Pangrazi & Beighle, 2013) and serves as a benchmark for separating the prepubescent and adolescent stages. Childhood physical activity researchers further separate stages based on motor development. Motor development is rapid until the approximate age of four. During this time, children learn

many motor skills, including walking, running, catching, and throwing. After the age of four, motor development plateaus. This plateau is associated with the end of toddlerhood and the start of childhood (Balyi et al., 2013). Educators and coaches sometimes employ other benchmarks related to biological, intellectual, emotional, and moral development, but most researchers use chronological age when grouping children and adolescents.

Child Development

Child development broadly refers to the physical, intellectual, behavioural, emotional, and moral changes that occur during childhood. For instance, physical development might refer to a change in body height as a result of growth along the epiphyseal plate in children's long bones (Balyi et al., 2013). Intellectual development, in contrast, might manifest as changes in how children use language to represent things they cannot see (Balyi et al., 2013). Behavioural changes, such as a movement away from self-centeredness and towards empathy, further exemplifies child development (Balyi et al., 2013). Child development researchers (e.g., Farrant & Zubrick, 2012; Tudge et al., 2016) insist that child development is a bioecological phenomenon. In other words, child development is the outcome of the interactions between the developing child and various contextual and temporal features (Bronfenbrenner & Morris, 2006).

Physical Activity

Physical activity incorporates leisure and non-leisure body movements that significantly increase energy expenditure (Wisotzki & Finlay, 2018). Walking is an example of light intensity physical activity, whereas running and weightlifting are examples of moderate to vigorous intensity physical activity. Physical activity and exercise are related but are not synonymous. Exercise refers to sequenced, planned, structured, and repetitive bouts of physical activity, with the goal of improving or

maintaining physical fitness (Wisotzki & Finlay, 2018). For instance, a personal trainer could incorporate light, moderate, and vigorous physical activity into an exercise routine that leads to various health outcomes (e.g., weight loss, improvements in cardiovascular fitness). A coach, parent, or educator could also structure physical activity to facilitate improvements in motor skill proficiency (e.g., throwing, catching, striking) in children.

Physical Inactivity

Physical inactivity refers to the absence of daily physical activity. Sedentary behaviours, such as sitting, watching television, and playing video games make up the majority of a physically inactive person's day (Wisotzki & Finlay, 2018). 7000 steps represents the daily step-count that corresponds to a physically active lifestyle (Tudor-Locke et al., 2013). Researchers have established this benchmark as a threshold below which individuals significantly increase their risk for high blood cholesterol, high blood pressure, metabolic syndrome, obesity, low bone density, depression, and injuries (Janssen & Leblanc, 2010).

1.7 ORGANIZATION OF THE THESIS

In the remainder of this thesis, I outline the research that underpins the childhood physical activity discourse along with a detailed discussion on how I plan to answer my research questions. Chapter 2 primarily pertains to the literature review process and its results. I engage in a deeper interpretation of the discourse in which I point out noticeable gaps in the literature. Chapter 2 culminates with a concise argument for the theoretical framework that guided the data collection and analysis. In the first half of chapter 3, I explore the ontology and epistemology of various approaches to research, followed by a rationale for a specific research methodology. In the second half of Chapter 3, I discuss the research context, sampling and data collection procedures, steps I took to establish

trustworthiness, pertinent ethical considerations, limitations, and biases. Finally, in Chapters 4, 5, and 6 I offer a detailed account of the data analysis procedures, the results, my interpretations, future research directions, and practical advice for stakeholders.

CHAPTER 2: LITERATURE REVIEW

2.1 LITERATURE REVIEW PROCESS

In the following literature review, I present current empirical and theoretical work pertaining to childhood physical activity. I discuss the benefits of childhood physical activity along with the current physical activity guidelines and participation rates in Canada. I provide an extensive summary of the frequently cited factors that researchers have linked to childhood physical activity engagement. My approach for critiquing the literature will be to lay out the existing research on its own terms, and then critique the fundamental epistemological limitations, rather than to point out the idiosyncratic limitations of each study (e.g., poor sample size, inappropriate questionnaire). Based on the gaps in the literature, I propose several different questions and I situate them within Bronfenbrenner's bioecological model for human development (2006). I limited the material included in the literature review to peer-reviewed textbooks and journal articles that I retrieved from the Education Resources Information Centre (ERIC) and SPORTDiscus databases. My literature review includes seminal articles and more recent studies that were published between 2015 and 2020.

2.2 LITERATURE REVIEW

2.2.1 Benefits of Childhood Physical Activity

Regular physical activity offers significant benefits for both children and adults. Carson et al. (2017) systematically reviewed 96 different research studies that investigated the relationship between physical activity and health indicators in children aged four years and younger. What the authors found was that interventions that targeted physical activity led to improved motor and cognitive development, psychosocial health,

and cardio-metabolic health. According to the authors, normal growth and development in younger children is contingent on adequate physical activity.

For school aged children (5-17 years of age), the impact of regular physical activity is equally significant. A review of 86 articles generated a list of seven health outcomes that were associated with lack of physical activity (Janssen & Leblanc, 2010). The health outcomes included: high blood cholesterol, high blood pressure, metabolic syndrome, obesity, low bone density, depression, and injuries. Each of these health outcomes were inversely related to physical activity. In other words, more frequent engagement in physical activity corresponded to lower incidences of each of the seven negative health outcomes.

New research is also shedding light on how physical activity affects children's mental health. Bailey et al. (2018) reviewed 16 studies involving mental health and physical activity. They concluded that school-based physical activity was highly effective in protecting children from mental illness. School-based physical activity promotes social interactions and builds resiliency, which the authors argued may help to reduce hopelessness, suicide, and self-harm.

The benefits of physical activity extend into adulthood, particularly in preventing chronic disease (Warburton & Bredin, 2017). Chronic diseases include cardiovascular disease, diabetes, cancer, hypertension, obesity, depression, and osteoporosis. Recent systematic reviews (e.g., Warburton & Bredin, 2017; Warburton, Nicol, and Bredin, 2006) point to physical activity as an effective method for preventing the onset of virtually all chronic conditions. Perhaps more surprisingly, physical activity mitigates and even reverses the effects of some chronic conditions, post-onset.

In sum, physical activity is beneficial and necessary for the wellbeing of adults (Warburton & Bredin, 2017; Warburton et al., 2006). In children, normal growth and development is contingent on adequate physical activity (Carson et al., 2017; Janssen & Leblanc, 2010).

2.2.2 Childhood Physical Activity Guidelines

In 2002, CSEP and Health Canada co-published physical activity guidelines for children and youth (Health Canada & Canadian Society for Exercise Physiology, 2002a, 2002b) that outlined exactly how much physical activity is needed. The guidelines stated that children should start with 30 minutes of physical activity per day and over the course of five months, progress to 90 minutes. Children could accumulate the 90 minutes in periods of at least 5 to 10 minutes. During the 90 minutes, children were to accumulate 30 minutes of vigorous and 60 minutes of moderate intensity physical activity. The guidelines also stipulated that children and youth should participate in a variety of physical activities to maximize health outcomes. Furthermore, children, youth, and adults were to reduce sedentary behaviours, such as sitting and watching television as much as possible.

Janssen and LeBlanc's (2010) systematic review examined the appropriateness of the Canadian guidelines for physical activity in children and youth. Their findings indicated that the 90 minutes of physical activity per day guideline exceeded the minimum required to bring about positive changes in many health outcomes. They found that as little as two to three hours of moderate to vigorous intensity physical activity per week was associated with significant health benefits. From a behaviour management perspective, guidelines that are set intentionally high may actually discourage physical

activity, especially for those in most need of physical activity (Brawley & Latimer, 2007; Warburton & Bredin, 2017).

Despite potential issues with the communication of minimum physical activity guidelines, most of the studies included in the systematic review, point to a linear dose-response relationship between physical activity and health outcomes. From a physiological standpoint, such findings justified CSEP's aggressive minimum physical activity guidelines (Janssen & Leblanc, 2010).

Janssen and LeBlanc's (2010) findings also shed light on the appropriate intensity for physical activity in children and youth. The majority of the studies that they analyzed suggested that most health outcomes are only achievable if children engage in a minimum of moderate intensity physical activity. However, they noted that only a handful of studies incorporated physical activity intensity into their designs. Janssen and LeBlanc's (2010) systematic review and those of others (e.g., Tremblay et al., 2010) concluded that cardio-metabolic conditions (e.g., blood cholesterol, high blood pressure, metabolic syndrome) and obesity were only mitigated through aerobic physical activity. In contrast, resistance training and other high-impact physical activity were more positively associated with healthy bone density. The findings of Janssen and Leblanc (2010), prompted new physical activity guidelines for children in 2011. CSEP, in cooperation with ParticipACTION and the Public Health Agency of Canada, concluded that there was enough evidence to reduce the minimum physical activity guidelines from 90 minutes of moderate to vigorous intensity physical activity per day to 60 minutes of moderate to vigorous intensity physical activity per day. Despite the linear dose-response relationship between physical activity and health outcomes, most of the increased health benefits occur within the initial 60 minutes of moderate to vigorous intensity physical activity.

Since 2011, CSEP (2018) has further amended their guidelines to also include walking, sleeping, and sedentary time. CSEP's new 24-hour movement guidelines recommend that 5- to 13-year-old children sleep 9 to 11 hours per night and 14- to 17-year-old children sleep 8 to 10 hours per night. The guidelines also stress the importance of consistent bed and wake times. CSEP further recommends that children accumulate at least 60 minutes per day of moderate to vigorous intensity physical activity. Children should also accumulate no more than two hours of sitting and screen time over a 24-hour period.

2.2.3 Childhood Physical Activity in Canada

The Canadian Health Measures Survey (CHMS) has measured physical activity in children and youth since 2007. In 2017, Colley et al. (2017) in conjunction with statistics Canada generated a report, which included the findings of all four cycles since 2007. Their aim was to compare and describe child and youth (6-17 years of age) adherence to four commonly cited interpretations of the 60 minutes of moderate to vigorous intensity physical activity per day guideline. The first interpretation considers guideline adherence to be 60 minutes of moderate to vigorous intensity physical activity per day when averaged across a week (e.g., Füssenich et al., 2016). This guideline recognizes that physical activity in children may not be the same each day of the week. For instance, a child might accumulate 3 hours on a Sunday, but only 20 minutes on Monday. The second interpretation considers guideline adherence to be 60 minutes of moderate to vigorous intensity physical activity every day of the week (e.g., Fulton et al., 2011). Individuals who, for instance, meet or exceed 60 minutes of moderate to vigorous intensity physical activity on one day but not on the next day do not meet this guideline, even if the daily average exceeds 60 minutes of moderate to vigorous intensity physical

activity. The third and fourth interpretations consider guideline adherence to be 60 minutes of moderate to vigorous intensity physical activity on either five days (e.g., Troiano et al., 2008) or six days (e.g., Colley et al., 2011) each week, respectively. In other words, a child might engage in 60 minutes of moderate to vigorous intensity physical activity on five or six days of the week but engage in less than 60 minutes of moderate to vigorous intensity physical activity on the remaining day or days. The child may also be sedentary on the remaining day or days.

Colley et al. (2017) analyzed the CMHS data by the four cycles, starting in 2007 and ending in 2015. Cycle 1 (2007-2009) included 1,473 participants, Cycle 2 (2009-2011) included 1,507 participants, Cycle 3 (2012-2013) included 1,328 participants, and Cycle 4 (2014-2015) included 1,300 participants. Although the samples included similar numbers of male and female participants, they did not include children who lived on indigenous reserves, lived in certain remote regions (e.g., high Arctic), or had parents who were in the Canadian Armed Forces. The researchers gathered moderate to vigorous intensity physical activity data from interviewer-administered questionnaires and accelerometers. The accelerometers recorded vertical and horizontal accelerations of the participants over a span of seven days. The researchers then converted these accelerations into physical activity intensity indices that quantified the frequency, duration, and intensity of the children's physical activity. The researchers organized the children's moderate to vigorous intensity physical activity by cycle, gender, age, and the four interpretations on guideline adherence.

With respect to varying interpretations of guideline adherence, Colley et al. (2017) concluded that between 2007 and 2015, only 5% of children between the age of 6 and 17 accumulated at least 60 minutes of moderate to vigorous intensity physical activity each

day of the week. The number of children aged 6 to 17 who accumulated 60 minutes of moderate to vigorous intensity physical activity on at least five or six days was only marginally higher at 6.8% and 10.1%, respectively. However, the calculated daily averages revealed that between 2007 and 2015, 35.6% of children met the 60-minute moderate to vigorous intensity physical activity guideline. Despite the discrepancies in adherence based of the different interpretations, the researchers stressed the significance that, at most, only one-third of Canadian children engage in enough daily moderate to vigorous intensity physical activity to accumulate significant health benefits.

Children and youth adherence to the 60-minute moderate to vigorous intensity physical activity guideline varied considerably by cycle. For instance, there was a 30% increase in the number of children accumulating a daily average of 60 minutes of moderate to vigorous intensity physical activity between Cycles 1 and 2 (41% versus 28.8%, respectively). In comparison, there was an 11% decrease in adherence between Cycles 3 and 4 (6.2% versus 5.5%, respectively). Despite the differences in adherence by cycle, the researcher stated that moderate to vigorous intensity physical activity differences across cycles did not pass the significance threshold.

Colley and colleague's (2017) analysis of gender difference in moderate to vigorous intensity physical activity revealed significantly higher average daily moderate to vigorous intensity physical activity levels in boys. Boys aged 6 to 17 accumulated daily averages of 64 minutes, 55 minutes, 64 minutes, and 64 minutes of moderate to vigorous intensity physical activity in Cycles 1, 2, 3, and 4, respectively. For the four cycles in total, boys accumulated a daily average of 62 minutes. In contrast, girls aged 6 to 17 accumulated a daily average of only 48 minutes across Cycles 1, 2, 3, and 4, respectively.

The study also found differing moderate to vigorous intensity physical activity levels across age groups. In each of the cycles, the average daily moderate to vigorous intensity physical activity was significantly higher in children aged 6 to 11 years than in children aged 12 to 17 years. When averaged over the four cycles, the younger age groups averaged 61 minutes per day. In contrast, the older groups only averaged 48 minutes.

In sum, Colley et al. (2017) reported that large swaths of Canadian children are not engaging in enough moderate to vigorous intensity physical activity to meet the Canadian guidelines. There is also no evidence to suggest that moderate to vigorous intensity physical activity levels amongst children had markedly changed since 2007 (Colley et al., 2017). Lastly, the results of the report point out that moderate to vigorous intensity physical activity engagements is substantially lower in older children (12 to 17 years of age) and in girls.

The low moderate to vigorous intensity physical activity engagement reported in the CHMS study aligned with the findings from the Canadian Physical Activity Levels among Youth (CANPLAY) study (Cameron et al., 2016). The CANPLAY study included pedometer data of 43,806 children and adolescents (22,132 boys, 21,674 girls, and aged 5 to 19 years) over eight cycles between 2005 and 2014. The researchers started by contacting the parents or legal guardians of a nationally representative sample of children. After obtaining consent, they mailed pedometers and instructed the children to wear the pedometers for seven consecutive days. After completion, parents were to mail back their children's daily step-count logs. The researchers then converted daily steps to minutes of daily moderate to vigorous intensity physical activity. To provide an example of how the researchers converted the data: 60 minutes of moderate to vigorous intensity physical

activity corresponded to a minimum of 13,000 steps per day for 6- to 11-year-old boys and 11,000 steps for 6- to 11-year-old girls.

Cameron et al. (2016) organized the children's step-count results by daily median steps, sufficient daily steps, and averaging fewer than 7,000 daily steps. The researchers included the prevalence of averaging fewer than 7,000 steps per day because it represents the typical daily step-count corresponding to a sedentary lifestyle (Tudor-Locke et al., 2013). The researchers did not provide a rationale for using median rather than average daily steps but perhaps it was to off-set positively skewed data.

Across the entire surveillance period (2005 to 2014), the CANPLAY study reported 10,935 median steps per day. Median steps per day were higher amongst boys across the eight cycles. In the most recent cycle, boys accumulated a median step-count of 10,932 and the girls accumulated a significantly lower step-count of 9,830. If steps per day are a proxy for moderate to vigorous intensity physical activity, then the CANPLAY findings point to the same phenomenon as the CHMS, which is that girls are significantly less active than boys.

Evidence on children's moderate to vigorous intensity physical activity and age also aligned with the CHMS study. Median steps per day were significantly lower with each successively older age group. For instance, data from the most recent survey (2012-2014) illustrated that median steps per day declined by approximately 1,000 steps with each five-year age increment (11,326 steps for 5- to 10-year-old children; 10,080 steps for 11- to 14-year-old children; and 8,488 for 15- to 19-year-old children). The difference between the youngest and oldest age group was 25%, which is similar to the 21% difference in average daily minutes of moderate to vigorous intensity physical activity

between the two age groups in the CHMS study (61 minutes for the 6- to 11-year-old children versus 48 minutes for the 12- to 17-year-old youth).

Findings from the CANPLAY study also revealed whether Canadian children and youth were taking enough steps to accumulate 60 minutes of moderate to vigorous intensity physical activity per day. The data showed that the prevalence of meeting the daily age and gender step-count criterion varied significantly over the eight surveys. During the 2012-2014 survey, only 7.8% of children met the minimum step-count criterion. In contrast, during the 2007-2008 survey 13.5% of children met the minimum step-count criterion. The 7.8 to 13.5% adherence rate for adequate daily steps between 2005 and 2014 is comparable to the 5% adherence rate published by the CHMS study.

The CANPLAY study (2016) also reported the prevalence of children who accumulated fewer than 7,000 daily steps. The results mirrored the gender and age results I reported earlier. More precisely, older children (15-19 years of age) were three times more likely (24% versus 7%) to accumulate fewer than 7,000 daily steps than their younger counterparts (5-10 years of age). With respect to gender, boys were significantly less likely to accumulate fewer than 7,000 daily steps. Furthermore, the prevalence of children from both genders and from all three age groups who accumulated fewer than 7,000 daily steps increased significantly between 2005 to 2014.

The CANPLAY study largely corroborates the CHMS findings. Most children in Canada are not active enough to meet the minimum daily step-count criteria. Moreover, girls and children over the age of 12 are particularly vulnerable to falling short of the minimum daily step-count. Girls and older children are also more likely to accumulate fewer than 7,000 steps per day, which is often described as the threshold for a sedentary lifestyle (Tudor-Locke et al., 2013). The CHMS reported an absence of any trend towards

increased engagement in moderate to vigorous intensity physical activity. The CANPLAY study not only confirmed this absence, but it reported a slight decrease in moderate to vigorous intensity physical activity between 2005 and 2015.

ParticipACTION (2018) incorporated the findings from the CHMS and the CANPLAY study into the ParticipACTION report card on physical activity in children and youth. The newest version of the ParticipACTION report card consists of eight different physical activity and health indicators. Notably, Canadian children scored a D+ for overall physical activity. Table 2.1 displays the latest ParticipACTION report card results along with global comparisons (Tremblay et al., 2016).

Table 2.1

Canadian and Global Childhood Physical Activity

Criterion	Grade (ParticipACTION, 2018)	Global Average (Tremblay et al., 2016)	Top Ranked Nation (Tremblay et al., 2016)
Overall Physical Activity	D+	D	Slovenia (A-)
Active Play and Leisure Activities	D	C	Netherlands, Ghana, and Kenya (B)
Active Transportation	D-	C	Netherlands (A)
Organized Sport Participation	B	C	Denmark (A)
Physical Education	C-	-	-
Sedentary Behaviours	D	D	Slovenia (B+)
Sleep	B+	-	-
24-Hour Movement Behaviours	F	-	-

Note. A comparison between physical activity indices in Canadian children and children from across the globe. The grades are assessed based on the following scheme: 20-39% criterion adherence constitutes a D grade (20-26% = D-; 27-33% = D; 34-39% = D+), 40-59% criterion adherence constitutes a C grade (40-46% = C-; 47-53% = C; 54-59% = C+), 60-79% criterion adherence constitutes a B grade (60-66% = B-; 67-73% = B; 74-79% = B+), and 80-100% criterion adherence constitutes an A grade (80-86% = A-; 87-93% = A; 94-100% = A+).

2.2.4 Child-Level Factors for Childhood Physical Activity Engagement

There are many factors that influence childhood physical activity engagement (Sterdt et al., 2014). Researchers often group factors into those related to children and to their context. Studies focusing on the child-level factors have shown that age, sex, motivation, physical competence, self-efficacy, and knowledge and understanding are particularly influential (e.g., Chen et al., 2017; Colley et al., 2017; Dishman et al., 2015; Timo et al., 2016).

As the CANPLAY and the CHMS reports pointed out, boys tend to be more physically active than girls. CHMS data showed that between 2007 and 2015, boys accumulated a daily average of 62 minutes of moderate to vigorous intensity physical activity while girls only accumulated 48 minutes (Colley et al., 2017). Girls were also less likely to accumulate 7,000 daily steps, which is the threshold associated with sedentary living (Cameron et al., 2016). Sterdt and colleagues' (2014) systematic review confirmed the significant relationship between sex and physical activity engagement. They found that in the 10 reviews they analyzed, boys between the ages of 5 and 17 were consistently more active than girls. It is noteworthy that in young children, toddlers, and infants (birth to 6 years of age), Hesketh et al. (2017) found no clear sex difference in physical activity engagement.

Researchers attribute sex difference in childhood physical activity engagement to gender norms surrounding physical activity participation (Branscum & Bhochhibhoya, 2016; Cairney et al., 2015; Määttä et al., 2019). In Canada, boys are more likely to participate in organized sports and therefore tend to remain more active than girls (Brunette et al., 2016). However, Norwegian researchers have recently reported the

opposite. That is, adolescent girls were more physically active and more likely to participate in organized sports than boys (Jakobsen & Evjen, 2018).

Age is another factor that is frequently associated with childhood physical activity engagement. The CHMS study found differing moderate to vigorous intensity physical activity levels across age groups (Colley et al., 2017). In every cycle conducted between 2007 and 2015, the average daily moderate to vigorous intensity physical activity was significantly higher in the 6- to 11-year-old age groups than in the 12- to 17-year-old age groups. Data from the CANPLAY study and Sterdt and colleagues' (2014) systematic review corroborated the age-related drop-off in childhood physical activity engagement (Cameron et al., 2016).

Age-related decline in physical activity may be linked to shifts in emotional and physical development (Martins et al., 2019). In terms of physical development, peak height velocity represents the period of maximal growth (Pangrazi & Beighle, 2013). On average, peak height velocity occurs in girls at about 12 years of age and 14 years of age in boys. The end of peak height velocity in girls typically coincides with the onset of menstruation. In boys, the end of peak height velocity coincides with the growth of the testes, pubic hair, and penis. This is related to increases in testosterone. Peak strength velocity, or the most rapid change in strength, also coincides with the end of peak height velocity in boys (Ross & Marfell-Jones, 1991). During this time, children's emotionality also develops. As children progress into adolescence, they learn to judge their own and others' behaviours, and they develop a sense of self and question their identity and how they fit in with others (Balyi et al., 2013). The rapid physical and emotional changes that occur between childhood and adolescence can cause children to be in disequilibrium, which might lead to temporary changes in coordination. Coupled with an increased

emotional awareness, children might become disenfranchised with some forms of physical activity, especially in competitive settings (i.e., organized sports).

A child's motivation for physical activity is one of the most important factors when it comes to childhood physical activity engagement (Whitehead, 2010b). A motivated child is willing and eager to be physically active (Whitehead, 2010b). Motivation theories concern themselves with the why and the how of human behaviour (Deci & Ryan, 1985). They attempt to shed light on why, for instance, a child chooses to partake in an activity and how they gather the impetus to do so. Early theories on motivation largely described motivation as a stimulus-response phenomenon (e.g., Freud, 1914; Hull, 1943). These theories viewed individuals as passive organisms that are pushed around by physiological drives and environmental stimuli (Deci & Ryan, 1985). Physiological drives and environmental stimuli would spur individuals into action but only so long as those actions were reinforced by positive outcomes related to basic needs (e.g., hunger, thirst, sex, avoidance of pain [Freud, 1915]). In the absence of meeting these needs, motivation would wane. Within such mechanistic theories, motivation was considered extrinsic to the individual (Deci & Ryan, 1985).

Mechanistic and extrinsic conceptualizations of motivation inadequately account for behaviours often observed in young children (Deci & Ryan, 1985). Young children tend to possess an insatiable curiosity to explore and interact with the world through movement. A toddler's relentless desire to walk or to seek out risky tasks, such as climbing down a set of stairs exemplifies this tendency. Toddlers are more likely to take such action for the benefit of the experience itself and not as a means to an end. Moreover, such behaviours are not contingent on positive reinforcement. In fact, children often continue behaviours despite repeated failure. For instance, imagine a child learning

how to walk. Their attempts are often marked by failure but they persist until they are successful.

White (1959) postulated a different conceptualization of motivation; one that would incorporate children's propensity for play and exploration that is not tied to extrinsic reinforcement. He argued that children own an innate desire to be effective agents in their environment. Children, in other words, are wired in their need to achieve competence. White (1959) referred to this innate desire as effectance motivation. Deci and Ryan (1985) incorporated effectance motivation into self-determination theory. The theory is based on the individual's need to be competent and self-determined (Deci & Ryan, 1985). Self-determination theory views individuals as active agents that initiate behaviours autonomously and volitionally. Their motivation is therefore intrinsic; that is, coming from within rather than in response to a stimulus and contingent on reinforcement.

Motivation is more than an intrinsic-extrinsic binary. A child can be both extrinsically and intrinsically motivated about aspects of physical activity. A child might also move towards intrinsic forms of motivation, but to initiate the behaviour, the caregivers might need to extrinsically motivate the child. For example, parents of a sedentary child might use television time as a way of coercing them into physical activity. Over time, the child's physical activity engagement may become less contingent on the reinforcement and instead driven by the inherent fulfilment of the activity.

Researchers have extensively studied the link between motivation and childhood physical activity. Teixeira et al. (2012) compiled the results of 66 empirical studies that linked motivation to objectively measured or self-reported physical activity. They concluded that physical activity engagement closely mirrored motivation in adults.

Encouragement, rewards systems, and other extrinsic motivators effectively promoted short-term physical activity engagement, while intrinsic motivation better predicted long-term physical activity engagement. The implications for this are that extrinsic motivators are useful or even necessary when reintroducing adults to physical activity. Their initial participation nurtures interest and might offer opportunities for success. The person might then start to enjoy physical activity and continue to engage, without extrinsic motivators spurring them into action.

Researchers have observed the link between motivation and physical activity engagement not just in adults, but children and youth as well. Fenton et al. (2014) measured the association between perceived types of motivation and moderate to vigorous intensity physical activity in 105 youth soccer players (mean age = 12.79 +/- 1.85 years). The researchers measured perceived motivation through a questionnaire, and they used accelerometers to measure moderate to vigorous intensity physical activity. They discovered that the players who perceived their motivation to be intrinsically sourced engaged in more moderate to vigorous intensity physical activity and less sedentary time than those that perceived themselves as motivated by extrinsic factors. The researchers also asked the players about their coaches' coaching style. What they found was that the players who demonstrated intrinsic forms of motivation were more likely to have coaches that employed autonomous coaching styles, whereby coaches offer players comparatively more freedom during training sessions. Deci and Ryan (1985) theorized about the importance of autonomy. They argued that individuals require a certain degree of freedom to engage in an activity in a way that they feel best reflects their internalized goals. If their engagement is tightly controlled, they are less likely to internalize the

behaviours (i.e., develop the intrinsic motivation) that lead to them persisting with the activity.

Dishman et al. (2015) showed that intrinsic motivation is also important for childhood physical activity engagement outside of the sporting context. The group studied 1,004 sixth and seventh-graders over the course of two years. They wanted to establish how intrinsic forms of motivation influenced objectively measured physical activity. Their results confirmed Fenton and colleagues' (2014) positive association between intrinsic forms of motivation and physical activity engagement with a larger and more diverse sample of children.

The extent and type of physical activity that children engage in largely depends on their physical competence (Whitehead, 2010c). Researchers, educators, and coaches typically categorize physical competence into skill-related and health-related components. Skill-related components include fundamental movement skills, such as locomotor, non-locomotor, and manipulative skills. Health-related components include muscular strength, muscular endurance, and cardiovascular endurance (Balyi et al., 2013). Health- and skill-related components afford individuals the tools to engage in physical activity. It is difficult to imagine a child riding a bicycle or swimming without knowing the basic skills associated with each physical activity.

Researchers from the University of Illinois (Figueroa & An, 2017) completed a systematic review of studies from the United States, the United Kingdom, Australia, Switzerland, and Finland that investigated how fundamental movement skills influenced preschoolers' physical activity engagement. The review confirmed that fundamental movement skills greatly impacted physical activity engagement. Children with higher

fundamental movement skill proficiency engaged in more physical activity during the preschool years.

Nurturing physical competence in young children pays dividends later in life. Lloyd et al. (2014) conducted a longitudinal study to determine the latent effect of preschool motor skill proficiency. Results from the 20-year follow-up showed that motor skill proficiency at the age of six was positively associated with physical activity participation at the age of 26. Timo et al. (2016) conducted a similar study, but instead of analyzing the link between physical activity engagement and objectively measured physical competence, they analyzed the link between physical activity engagement and child-perceived physical competence. They concluded that seventh graders who perceived themselves as being physically competent, were much more likely to be physically active in the twelfth grade. Whether perceived or objectively measured, the evidence overwhelmingly supports the importance of physical competence for lifelong physical activity engagement.

Some children have impairments that influence the way they express physical competence. Impairment refers to the functional limitations caused by a child's condition, whether physical or psychological (Anastasiou & Kauffman, 2013). With respect to physical activity, an impairment might be a spinal injury, which restricts a child to a wheelchair. For children with impairments, it can be more difficult to engage in physical activity. If the child has access to transportation, facilities with the necessary physical infrastructure (e.g., ramps, elevators), and community sports that welcome impaired children, then the child's impairment vis-à-vis physical activity might be negligible. However, if the child lacks adequate transportation and access to suitable facilities, then the impairment might be more substantial.

Impaired children tend to be less physically active than the general population (Wouters et al., 2019). Children with moderate to severe intellectual disability (e.g., Down syndrome, fetal alcohol spectrum disorder) appear particularly prone to inactivity (Sit et al., 2017). However, when there is enough support to counteract barriers to impaired children's physical activity their engagement significantly improves (Brunton, 2017). Willis et al. (2018) tested the effectiveness of a goal-directed, family-centred intervention. The intervention significantly improved physical activity participation outcomes for impaired children. Arbour-Nicitopoulos and collegues' (2018) literature review indicated that inclusive out-of-school physical activity programs were particularly effective in promoting impaired children's physical activity. Evidence from a systematic review further suggested that exergaming might be a practical solution to physical inactivity in impaired children (Rosly et al., 2017).

Children's physical activity engagement further hinges on their belief in their ability to succeed (Whitehead, 2010a). A child that believes they can run a mile without stopping is much more likely to attempt it than a child that lacks such a belief. Bandura (1997) referred to such beliefs (i.e., task-specific confidence) as self-efficacy.

Suton and colleagues (2013) measured the association between self-efficacy and physical activity engagement in 281 middle school children. Through questionnaires, the researchers measured how strongly children believed in their ability to complete physical tasks. What they found was that the children who they placed into the high self-efficacy group accumulated significantly more physical activity than the counterparts in the low self-efficacy group.

In a different study, Manley and colleagues (2014) examined the relations between self-efficacy, physical activity, aerobic fitness, and body composition. They also

evaluated whether a school-based pedometer intervention (i.e., providing students with a pedometer and asking them to track their steps) influenced these variables. The study included 116 participants, 11 to 13 years of age. The findings confirmed that the school-based pedometer intervention had no effect on self-efficacy levels, physical activity, aerobic fitness, or body composition. However, self-efficacy was associated with physical activity participation. Moreover, children with optimal body mass indices had significantly higher self-efficacy and more frequently engaged in physical activity.

Knowledge and understanding about the importance of regular engagement in physical activity represents another child-level factor that positively influences childhood physical activity (Whitehead, 2010a). A child who knows the basics about exercise, sleep, nutrition, physical fitness, the negative consequences of sedentary behaviour, and safety during physical activity is more likely to value and engage in physical activity (Longmuir et al., 2015; Whitehead, 2007).

Recent studies have shed light on how knowledge and understanding vis-à-vis fitness and physical activity influences physical activity engagement. Ferkel et al. (2014) compared health-related fitness knowledge, physical fitness, and physical activity. Their review suggested that health-related fitness knowledge can successfully predict physical fitness and physical activity participation in children and young adults. However, the direction of the relationship between health-related fitness knowledge and physical activity participation is not clear. It might very well be that a child that is physically inactive may resist learning about and disregard health-related fitness knowledge; while a child that is physically active might seek out this knowledge to validate their physical activity engagement.

Haslem et al. (2016) investigated how health-related fitness knowledge influenced adolescent physical activity participation. The study collected questionnaires from 280 adolescents. The questionnaires measured physical activity and health-related fitness knowledge. The study's multiple regression path analysis revealed that health-related fitness knowledge had a negative effect on amotivation. In other words, those adolescents who demonstrated high health-related fitness knowledge were less likely to lack motivation for physical activity.

Chen, Liu, and Schaben (2017) analyzed how health-related fitness knowledge influenced physical activity engagement in 660 eighth-grade students. The researchers measured health-related fitness knowledge by a standardized written test. To evaluate physical activity and sedentary behaviours, they used questionnaires. They then divided the participants into high, medium, and low health-related fitness knowledge groups. The analysis revealed that students in the high-knowledge group reported significantly higher physical activity and lower sedentary time than their counterparts in the low-knowledge group. Again, it is difficult to know the causal direction. It is unclear whether health-related fitness knowledge leads to regular engagement in physical activity or if regular engagement in physical activity leads to health-related fitness knowledge.

2.2.5 Context-Level Factors for Childhood Physical Activity Engagement

In addition to child-level factors, researchers have also intensely studied how childhood physical activity engagement varies by context. Researchers have linked children's physical activity engagement to their peers, their family, their involvement in organized sport, and their schools (Schaerz & Balderson, 2019).

Through frequent and reciprocal interactions, children's peer groups significantly influence development (Bronfenbrenner & Morris, 2006). Imagine a child biking with

friends for hours or a group of children spending an entire afternoon in an outdoor pool. It is difficult to imagine that such interactions do not significantly affect the developmental trajectory of children's physical activity behaviours.

Data from the *Growing Up in Ireland* national study (Garcia et al., 2016), among other things, investigated how peers and various social factors correlated to moderate to vigorous intensity physical activity in over 1,500 prepubescent children. They reported that time spent with friends significantly correlated with moderate to vigorous intensity physical activity in both boys and girls. That is, the more time they spent with friends, the more moderate to vigorous intensity physical activity they accumulated. For boys, perceived popularity strongly correlated with moderate to vigorous intensity physical activity. For girls, perceived sociability (i.e., extroverted versus introverted behaviours) rather than popularity correlated with their moderate to vigorous intensity physical activity. The study also correlated child-level factors (e.g., body composition) with moderate to vigorous intensity physical activity and screen time. They found that peers, sociability, and popularity closely correlated with moderate to vigorous intensity physical activity, while child-level factors closely correlated with screen time.

Pawlowski, Schipperijn, Tjørnhøj-Thomsen, and Troelsen's (2018) qualitative analysis studied the facilitators and barriers to school-recess physical activity. The authors interviewed 143 prepubescent children in Denmark and New Zealand. Analyses revealed that the most frequently cited reason for why children participate in physical activity was "just because my friends do" and "I like being together with my friends" (p. 45). Unfortunately, the same reason also compelled children to play video games and engage in other sedentary activities, despite preferring physical activity.

Much like the effect of peers, children's families influence their physical activity engagement (Jerina et al., 2018). A child with physically active parents and siblings is much more likely to engage regularly in physical activity. Physically active families normalize physical activity and children learn to value its positive effect on health and wellbeing.

Pujadas-Botey et al. (2016) investigated physical activity levels in Alberta children. They collected parental data and found associations between parental age and education and physical inactivity. Parental age negatively influenced parental physical activity involvement, which they argued may predispose them and their children to sedentary lifestyles. In other words, children with older parents might be less physically active than those with younger parents. Pujadas-Botey et al. (2016) also reported that children (5-13 years of age) of parents with little to no post-secondary education were more likely to be inactive than those with parents with college diplomas and university degrees.

Researchers have investigated the role of familial coactivity as a method for improving physical activity in children (Rhodes & Lim, 2018). Previous intervention studies showed that coactivity reduced sedentary time and increased physical activity in children (e.g., O'Dwyer et al., 2012). Research has also pointed out that parents' fitness and physical activity engagement significantly influenced the physical activity engagement of their children (e.g., Strutz et al., 2018; Yoon et al., 2018). To put it differently, fit parents are more likely to be physically active with their children.

Forthofer et al. (2017) studied the effects of various psychosocial factors on childhood physical activity. The researchers included a total of 1,857 children and parents from elementary and middle schools located in two school districts in the United States.

Their analysis revealed that parents' support for physical activity protected against declines in physical activity in their children; that is, parents who actively support their children's physical activity can have a positive long-term impact on their children.

Physical activity organizations further promote childhood physical activity engagement (Sterdt et al., 2014). According to recent data, over three-quarters of children participate in at least one organized sport over the course of the year (Canadian Fitness & Lifestyle Research Institute, 2018a). Soccer tops the list for most participation (Lethbridge Sport Council, 2019). Organized sport develops motor and psychosocial attributes that are prerequisite to both elite sports and lifelong physical activity (Coté et al., 2009; Goodway & Robinson, 2015).

Researchers have devoted much of their recent attention on the phenomenon of early sport specialization. Jayanthi et al. (2015) and Jayanthi et al. (2013) define early sport specialization as focusing on one sport at the expense of others. Research has provided evidence that early specialization is detrimental to movement skill proficiency, fitness, and long-term physical activity engagement, and also raises the likelihood of burnout, and injury (DiFiori et al., 2014; DiStefano et al., 2018; Jayanthi et al., 2015). Instead, experts recommend that children sample many different sports for as long as possible (Coté et al., 2009). Longitudinal evidence supports the fact that childhood involvement in a diverse number of sports positively relates to frequency of leisure-time physical activity in young adulthood (Kjønniksen et al., 2009; Robertson-Wilson et al., 2003).

Children spend about half of their waking hours at school until (Patton & McDougall, 2009). The relation between childhood physical activity and both curricular and extracurricular school activities has therefore been the topic of many research studies.

Culpepper et al. (2011) studied the effects of curriculum models on childhood physical activity. The trio found that the teaching games for understanding and sport education models corresponded to the highest physical activity participation. The teaching games for understanding model is an approach to physical education curriculum whereby all students, regardless of ability or skill level, are able to partake in a number of different games (Griffin & Butler, 2005). The sport education model uses sport as a vehicle for developing movement competence (Jewett et al., 1995).

Schools can also nurture physical activity through school-based physical activity initiatives. Cluss et al. (2016) conducted a 10-year longitudinal study during which they investigated the effectiveness of a district-wide, school-based health promotion initiative to increase elementary school children's physical activity. The school-based health promotion initiative provided opportunities for students to learn about health and physical activity along with opportunities to engage in structured aerobic activity outside of physical education class. Over the 10-year span, the researchers recorded a 293% increase in average physical activity engagement, which amounts to approximately 22.4 minutes for every year of the study. Several other studies have implemented extra-curricular physical activity interventions (e.g., run club, step-challenges) and in almost all cases, these interventions led to significant increases in childhood physical activity (e.g., Ordóñez Dios et al., 2019).

The importance of recess-based physical activity has garnered further interest among researchers (e.g., Tercedor et al., 2019). The time away from structured classroom settings allows children to participate spontaneously in physical activity with their peers (Erwin et al., 2012). Behrens et al. (2019) found that when schools encouraged physical activity during recess, they were able to make a significant contribution to children’s

physical activity time. In Table 2.2, I display a list of several additional context-level factors that researchers have linked to childhood physical activity.

Table 2.2

Context-Level Factors Related to Childhood Physical Activity

Factor	Sources	Summary
Active Transportation	Stanley et al. (2013) Pereira et al. (2017) de Moraes Ferrari et al. (2016) Jerina et al. (2018)	Children that walk and cycle to school are more physically active.
Technology Usage	Harrington et al. (2016) Garcia et al. (2016) Rutten et al. (2015)	Children who engage in excessive screen-based sedentary time (e.g., TV, gaming) are less likely to be physically active.
Facility Access	Pereira et al. (2017) Sterdt et al. (2014) Oliveira et al. (2014) Kim et al. (2017) Pawlowski et al. (2018) Harrington et al. (2016)	Proximity to swimming pools, playgrounds, fields, parks, gymnasia is linked to physical activity.
Weather	Stanley et al. (2013) Oliveira et al. (2014) Pawlowski et al. (2018)	Seasonal changes in weather influences physical activity. Wet and cold weather deters physical activity.

Notes. Studies listed in ERIC and SPORTDiscus since 2013 that have reported contextual-level factors related to childhood physical activity.

2.2.6 Qualitative Childhood Physical Activity Research

Qualitative researchers have attempted to capture children's physical activity-related perceptions and experiences (e.g., Pawlowski et al., 2018). Many of these studies have offered parents and children a voice in the childhood physical activity discourse, which typically remains undocumented in quantitative research. One such study was that of Ling et al. (2016) on parents' barriers to and strategies for supporting physical activity in their children. The parents and children were all part of Head Start, a program that provides low-income children and their families in the United States with support for early childhood education, health, and nutrition (U.S. Department of Health & Human Services, 2018). The study compiled interview data from 32 parents. The thematic analysis revealed several barriers related to physical activity, including lack of time, inability to access costly sport programs, short attention spans in children, lack of education, electronic media use, and unsafe environments. Parents demonstrated their support for family outings to parks and recreation areas and they expressed interest in enrolling in physical activity classes with their children.

Alvarez-Bogantes (2019) also studied parents' perceptions regarding their children's physical activity. More precisely, the researchers sought to learn about mothers' perceptions of the social support they provide for their children to engage in physical activity. The thematic analysis of the 15 interviews they conducted revealed that the mothers were aware of their children's physical inactivity and the need to support them in becoming more physically active. Mothers felt that cost, time constraints, lack of extracurricular-community activities, and unsafe environments deterred their children from being physically active.

Another qualitative study, conducted by Powell et al. (2019), explored physical activity during primary school physical education classes in the United Kingdom. The project consisted of individual teacher interviews, group child interviews, and observations. The researchers observed 138 children and interviewed 80 children and 13 teachers. Findings indicated that children were moderately to vigorously active for less than half of the 35-minute lessons. As one student said in the group interview, “we have to wait in a queue for our turn quite a bit” (p. 941). The researchers insisted that primary educators need to shift their perspectives towards a better balance between instruction and physical activity during primary physical education lessons. They called for professional development that targets teachers' knowledge and beliefs about the role of physical education in facilitating physical activity.

2.3 ANALYSIS AND SYNTHESIS

Most childhood physical activity researchers have employed quantitative methods. Of the 53 studies on childhood physical activity published between January and May of 2019, only five employed qualitative methods (see Table 2.3). Of those quantitative studies, most are non-experimental. Studies like those of Colley et al. (2017) and Cameron et al. (2016) on childhood physical activity rates in Canada are primarily descriptive. That is, they reported on childhood physical activity through measures of central tendency (i.e., mean, median, and mode) and variability (i.e., standard deviation [Gall et al., 2007]). Descriptive studies often provide inspiration for researchers. For example, 43 different studies have cited Colley and colleagues’ (2017) summary of childhood physical activity rates in Canadian children. Other research, for instance Garcia and colleagues’ (2016) analysis of the data from the *Growing Up in Ireland* national study use correlation or causal-comparative designs. Both designs investigate the

phenomenon *ex post facto* by establishing the existence and strength of relations between variables through regression analyses, hypothesis testing, and inferential statistics.

Table 2.3

Methods in Childhood Physical Activity Research

Method	Number of Publications
Quantitative	47
Qualitative	5
Mixed	1

Note. Results of ERIC and SPORTDiscus search for studies published between January of 2019 and May of 2019 (n = 53) pertaining to childhood physical activity, categorized by method.

The limitation to quantitative research is that it tends to reduce childhood physical activity engagement to simple cause and effect relations (e.g., Lloyd et al., 2014; Timo et al., 2016). Through tightly formulated questionnaires, accelerometers, and pedometers, researchers can collect objective data on physical activity and many other different characteristics. They can collect this data from large populations, calculate correlation coefficients, and—depending on levels of significance—generalize their findings to entire populations. Correlations are valuable in that they establish links and highlight areas that researchers need to further study. However, correlations cannot confirm causality. For example, the suggestion that motivation causes children to engage in physical activity would be misguided. Motivation is a complex construct and is as likely to be the outcome of physical activity engagement as it is to be the producer. In fact, some experts (e.g., Whitehead, 2010a) highlighted the complex bidirectional relationship between motivation and physical activity.

Childhood physical activity researchers' focus on quanta leaves little room for children and parents to share their perceptions and experiences. Perceptions are powerful modulators of behaviour (Ratey, 2001). Perceptions are a product of a child's senses and experiences. Experiences expose children to various stimuli that they then associate with existing memories. Positive experiences typically lead to positive perceptions whereas negative experiences lead to negative perceptions. Children's perceptions of their own abilities are not solely a product of objective features. For example, a coach's negative and abusive language might diminish a child's perception of their abilities despite their high score on and objective fitness test. In contrast, a child with low objectively measured fitness might positively perceive their abilities based on positive feedback from parents.

In both examples, the effect of children's perceptions on their abilities is likely to influence physical activity engagement, irrespective of their objectively measured fitness.

Quantitative research in childhood physical activity has provided objective insights into how various child-level and context-level variables correlate to physical activity. Inferential statistics has allowed researchers to generalize their findings to entire target populations (Gall et al., 2007). However, quantitative methods often fail in recording the words of participants (Creswell, 2015). Participants' perceptions and experiences cannot be interpreted using descriptive and inferential statistics, unless they are converted to scores (e.g., Likert scale). Pawlowski et al. (2018) wrote about the lack of understanding of facilitators and barriers related to recess physical activity in children. They blamed this on the overabundance of quantitative studies that have failed to integrate the perceptions and experiences of children. Given the limitation of quantitative methods and their overabundance in childhood physical activity research, there is a need for more qualitative studies that allow researchers to capture children and their parents' perceptions and experiences.

Developmental perspectives are also underrepresented in childhood physical activity research. Many different factors influence childhood development but it is ultimately the manner in which those factors converge that determines children's developmental trajectory (Bronfenbrenner & Morris, 2006). Several researchers (e.g., Obrusnikova & Miccinello, 2012; Pawlowski et al., 2018) have used socioecological perspectives to learn how intrapersonal, interpersonal, built environmental, political, and natural environmental factors interact to influence behaviours. However, socioecological models do not attempt to elucidate the processes that underpin the development of behaviours. The bioecological model purports that child development is the product of a

multitude of personal, temporal, and contextual factors (Bronfenbrenner & Morris, 2006). However, these factors exert their influence not onto human development directly, but onto meaningful interactions between the developing child and the individuals, objects, and symbols in the child's immediate environment. Despite the apparent applicability, childhood physical activity researchers have yet to employ this model in their studies on physical activity engagement.

2.4 THEORETICAL FRAMEWORK

Physical activity engagement is a developmental outcome, much like learning how to speak or walk. As is the case for other developmental outcomes, a complex web of factors influences physical activity engagement. To learn about the convergence of these factors and establish how they exert their influence on childhood physical activity, I applied Bronfenbrenner's bioecological model as the theoretical framework.

Bronfenbrenner's bioecological model of human development is a latter-day adaptation of his initial ecological model, outlined in his book *The Ecology of Human Development, Experiments by Nature and Design* (1979). The bioecological model is comprised of four interconnected elements, including proximal processes, person characteristics, context, and time. These elements simultaneously promote and deter human development. However, the effects of each element are not additive, instead each are part of an interactive system (Bronfenbrenner, 1999).

2.4.1 Proximal Process

Proximal processes are interactions that occur between a developing child and the individuals, objects, and symbols in the immediate environment (Bronfenbrenner & Morris, 2006). Proximal processes come in many forms, but there are several universal hallmarks. First, proximal processes are unique for each developmental outcome (e.g.,

motor proficiency, vocabulary development). Bioecological researchers across different fields therefore study different proximal processes. For example, Farrant and Zubrick (2012) described proximal processes related to child vocabulary development as parent-child book reading. In comparison, Nobre et al. (2014) described proximal processes related to motor development as physical activity. Parent-child book reading and physical activity are unique proximal processes that lead to entirely different developmental outcomes.

Second, proximal processes must be reciprocal to be effective (Bronfenbrenner & Morris, 2006). In other words, the developing child must engage with the individuals, objects, and symbols in the immediate environment, but those individuals, objects, and symbols must also engage with the developing child. The lack of reciprocity is the reason television and other screen-based technologies are often poor substitutes for social interactions. Research into the influence of appropriate parental affection on child health and development highlights the importance of reciprocity (e.g., Aunola et al., 2015; Hesse et al., 2018).

Third, proximal processes must be regular and long-lasting (Bronfenbrenner & Morris, 2006). Proximal processes that occur infrequently or over a short period of time may not generate enough momentum to lead to significant changes in a developmental outcome. For instance, Bilge et al. (2014) found that significant development of some skill-related components of movement (i.e., locomotor) only occurred if they were practiced three times per week.

Fourth, proximal processes must become progressively more complex over time (Bronfenbrenner & Morris, 2006). Development will plateau and eventually regress if the proximal processes that led to the outcome do not become more challenging. For

example, playing simple games of catch with a child will lead to the development of the locomotor, non-locomotor, and manipulative skills that enable a child to catch the ball and return it. However, the child's skill only develops in parallel to the activity. The absence of progressively more complex activities (e.g., catching fly-balls, high-speed ground balls, batting, running bases) likely means that the child will not be successful in a dynamic situation such as a baseball game. Researchers in sport science have long been aware of the importance of progression. For that reason, most sport governing bodies in Canada promote the long-term development for sport model (Balyi et al., 2013), which lays out a detailed and evidenced-based plan for activity progression.

Proximal processes are the engines of development (Bronfenbrenner & Morris, 2006). At this juncture, childhood physical activity research sheds little light on the proximal processes that underpin physical activity engagement, especially from the perspective of children and their parents. There is some evidence that highlights the modulating effect of parent-child coactivity on both parent and children's physical activity engagement (e.g., Cueto-Martin et al., 2018) but no qualitative research exists that illustrates how such coactivity takes form. For example, what are the nature of the interactions that occur during physical activity? Are there elements of reciprocity or are the interactions one-sided? How might coactivity promote physical activity engagement?

2.4.2 Child Characteristics

The biopsychological characteristics of the developing child promote and deter development. The effects of these characteristics are mostly indirect, mediated by how they promote or deter proximal processes (Bronfenbrenner & Morris, 2006; Tudge et al., 2016). Bronfenbrenner and Morris (2006) proposed three influential biopsychological characteristics: dispositions, resources, and demands. Dispositions are the inherent

qualities of the developing child's mind and character. Dispositions include motivation, self-efficacy, persistence, and temperament. Resource characteristics are the physical and cognitive attributes that promote and deter development. Examples include ability, knowledge, and fitness. Resource characteristics also include the experiences of the developing person, such as exposure to certain sports. Demand characteristics refer to physical traits such as sex, age, height, and impairments.

Bronfenbrenner and Morris (2006) wrote that "the characteristics of the person function both as an indirect producer and as a product of development" (Bronfenbrenner & Morris, 2006, p. 798). In other words, person characteristics are often the developmental outcome as well as important promoters and deterrents of the proximal processes that hone them. Bioecological researchers have identified many different characteristics that appear influential in children's development. In her study on socialization of moral behaviours in adolescents, Ochoa (2014) identified gender and age as most influential. Nobre et al. (2014) also listed gender and age as significant person characteristics in their study of motor development in Brazilian children. Benson and Buehler (2012) cited aggression as their primary person characteristic of interest in their study on peer deviance and adolescent aggression. Genetic makeup is another person characteristic that researchers have incorporated. An example of this is Maynard, Beaver, Vaughn, DeLisi, and Roberts' (2014) study of school disengagement amongst sibling-pairs.

With respect to childhood physical activity, motivation, self-efficacy, physical competence, knowledge and understanding, age, and sex are all well-established correlates. However, is the significance of these correlates evidenced in children's experiences? For example, are physically active children defined by experiences that

promote motivation? Do children need to have a vast repertoire of experiences that scaffold physical competence? In addition, if child characteristics indirectly influence developmental outcomes by way of proximal processes, how are childhood physical activity correlates, proximal processes, and sustained physical activity engagement connected?

2.4.3 Context

Much like the characteristics of the child, the immediate and distant physical, social, economic, and political environments (i.e., context) promote and deter the proximal processes that lead to human development (Bronfenbrenner & Morris, 2006). Bronfenbrenner (1979) described the context as nested systems that envelop the developing child. The most immediate system is the microsystem. The microsystem includes the developing child and the individuals, objects, and symbols that are regularly present in the child's life (e.g., family members, school, and sport clubs). Through regular interactions, those individuals within the microsystem greatly influence the developing child. For example, Cueto-Martin et al. (2018) found that parent-child physical coactivity improved physical fitness and physical activity participation of both the parents and the children.

Bronfenbrenner and Morris (2006) incorporated the person characteristics of the individuals that interact with the developing child into the microsystem. Through their dispositions, resources, and demand characteristics these individuals influence the developing child. For instance, Benson and Buehler (2012) reported lack of family warmth (i.e., love and affection) and peer deviance as important influencers of adolescent aggression. The microsystem also includes elements outside of the home. Schools and sport clubs can significantly affect children's development.

The next system within Bronfenbrenner's (1979) contextual sphere is the mesosystem. The mesosystem is a cluster of microsystems in which the developing child is directly situated. Children's development benefits from stability between the microsystems that make up the mesosystem. For example, in a mesosystem where school, family, and organizations (i.e., microsystem) are offering consistent messaging about the importance of physical activity (i.e., developmental outcome), childhood physical activity engagement is likely better protected than in a mesosystem where the messaging is inconsistent. Crosby et al. (2015) studied the effectiveness of school-based parental involvement on early literacy to evaluate how the mesosystem facilitated development. Their results indicated that school-based parental involvement led to improved levels of achievement in foundational literacy competencies. Other studies have found similar effects of school-based parental involvement on a variety of developmental outcomes (e.g., Benner et al., 2016; Park & Holloway, 2017).

Structures within the micro and mesosystem sometimes have indirect effects on the developing child. For example, stress in a parent's professional life might impact the developing child. Bronfenbrenner (1979) referred to the system that encompasses these structures as the exosystem. He wrote at length about the indirect impact of family socioeconomic status on child development. In support of this, he cited research from Head Start, a program that provides low-income children and their families in the United States of America with support for early childhood education, health, and nutrition (U.S. Department of Health & Human Services, 2018). The Public Health Agency of Canada operates a similar program called the Aboriginal Head Start in Urban and Northern Communities. The program funds Indigenous community-based organizations that offer culture and language, education and school readiness, health promotion, nutrition, and

social support. The program annually supports 4,600 to 4,800 Indigenous preschool children and their parents (Government of Canada, 2017).

The macrosystem is the outermost layer of the developing child's context (Bronfenbrenner, 1979). This system includes the religious, political, cultural, and social characteristics that affect the developing child. Researchers have reported on the devastating effects of geopolitical, ethnic, and religious conflicts on the development of children (Lester et al., 2013; Qouta et al., 2008; van Ee et al., 2012). Physical activity researchers have found that race, ethnicity, and culture also have a significant effect on how children are encouraged to take part in physical activity (e.g., Delaney et al., 2017). Koenen (2017) reported that women and girls worldwide, were less physically active than their male counterparts. In most cases, gender differences in physical activity traced back to religion, culture, tradition, and national policies.

Parents, peers, school, and physical activity organizations are the main context-level factors that influence childhood physical activity (Schaerz & Balderson, 2019). Researchers poorly understand the exact mechanisms by which these factors shape children's experiences and ultimately lead to sustained physical activity. For instance, are parents and peers as important as some researchers (e.g., Pawlowski et al., 2018; Pujadas-Botey et al., 2016) have suggested? If so, by what mechanisms do they influence children's physical activity engagement?

2.4.4 Time

The final element of the bioecological model is time (Bronfenbrenner & Morris, 2006). Time influences a child's development on three separate levels. Microtime is the first level and refers to the continuity and discontinuity of proximal processes. The second level is mesotime, which represents the time interval over which proximal processes

occur. Bronfenbrenner and Morris (2006) included both levels as important features of proximal processes. The third temporal level is macrotime. Macrotime focuses on the changes to elements identified by the bioecological model over time. For example, in reference to Elder's (1974) work, Bronfenbrenner (1979) wrote about the influence of the great depression on the development of children. He summarized that the effects of the great depression were different, depending on whether crucial periods of children's development aligned with the beginning, middle, or the end of the depression.

Technology and social media platforms are examples of objects and symbols that Bronfenbrenner and Morris (2006) included as features of the microsystem. However, the rapid emergence and availability of technology and social media platforms is a function of the change in time. Screen-time in children has steadily risen as a result of the macrotime shift in technology availability (Ponti et al., 2017). Although screen-time generally has a negative effect on physical activity engagement (Potter et al., 2018), recent research showed that exergames that combine video games and various physical activity tasks positively influenced physical activity engagement in children (e.g., Zan & Ping, 2014; Zan et al., 2015). Questions remain about how artifacts of the information age exert their influence on childhood physical activity engagement. There may also be additional and previously undocumented temporal factors that influence children's physical activity.

2.4.5 Interaction between Bioecological Elements

Child characteristics, context, and time can significantly promote and deter the development of children. In most cases, personal, contextual, and temporal characteristics do not directly affect the development of the child. Instead, these characteristics affect the quality of proximal processes. For example, socioeconomic status might not directly lead

to low physical activity in children. However, it might influence how long and how frequently a parent is physically active with their child (e.g., riding a bike, playing catch, swimming). Socioeconomic status might also determine whether parents can afford to purchase a bike for their child or register them in swimming lessons.

In their influence on proximal processes, the effects of personal, contextual, and temporal characteristics are interactive, rather than additive. A macrosystem characteristic might interact with a person characteristic. The effect of this interaction would manifest in the quality of the proximal processes related to a developmental outcome. For instance, some cultures might deter girls from becoming physically active (Koenen, 2017). In such cultures, the proximal processes that lead to regular engagement in physical activity might lack required elements such as reciprocity and increasing complexity. Figure 2.1 summarizes the potential interaction between various bioecological factors.

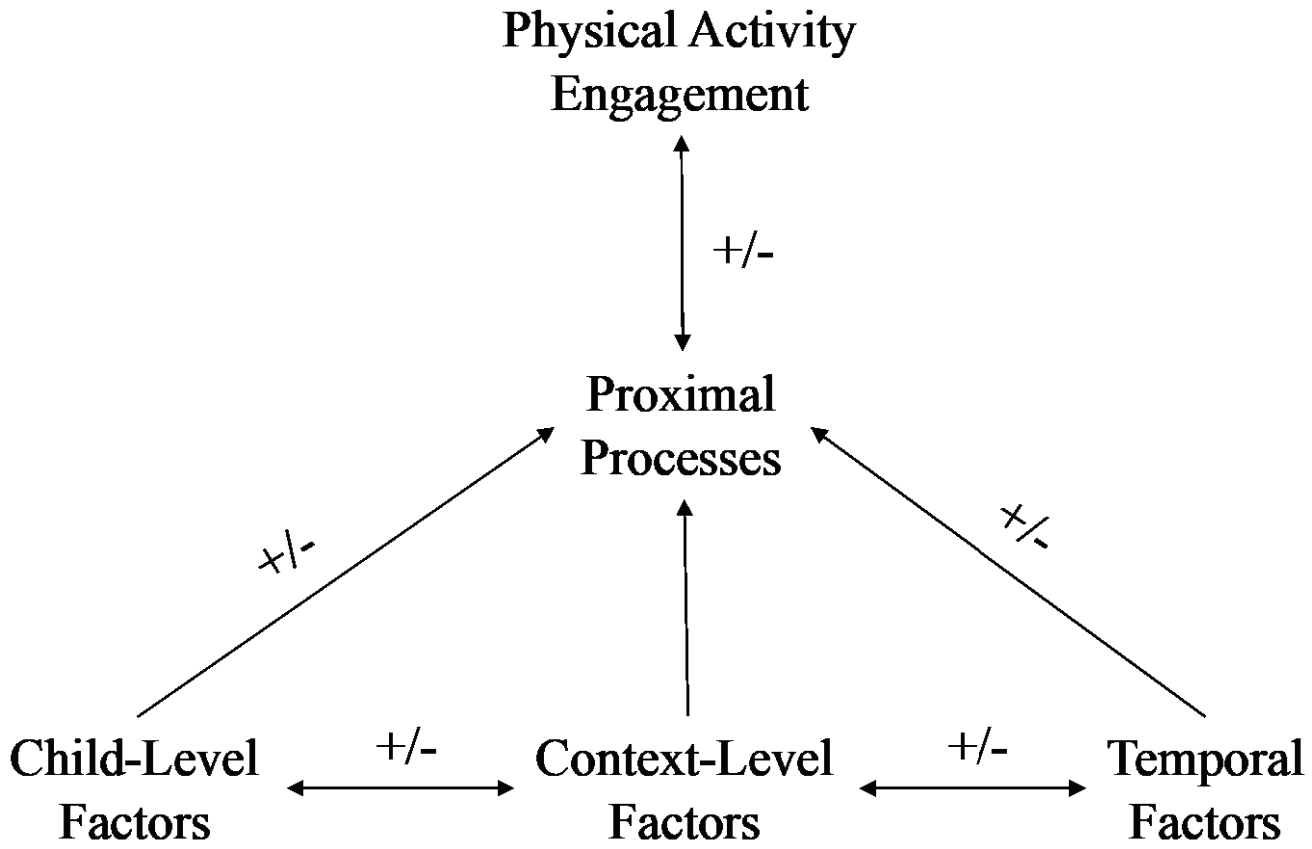

Figure 2.1. Proximal processes promote or deter (+/-) development (i.e., physical activity engagement). Proximal processes mediate the promoting or deterring effects of child-level, context-level, and temporal factors on development.

CHAPTER 3: METHODOLOGY

3.1 RESTATEMENT OF PURPOSE, PROBLEM, AND RESEARCH QUESTIONS

The majority of Canadian children are not accumulating enough physical activity (Cameron et al., 2016; Colley et al., 2017). Researchers have extensively studied the correlates of childhood physical activity (e.g., Pereira et al., 2017, Sterdt et al., 2014) but none have studied childhood physical activity from a qualitative, bioecologically-oriented developmental perspective. The purpose of this project is to interview children and their parents and learn about the bioecological mechanisms that promote or deter childhood physical activity engagement.

3.1.1 Research Questions

I pose the following questions in accordance with each element within the bioecological model (i.e., developmental outcome, person, process, context, time):

I. What childhood physical activity preferences are evident in children and their parents' perceptions and experiences?

II. What proximal processes related to childhood physical activity are evident in children and their parents' perceptions and experiences?

III. How do the child characteristics that children and their parents perceive as important physical activity determinants promote and deter childhood physical activity engagement?

IV. How do the contextual elements that children and their parents perceive as important physical activity determinants promote and deter childhood physical activity engagement?

V. How do the temporal elements that children and their parents perceive as important physical activity determinants promote and deter childhood physical activity engagement?

3.2 RATIONALE FOR METHODOLOGY

A broad range of ontological and epistemological assumptions overarch human development, particularly within the context of childhood physical activity. The ontological and epistemological conceptualizations that are potentially suitable for the process of research inquiry related to my work include positivism, post-positivism, and constructivism.

Positivism postulates that features of the social environment exist independently of the individuals who create them (Gall et al., 2007). Therefore, everyone exists within a single reality. Positivist believe that knowledge is objective and measurable (Hutchinson, 1988). A childhood physical activity researcher who takes a positivist approach might study the effects of an intervention on childhood physical activity. The researcher approaches the problem on the assumption that the intervention directly affects the child's physical activity, and that the child plays no part in its effectiveness. The researcher's role is to discover and collect knowledge and present it in an unbiased and neutral manner (Brinkmann & Kvale, 2018). To borrow from Brinkmann and Kvale's (2018) work, positivist researchers are like miners. They discover knowledge that resides in the participants and once collected, that knowledge remains uncontaminated.

Much like positivists, post-positivists subscribe to the notion of a single reality (Creswell & Plano-Clark, 2017). However, they abandon the idea of provable objective truths. Researchers can collect evidence that allow them to refute the absence of objective truths (Gall et al., 2007). To put this into an example, a researcher cannot prove a causal

link between childhood obesity and physical inactivity, but he or she can provide evidence that refutes the absence. To refute the absence of objective truths, post-positivist researchers generally test hypotheses, make thoughtful decisions about sampling, demonstrate validity and reliability, and employ inferential statistics.

Constructivists insist on the existence of multiple realities, wherein individuals interact and construct themselves (Gall et al., 2007). Individuals therefore construct unique social realities. A constructivist childhood physical activity researcher might insist that childhood physical activity is a product of the interactions between parents, children, educators, coaches, and others. Constructivism subscribes to the notion that features in the social environment do not have meaning apart from what individuals construct for them (Gall et al., 2007). Therefore, constructivists typically reject the existence of absolute truths.

Interpretations of the world are unique to each individual. For instance, a child might interpret physical education as discouraging. In comparison, an educator might interpret physical education as fun. The unique interpretation of the educator and the child influences their respective actions. The educator likely encourages the child to participate, whereas the child might want to withdraw. In this example, the divergent interpretations likely influence the physical activity engagement of the child.

Constructivists operate under the understanding that knowledge is not discoverable; instead, individuals construct knowledge. Constructivism falls in line with postmodern conceptions of knowledge such as the narrative, the linguistic, the contextual, and the interrelated manner in which individuals create knowledge (Brinkmann & Kvale, 2018). Researchers guided by constructivism are akin to travellers. On their journey, they

observe, and they engage in conversations. In-so-doing, they hear stories and actively participate in attributing meaning to those stories (Brinkmann & Kvale, 2018).

Constructivism, and in particular constructivist ontology rests on the seminal work of three influential thinkers: Jean Piaget (1954), Lev Vygotsky (1926), and Jerome Bruner (1966). Their contributions and especially those of Piaget have been subject to criticism and have evolved since they were first conceived. For instance, Lev Vygotzky's work on sociocultural perspectives, suggested that cultural background may significantly alter the stages of development proposed by Piaget (Yasnitsky, 2012). Nonetheless, their contributions still inform our understanding of human development today. Table 3.1 summarizes Piaget, Vygotsky, and Bruner's contribution to constructivism and development. Table 3.1 also outlines the ontological alignment between their work and Bronfenbrenner and Morris' (2006) bioecological model.

Table 3.1

Constructivist Thinkers and Alignment with the Bioecological Model

Scholar	Contribution	Alignment with the Bioecological Model
Jean Piaget (1954)	Theory of cognitive development – development as a multistage process whereby the individual's cognition emerges from a series of linked experiences. He viewed human development in relation to the child and not necessarily the individuals that the child interacts with or the context in which the child finds themselves.	Aligns with the importance of the biopsychological characteristics of the child in human development.
Lev Vygotsky (1926)	Zone of proximal development – child development is contingent on social aspects; that is, interactions with adults, more capable peers, and cognitive tools lead to development. Focus on social constructivism, whereby the social context is as important as the individual.	Aligns with the importance of the context (i.e., microsystem, mesosystem, exosystem, macrosystem) in shaping human development.
Jerome Bruner (1966)	Scaffolding – provides a blueprint for developmentally promotive interactions between children and adults. Development is supported, or scaffolded, by adults. As children grow more competent, the scaffolding is incrementally removed.	Aligns with the importance and centrality of proximal processes in human development

Considering the focus of my research and the ontological alignment with the bioecological model, a constructivist epistemological stance is best-suited. Several qualitative childhood physical activity researchers have used constructivist epistemology to frame their studies (e.g., Alvarez-Bogantes, 2019; Pawlowski et al., 2018). The lived experiences of children shape their physical activity engagement. There are many experiences that children share (e.g., attending school or taking part in organized physical activity); however, the significance of these experiences is subject to each child's perceptions. As a researcher, I seek to understand the experiences related to the central themes and how they relate to perceptions. Positivist and post-positivist epistemological frameworks, central to which lie notions of objectivity and truth, are simply not appropriate considering the centrality of experience, meaning, interpretation, and human interrelation in my research.

3.3 METHODOLOGY

Constructivist-informed research seeks qualitative knowledge as expressed in everyday language (Brinkmann & Kvale, 2018). To answer my research questions, I am looking for nuanced accounts of children's physical activity. I might wish to learn more about the nature of physical activity participation at school. For instance, how does recess-based physical activity take shape? Qualitative approaches that focus on thick description of social contexts and phenomena are best-suited for research problems that are embedded in constructivist ontology and epistemology (Marshall & Rossman, 2014).

Qualitative researchers take a bottom-up, or inductive approach, whereby themes and patterns emerge from the data (Gall et al., 2007). The data collection methods reflect the inductive nature of qualitative research. For instance, researchers might use interviews to glean insight into a phenomenon. The researchers format the interview topics in a way

that provides enough guidance to remain on topic, but not so much as to restrict the participants' responses. The amount of structure researchers provide depends on the research questions and the participants, but the goal is always to capture meaningful and rich responses.

3.4 METHOD

Qualitative researchers have several data collection methods at their disposal. The most frequently used methods are interviews, observations, and questionnaires (Gall et al., 2007; Marshall & Rossman, 2014). Qualitative researchers that study childhood physical activity engagement overwhelmingly employ interviews to collect data (e.g., Alwhaibi & Aldugahishem, 2019; Columna et al., 2019; Wright et al., 2019).

Kvale (1996) defined interviews as conversations between two or more individuals on a topic that is of mutual interest. Interviews can be tightly structured, as is the case in standardized open-ended interviews. They can also be unstructured, as is the case in informal, conversational interviews (Gall et al., 2007). My approach incorporated a guided topical interview style, which lies somewhere between the structured and unstructured interview. I generated a list of topics to discuss with the interviewees. The topics aligned with the broad research questions (p. 54). The questions were open-ended and included follow-up questions. Interviewees' answers can at times be ambiguous or even contradictory (Brinkmann & Kvale, 2018). The follow-up questions allowed me to elucidate whether such ambiguities and contradictions are due to communication or due to the interviewees' genuine experiences and perceptions.

3.5 PARTICIPANTS, RECRUITMENT, AND SETTING

3.5.1 Participants

Sixteen children (seven boys, nine girls; mean age of 11.5 years) and 11 parents (three mothers, eight fathers; mean age of 42 years) participated. I recruited prepubescent children for two reasons. First, the prepubescent years represent an important window in the development of physical activity habits (Whitehead, 2010c). Second, prepubescent children possess the intellectual and emotional maturity I felt was important to elicit the type of responses needed to answer my research questions. To elaborate, prepubescent children possess the intellectual capacity to think reasonably about concrete objects and events that they have experienced (Balyi et al., 2013). Generally speaking, prepubescent children are good at expanding their thinking from specific examples to general principles (Balyi et al., 2013). From an emotional perspective, prepubescent children can judge their behaviours and articulate how they differ from others (Balyi et al., 2013).

3.5.2 Recruitment

I recruited children and parents by way of the social media post presented in Appendix 2. I published this post on both Facebook and Instagram. I based recruitment on content and participant saturation, which required only a single social media recruitment campaign. I discuss saturation in Chapter 4.

3.5.3 Setting

During the data collection of this investigation, seven of the 11 participant families resided in Lethbridge Alberta, Canada. With just over 100,000 inhabitants, Lethbridge is the third largest urban center in Alberta, behind Calgary and Edmonton (City of Lethbridge, 2019). Lethbridge is located approximately 130km from Waterton Lakes National Park. Its proximity to the southern Canadian Rocky Mountains

contributes to mild winters (Environment Canada, 2019), making year-round outdoor physical activity more appealing than in other Canadian cities. There are just over 100 sport and recreation organizations and businesses in Lethbridge. An estimated 15,000 children annually register and participate in organized physical activity. The most popular physical activity, based on active memberships, is soccer with 2,200 members (Lethbridge Sport Council, 2019). The remaining four participant families resided in other communities within the province of Alberta during the data collection. One family resided in Calgary, which is located approximately 215km north of Lethbridge. The other three families resided in smaller rural towns within close proximity of Lethbridge.

3.6 DATA GATHERING AND TRUSTWORTHINESS

3.6.1 Demographic Survey

An important aspect of qualitative research is understanding the participants. The demographic surveys served to augment the thick description of children and their parents' experiences and perceptions with specific information pertaining to aspects such as family finances, age, gender, and organized physical activity participation. The data from the demographic survey is presented primarily in a descriptive, rather than comparative form in Chapter 4. Table 3.2 includes all demographic survey questions in full.

Table 3.2

Demographic Survey Items

Item	Question
1.	What is your name?
2.	What is your age?
3.	What is the name of the participating child (or children)?
3.	What is your relationship to the participating child (or children [e.g., mother, father])?
4.	What is the age of the participating child (or children)?
5.	What is the gender of the participating child (or children)?
6.	What is your home address?
7.	What is your highest completed level of education (e.g., High School, Master's Degree)
8.	What is your after-tax household income?
9.	What is the name of the school that your participating child (or children) attend(s)?
10.	Has your child (or children) participated in organized sport(s) in the past? Is your child (or children) currently participating in organized sport(s)? If so, please name the sport(s).

Note. Demographic survey administered to parents using the secure Qualtrics survey platform.

3.6.2 Physical Activity Journal and Pedometer

I sent a packaged and previously unopened digital pedometer (Multifunctional Sport Pedometer, Pingko, inc.) to each of the children in the mail prior to the start of the investigation. The pedometers offered objective insight into the children's physical activity engagement over the course of one week. I instructed the children to wear the pedometers for seven consecutive days and record the daily steps in the physical activity journal at the end of each day. The seven-day recoding period is consistent with the valid and reliable Canadian Assessment for Physical Literacy (Francis et al., 2016; Longmuir et al., 2015). Some pedometers have sending and receiving capabilities and the step-count data is automatically uploaded to fitness applications. The pedometers that I sent to the children did not have such capabilities and thus did not pose privacy concerns.

In addition to the pedometer data, I instructed children to journal their day's physical activity for the seven-day period. I included a sample page from the physical activity journal, along with the perceived exertion scale in Appendix 3. The first two items in the physical activity journal helped me generate a detailed description of the children's physical activity engagement. The first item, the pedometer tracking log is a valid and reliable tool for monitoring childhood physical activity engagement (Craig et al., 2010; Longmuir et al., 2015; Tudor-Locke et al., 2005) and has been implemented extensively in childhood physical activity research (Cameron et al., 2016; Colley et al., 2017). The second item allowed the children to document their perceived level of exertion for the purpose of elucidating physical activity intensity. The 10-point rating of perceived exertion scale is a valid and reliable instrument for monitoring physical activity intensity in children (Yelling et al., 2002). The third, open-ended item allowed the children to elaborate on the day's physical activity. The physical activity journal entries, in particular

the written responses to the third item, guided the interview conversations with both the children and their parents.

3.6.3 Interview

The children and their parents each took part in one, 30-45-minute interview. Children and parent interviews were individual interviews, but I allowed parents to attend their children's interviews if they desired. Likewise, the children were permitted to attend the parent interviews. Of the 27 interviews, two were children-parent joint interviews. As previously stated, I chose a guided topical format for the interview. My format did not have a predefined question sequence; instead, I organized the interview conversation primarily around comments from the physical activity journals that aligned with my research questions. The comments that I selected generally pertained to two different topics: 1) interactions with others; and 2) factors that helped promote or deter physical activity. I asked the children and their parents to specify and elaborate on the comments related to 1 and 2. Table 3.3 exemplifies how I generated the interview discussion topics.

Table 3.3

Sample Interview Schedule

Topic	Example Physical Activity Journal Comments	Example Interview Questions
Interactions with others	*I played soccer at recess with my friends.*	Children question and follow-up: *Can you tell me a little bit more about your recess soccer game on [day]? How did you decide on soccer? How do you decide on teams?* Parent question and follow-up: *Can you tell me a little bit more about [child's] physical activity at school? As far as you know, how does recess play out for [child]?*
Factors that helped promote or deter physical activity	*My physical activity has plummeted since the start of the coronavirus-disease-2019 (COVID-19) pandemic.*	Children question and follow-up: *You wrote in your physical activity journal that your physical activity has plummeted since the start of COVID-19, can you tell me how you think COVID-19 has affected your physical activity? What would help you return to a physically active lifestyle?* Parent question and follow-up*: [children] wrote about the impact of COVID-19. Can you tell me how COVID-19 has impacted [child's] physical activity? What is it about COVID-19 that is to blame for the reduced physical activity?*

3.6.4 Trustworthiness

Trustworthiness is the cornerstone of good qualitative research (Marshall & Rossman, 2014). To establish trustworthiness, Lincoln and Guba (1985) suggested that researchers engage in member checking. Member checking refers to the iterative process of ensuring that the researcher's interpretations accurately reflect the perceptions and experiences of the children. To that end, I provided the children and their parents with a detailed description of my interpretation so that they could determine whether I accurately and sufficiently captured their perceptions and experiences.

Triangulation is another hallmark of trustworthy research (Lincoln & Guba, 1985). Qualitative researchers triangulate their work by gathering data from multiple sources (Marshall & Rossman, 2014). Accordingly, I gathered both the children and their parents' perceptions and experiences and employed three data gathering tools: demographic surveys, physical activity journals, and interviews. Across these data sources and gathering tools arose several consistent themes that I present in Chapter 4.

Trustworthy qualitative research should culminate with peer-debriefs (Lincoln & Guba, 1985). Peer-debriefs involve the primary researchers and a like-minded colleague. Together, they critically review the research data and discuss their interpretations and disclose diverging interpretations if they arise. Upon completion of the thematic analysis, I met with my supervisor and discussed my interpretations.

I also acknowledge that interviewing children presents itself with unique challenges to trustworthiness. Of all types of interviewees, children are the most prone to the interviewer leading the questions (Docherty & Sandelowski, 1999). For that reason, I grounded most of my interview questions in the comments that the children offered in their physical activity journals. For example, I only asked about the impact of organized

physical activity if the children mentioned it in their physical activity journal or previously in the interview. For the follow-up questions and probes, I encouraged children to share specific examples to validate their responses to the initial questions.

3.7 ETHICAL CONSIDERATIONS

Prior to collecting data, I sought ethical approval from the Office of Research Ethics at the University of Lethbridge. Ethical research must be appropriate, safe, and consistent with the current version of the Tri-Council Policy for the Ethical Conduct of Research Involving Humans. I received approval from the office of Research Ethics on May 19, 2020 (Appendix 4).

I asked the parents to complete the written parental consent forms for their children, as well as the consent forms for the parents' participation. To ensure that participation was consensual and un-coerced, I acquired informed assent from the children. Assent refers to a child's affirmative agreement to participate in research. The Tri-Council Policy Statement for Ethical Conduct for Research Involving Humans states in section 3.10 that assent must be gathered from all persons that have some ability to understand the significance of the research and that the participatory wishes of those persons must be respected (Government of Canada, 2020). I included the consent and assent forms in Appendix 5.

3.8 LIMITATIONS AND RESEARCHER BIASES

I devoted this research to the collection of perceptions and experiences and the subsequent reporting of themes that highlight aspects of the lived experiences of children and their parents. I generated several hypotheses that explain how the developmental processes that underpin the children's' physical activity take shape. I did not test these hypotheses, nor did I generalize the findings to a specific target population.

Bronfenbrenner and Morris (2006) wrote that both subjective and objective forces drive human development. In other words, the perceptions and experiences of the developing person, along with physical features in the environment influence how children develop. My intent was to investigate the perceptions and experiences of children and their parents. I did not intend to quantify the effects of various factors on human development.

Possible sources of error include the data sources (i.e., children and their parents) and me. It is possible that the children failed to accurately portray their perceptions and experiences. Despite communicating to children that I am not looking for right or wrong answers, the children may have felt that they ought to answer questions in a certain way, perhaps by overstating or embellishing certain aspects of their physical activity journey. As they come to know me as a researcher that studies physical activity, the children and their parents may have overstated certain aspects. To counter such sources of error, I focused on eliciting follow-up responses that contained supporting examples.

It is also possible that I failed to accurately interpret the responses from the children. I have a working understanding of the mechanisms behind childhood physical activity engagement and there existed the risk that I inadvertently posed questions or interpreted the data in a way that confirmed either my own biases or agreed with existing frameworks. To counteract the negative impact of assumptions and biases, Marshall and Rossman (2014) wrote that qualitative researchers should engage in frequent self-reflection during the research process. They should keep detailed field notes that describe how their assumptions and biases influence their research. Qualitative researchers call this process bracketing (Newman & Tufford, 2010). During the data collection and interpretation phases, I kept a research journal that I updated on an almost-daily basis.

The journal contains my day-to-day reflections and my thought processes. It also includes a detailed account of potential biases and assumptions and how I dealt with them. For an excerpt of my journal, please refer to Appendix 1.

3.9 DATA COLLECTION PROCESS

The data collection began with a welcome email to the participating parents. The welcome email included the link to the demographic survey, the consent and assent forms, and an electronic copy of the physical activity journal. In the welcome email, I also asked parents to confirm a 15-20-minute information video-conference (Zoom Video Communications, Inc.). The information video-conferences, which occurred in the last week of May 2020, allowed me to achieve the following: 1) introduce myself to the children and their parents; 2) explain the research process (i.e., informed consent, assent, the right to withdraw at any point without repercussion); 3) ask the parents and children to digitally sign and return to me by email the informed consent form for the parent's participation, the parent's consent form for the child's participation, and the assent form for the child's participation; 4) ask parents to complete the demographic survey using the Qualtrics platform; 5) explain to the children how to operate the pedometers and how to fill out the physical activity journal; and 6) schedule the child and parent interviews.

When I received the signed consent and assent documents and the demographic survey, I mailed the pedometers and a hard copy of the physical activity journal to the children. Once the children completed their seven-day physical activity journals, I collected the scanned copies via email. I carefully read through each child's physical activity journal and highlighted the comments that I wanted to focus on during the interview.

I scheduled the interviews on a family-by-family basis; that is, I completed all the interviews with one family (child and parent interviews) before I started with the next family. I interviewed all the children and their parents using Zoom's video conferencing platform (Zoom Video Communications, Inc.). Before starting the interview, I reminded the children and their parents of their right to withdraw at any point, without repercussions. I also communicated that there were no right or wrong answers to the interview questions and that I was merely interested in hearing the children and their parents' thoughts. I employed the Zoom-embedded recording feature to record the interview. In order to protect the children and their parents' privacy, I recorded the meeting directly to my computer rather than to the Zoom platform (i.e., cloud). To prevent security breaches, I password protected the Zoom meeting and enabled the waiting room feature.

CHAPTER 4: RESULTS

This chapter offers a detailed description of the analytic and interpretative steps that I took to manage the data of this investigation. I offer a detailed account of how I processed the interview audio, physical activity journals, and demographic surveys. I also include the details on how I determined participant and content saturation. I devote the remainder of this chapter to unpacking the content of the thematic analysis. I organized the results by the major themes, which include physical activity engagement, coactivity, child characteristics, others, community, and public health restrictions. I subdivided these themes into more precise categories. For instance, I subdivided coactivity into adult-directed and child-directed coactivity. Figure 4.1 summarizes the results of the thematic analysis.

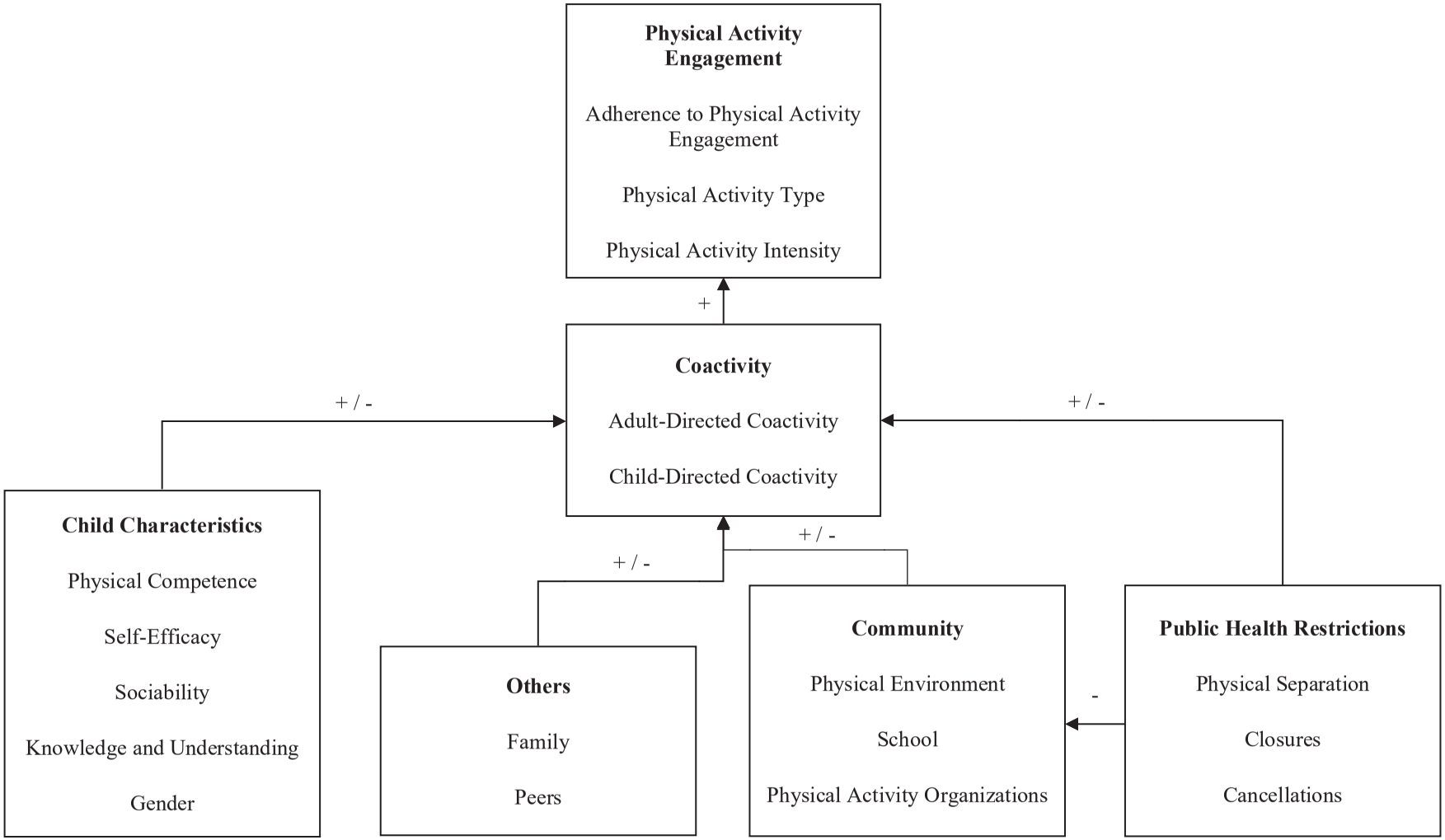

Figure 4.1. Results of the thematic analysis. Data sources include child and parent interviews, child physical activity journals, and parent demographic surveys. Promoting effects (+) and deterring effects (-).

4.1 ANALYSIS AND INTERPRETATION

I started the analysis and interpretation phase of this investigation with the demographic survey. I instructed parents to complete these surveys in advance of the interview. Once I received them, I copied all the information into an Excel spreadsheet; Microsoft Corporation, Microsoft Office (2016). I pooled the participants by family and gave each of them pseudonyms, which I applied to all the data sources (i.e., physical activity journals, transcripts). I used all data sources (i.e., demographic surveys, physical activity journals, interviews) to generate the accompanying tables and figures.

To analyze the child and parent transcripts and the open-ended portion of the physical activity journal, I used NVivo qualitative data analysis software; QSR International Pty Ltd. Version 12, 2017. I analyzed the data sources in the same order as I conducted the interview (i.e., by family and always ending with the parents). As a framework for analyzing the interview text, I applied Marshall and Rossman's (2014) analytic phases. The first phase consisted of the transcription of the Zoom recorded audio files and the open-ended portions of the physical activity journal. Zoom contains a feature that allows users to record audio, video, and chat text. Users can then download each file separately to a computer or stream them from the browser. To transcribe the Zoom audio file to text, I played the audio at a reduced speed and entered the text into the NVivo embedded word processor. I transcribed the audio word-for-word and included pauses, and fillers (e.g., um, ah, like). The 27 interviews and 16 physical activity journals yielded approximately 110,000 words or 310 pages (double-spaced, 12-point, Times New Roman font) of text. I started the first transcript on June 22, 2020 and completed the last transcript on July 24, 2020. After I finished all the transcripts, I spent approximately two weeks reading and rereading the transcripts to become intimately familiar with the

content. As I read and reread the transcripts, I documented my first impressions in my research journal and generated an initial code framework.

After familiarizing myself with the transcripts, I moved to coding. I started with the initial code framework that I generated during the data familiarization. These initial codes included physical activity, coactivity, family, peers, school, and coronavirus-disease-2019 (COVID-19). I first organized all the transcripts into a family framework that consisted of initial codes and emerging codes. Next, I revisited each of the codes within the family and connected them to each other when appropriate. I repeated the same process with the remaining transcripts on a family-by-family basis. The codes reflected statements that struck me as important with respect to physical activity engagement, the children and parents repeated in several places, or the children and parents explicitly highlighted as important. I also coded statements that related to the research questions, theoretical framework, and literature review. I started coding on August 4, 2020 and finished on August 19, 2020.

During the next phase of the thematic analysis, I re-evaluated all my codes and relationships and structured them within a thematic map. I made no substantive changes to the codes or the relationships between codes. Instead, I focused on consolidating codes into interconnected categories and themes. I started the thematic analysis on September 25, 2020 and finished on October 23, 2020. I kept a detailed research journal throughout the data collection and analysis. I started the journal at the outset of the data collection and continued until the end of the thematic analysis. I wrote down potential biases and explained how I safeguarded against these biases.

The final step of the analysis and interpretation was to share my findings with the children, their parents, and my supervisor. I generated a video that highlighted the main

findings and emailed them to the parents. I asked parents to carefully watch the video with their children and email me with additional insight if they felt I omitted or misrepresented something they said or wrote. I repeated this process with my supervisor. Neither discussion led to any appreciable modification to the interpretations of the findings.

To ensure that I gathered a diverse array of perceptions and experiences related to childhood physical activity, I carefully monitored the saturation during the analysis and interpretation phase. I evaluated saturation based on participant and content saturation. Participant saturation meant the inclusion of a diverse sample of children that would bring forward different perspectives. I wanted to ensure that my sample was not limited to one group (e.g., physically active boys from more financially privileged families). To that effect, my plan was to conduct interviews until I achieved balance on the basis of physical activity engagement (i.e., meet or did not meet Canadian physical activity guidelines), gender (i.e., boy, girl), and family after-tax income (i.e., above or below Canadian median after-tax income). Table 4.1 breaks down the children based on these three characteristics.

Table 4.1

Participant Saturation

Characteristics	Number of Children	
Physical Activity Engagement	Seven children met the Canadian physical activity guidelines	Nine children did not meet the Canadian physical activity guidelines
Gender	Nine girls*	Seven boys*
Family After-Tax Income	Eight children from households below the Canadian median after-tax income**	Six children from households above the Canadian median after-tax income**

Note. Participant saturation based on physical activity engagement, gender, and household after-tax income. *Identified by parent in demographic survey; **$101,900 in 2018 (Statistics Canada, 2020).

In addition to participant saturation, I monitored content saturation; that is, the amount of new insight that emerged with each data source. During the coding phase, I carefully recorded the different codes and relationships that emerged from families' transcripts and physical activity journals (Table 4.2). Based on participant and content saturation, I concluded that 16 children and 11 parents offered sufficient insight for the purpose of this investigation; therefore, I did not recruit additional participants.

Table 4.2

Content Saturation

Family Pseudonyms	Number of Emerging Codes	Number of Emerging Relationships between Codes
Dogio	13	11
Johnson	5	15
Keller	1	9
Heath	1	6
Zucker	2	5
Peters	2	6
Davis	-	2
Lang	-	-
Evans	-	-
Williams	-	-
Smith	-	-

Note. Number of new codes and relationships that emerged from families' physical activity journals and transcripts. I coded the physical activity journals and transcripts on a family-by-family basis, in the same order as the interviews.

4.2 PHYSICAL ACTIVITY ENGAGEMENT

Physical activity engagement was the central theme that emerged from my analysis of the children and parents' interview transcripts and the children's physical activity journals. Physical activity engagement envelops three categories, which include adherence to physical activity guidelines, physical activity type, and physical activity intensity. There were 75 comments related to physical activity engagement from 22 different data sources (i.e., transcripts, physical activity journals). These comments covered approximately 8% of the data sources. Table 4.3 summarizes the comments by participants and categories (i.e., adherence, type, intensity). In addition to comments from the transcripts and physical activity journals, I also present descriptive data, such as ratings of perceived exertion and step-count, which I obtained from the children's physical activity journals.

Table 4.3

Physical Activity Engagement Theme: Comment and Data Distribution

Child(ren) Pseudonyms	Parent Pseudonyms	Adherence	Type	Intensity
Riley	Tiffany	QqD	D	D
Zack	Cindy	D	D	D
Michaela	Jillian	QD	D	D
Allie, James	Dora	qD	D	D
Marc, Jordan	Jamie	QQqD	QqD	D
Eva, David	Darlene	QQD	QQD	D
Scarlett	Melanie	QqD	QqD	D
Janelle, Kayla	Jeremy	QQqD	QQD	D
Kurtis, Adison	John	QQqD	QQD	D
Alex	Gabrielle	QqD	QD	D
Lexi	Peter	QqD	QqD	D

Note. Q = direct quotation(s) from interview and/or physical activity journal (child[ren]); q = direct quotation(s) from interview (parent); D = Supporting numerical data (i.e., rating of perceived exertion, pedometer data) from physical activity journal and/or demographic survey.

4.2.1 Adherence to Physical Activity Guidelines

This category is a composite of step-count data from the physical activity journal and the transcript data. From the 75 comments related to physical activity engagement, 21 comments from 21 data sources were related to adherence to physical activity guidelines.

Using the children's daily-step log from the physical activity journal, I quantified their physical activity engagement to determine whether they engaged in a minimum of 60 daily minutes of moderate to vigorous intensity physical activity when averaged over the seven-day physical activity journaling period. Of the 16 children, seven accumulated sufficient average daily steps to meet the step-count threshold that corresponds to 60 minutes of daily moderate to vigorous intensity physical activity (Tudor-Locke et al., 2011). Table 4.4 breaks down the children's adherence to the Canadian physical activity guidelines.

Table 4.4

Gender and Physical Activity Engagement

	Meet Canadian Physical Activity Guidelines	Do Not Meet Canadian Physical Activity Guidelines
Boys	6	1
Girls	1	8

Note. Number of children by gender and adherence to the Canadian daily physical activity guidelines (60 minutes of daily moderate to vigorous intensity physical activity [Canadian Society for Exercise Physiology, 2018)]). Based on Tudor-Locke and colleagues' (2011) review, the proposed age-gender adherence to the Canadian daily physical activity guidelines were: ≥13,000 steps/day for 6–11-year-old boys; ≥11,000 steps/day for 6–11-year-old girls, and ≥10,000 steps/day for 12–19-year-olds.

To better understand how the journaling week compared to a typical week, I asked the children to reflect on the journaling week during the interviews. Nine out of 16 felt that the journaling week accurately reflected their physical activity during a typical week; three felt that they engaged in less physical activity; and four felt that they engaged in more physical activity.

Those children that engaged in less physical activity during the journaling week cited COVID-19-related public health restrictions (i.e., closure of schools, organized physical activity cancellations, physical separation) as the main reason for engaging in less physical activity. My dialogue with Allie exemplifies how COVID-19 negatively impacted physical activity engagement.

> *Myself:* How does the journaling week compare to, say another week before COVID-19?
> *Allie:* I did a little bit less because when there wasn't COVID19, I would dance, and I would be on school sports and I would be biking outside more a little bit. Going to school, doing PE. But, now that COVID-19 came, I haven't been dancing that much, I haven't, um, done PE in gym (p. 1).

I discuss the precise nature by which COVID-19-related public health restrictions affected the children's physical activity engagement later in this chapter.

The children that felt they engaged in more physical activity during the journaling week reported that the act of committing their physical activity to paper and counting their steps motivated them to find more opportunities to be physically active. The following excerpt from Jordan's interview highlights the impact of journaling on his physical activity:

> *Myself:* How would you say the week of journaling, how does that compare to another typical week? Do you do more? Do you do less? Do you do different stuff?
> *Jordan:* Um, I think I did more. Just because at the end of the day we wrote it down and I could see how many steps I took and I could do more, so that at the end people could see how many steps I took. So, yeah. I think that's, yeah.

> *Myself:* So, you feel the journaling kind of motivated you to do more?
> *Jordan:* Yeah, I think so. Yeah (p. 1).

4.2.2 Physical Activity Type

This category consists of participant feedback from the physical activity journal and the transcript data. From the 75 comments related to physical activity engagement, 54 comments from 14 data sources were related to physical activity type and more precisely, game-based physical activity.

Based on the physical activity journals, the children engaged in a variety of physical activity. Outdoor play, trampoline, and golf were the most popular based on total minutes of engagement. Figure 4.2 depicts the most popular physical activities that the children engaged in during their journaling week by total minutes. When I asked the children and their parents about physical activity preferences, they spoke extensively about game-based physical activity.

> *Myself*: What's your favorite part about gym class?
> *Eva:* I think definitely tag games. I remember in fourth grade we had this one tag game where you tag each other's ankles. And, all the girls in fourth grade and one boy. We take him one-by-one and we take them all down, one-by-one. It wouldn't matter if he came to one of us because then one of us would take him (p. 13).

Games like dodgeball and tag appeared particularly popular. The following dialogue describes grounders, a game that the children often play on playgrounds.

> *Myself:* Tell me how grounders works.
> *Marc:* So, there is this one guy who is it, and he's on the ground and once he's on the ground he has to close his eyes and try to tag people on the equipment. Whoever gets tagged has to go on the ground and is then it (p. 7).

When I asked the children about their attraction to game-based physical activity, they offered a very simple explanation: it makes physical activity enjoyable and meaningful. Game-based physical activity offers children a sense of purpose and allows

them to hone physical skills. Jamie's comment in reference to her son's sport participation exemplifies that:

> *Myself*: One of the things that I have noticed here, just from talking to Marc and Jordan, but also other kids is the association between physical activity and games and play. Do you feel that it's important to them to have a game and play aspect to them?
> *Jamie:* Yeah, I think so. It gives them a purpose for why they're being active. Especially when it comes to practice, they're usually never all that much fun, but the end goal is to do well and win their games and stuff. Basketball, I think for Marc this year, was a lot tougher for him because he made the rep team, so they worked a lot harder, but they did really well. They won the city finals and they won zone finals and being able to win that and get the end goal of being the best was a huge motivation to keep them active (p. 11).

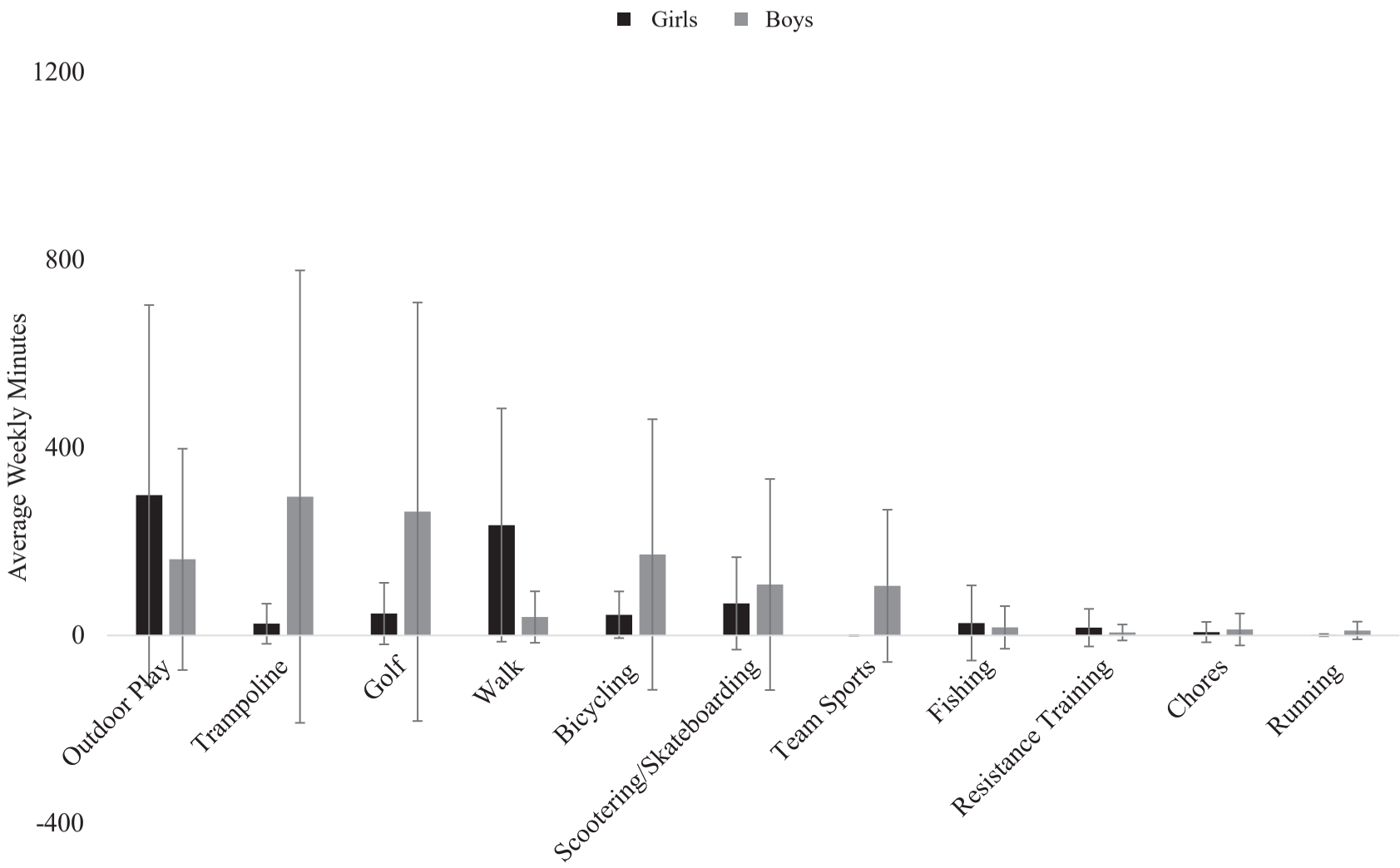

Figure 4.2. Self-reported physical activity distribution for seven boys and nine girls over a seven-day period prior to the interviews. Values are expressed as mean ± 1 standard deviation.

4.2.3 Physical Activity Intensity

Physical activity intensity is the third category under physical activity engagement. I relied exclusively on the physical activity journals to populate this category. Physical activity intensity refers to the children's perceived level of exertion during the various physical activities that they engaged in over the course of the seven-day physical activity journaling period. Using a 10-point scale, I invited the children to rate the average level of perceived exertion for each physical activity. A 1-point score corresponded to a "very, very easy" level of perceived exertion, whereas a 10-point score corresponded to a "so hard I'm going to stop" level of perceived exertion (Yelling et al., 2002). Figure 4.3 summarizes the total weekly minutes at each perceived level of exertion. Based on this self-reported feedback, the children spent the majority of their weekly minutes at either 5, 6, or 7 points of perceived level of exertion, which corresponds to moderate intensity physical activity (Yelling et al., 2002).

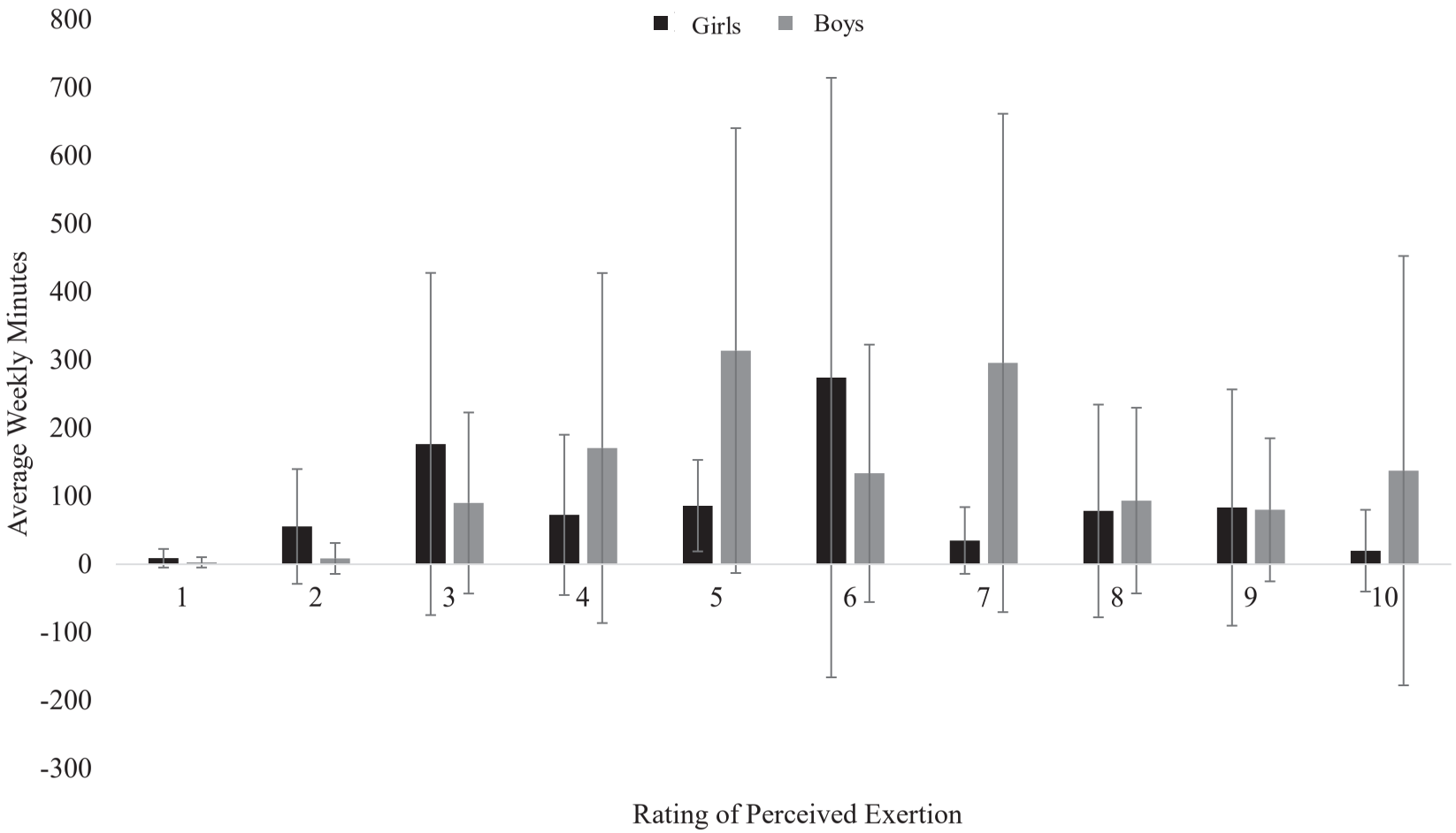

Figure 4.3. Rating of perceived exertion distribution for seven boys and nine girls during the seven day period prior to the interviews. 1 = very, very easy; 2 = very easy; 3 = easy; 4 = just feeling a strain; 5 = starting to get hard; 6 = getting quite hard; 7 = hard; 8 = very hard; 9 = very, very hard; 10 = so hard I'm going to stop (Yelling, Lamb, & Swaine, 2002). Values are expressed as mean ± 1 standard deviation.

4.3 COACTIVITY

Coactivity refers to physical activity engagement with at least one other individual. Coactivity implies reciprocity between the children; that is, children interact with each other by simultaneously engaging in a physical activity (Rhodes & Lim, 2018). A child venturing out for a bike ride with their parents, participating in a soccer team practice, or playing tag games with their peers exemplifies how coactivity can take form. Based on my analysis of the children and parents' transcripts, I divided coactivity into two distinct categories: Adult-directed coactivity and child-directed coactivity. There were 191 coactivity-related comments from 38 different data sources. These comments covered approximately 18% of the data sources. Table 4.5 summarizes the comments by participants and categories (i.e., adult-directed coactivity, child-directed coactivity).

Table 4.5

Coactivity Theme: Comment Distribution

Child(ren) Pseudonyms	Parent Pseudonyms	Adult-Directed Coactivity	Child-Directed Coactivity
Riley	Tiffany	Qq	q
Zack	Cindy	Q	Qq
Michaela	Jillian	Qq	Qq
Allie, James	Dora	QQq	QQq
Marc, Jordan	Jamie	-	QQq
Eva, David	Darlene	QQq	QQq
Scarlett	Melanie	Qq	Q
Janelle, Kayla	Jeremy	QQq	QQ
Kurtis, Adison	John	QQq	QQq
Alex	Gabrielle	Qq	Qq
Lexi	Peter	Qq	Qq

Note. Q = direct quotation(s) from interview and/or physical activity journal (child[ren]); q = direct quotation(s) from interview (parent).

4.3.1 Adult-Directed Coactivity

From the 191 comments related to coactivity, 84 comments from 29 data sources were related to adult-directed coactivity. Adult-directed coactivity encompasses all the comments related to coactivity during which an adult generally determined the nature of the physical activity, such as a parent playing basketball with a participant or a coach providing instruction during a participant's sport practice or competition. As my conversation with David demonstrates, adult-directed coactivity often directly involves an adult:

> *Myself*: Okay, and what kind of stuff do you like to do with your dad when you're out with your dad?
> *David:* We like to go down, not high hills but normal hills, like blue and green. And we don't hit too big of jumps, but we hit like three feet high jumps. That's it.
> *Myself*: And your dad is your favorite guy to go snowboarding with?
> *David:* Yeah. Me and my dad have our own snowboards to go snowboarding with (p. 6).

By engaging in coactivity with the children, adults (e.g., coaches, family members) model the importance of regular engagement in physical activity. My interaction with Cindy demonstrates how she and her partner nurture family coactivity:

> *Myself:* I'm going to come to you guys. For you as a family, whether it's, you know, Zack with a sister or Zack with you guys. How do those interactions take shape?
> *Cindy:* Really well. We're an active family, I'd say overall we're as active as can be. We're always outside, whether going for a walk, biking or hiking. My partner and I love to golf, so we include Zack and the girls. His sisters are a little bit younger. I wouldn't say that they play really well together all the time, but often they do. Just, you know, personalities and stuff clash. I'd say overall they like to be outside and play together. Um, but yeah, Zack loves to be with his family, he loves to be with [my partner] and I. If [my partner] and I wanted to do pretty much anything, he'll do that too.
> *Myself:* Can you describe that parenting approach you take when you're out being physically active?
> *Cindy:* Um, a lot of times for family stuff, it is more around the experience, like, let's go for a bike ride and stop at different parks along the way. Or, if we go boating, we like to stop and swim. It's all about the experience (p. 6).

In some cases, adults also exert coercive influence, as my dialogue with Kurtis suggests:

> *Myself:* Thinking of your dad and sister, how to they help you be physically active?
> *Kurtis:* Um, well, my dad usually makes us go for walks and I appreciate that, but sometimes I just don't really want to. I just want to stay at home.
> Myself: So, dad gets you out the door?
> *Kurtis:* Yeah (p. 7).

Adult-directed coactivity also included coactivity in which the adults are not directly involved. Instead, the children are coactive with other children and the adults merely offer instruction. As I discuss in subsequent sections, this type of coactivity typically takes place in schools and with physical activity organizations. Tiffany offered an example of how her daughter's dance coach facilitated online game-based coactivity amidst COVID-19 restrictions:

> She cherishes her friendships and when they're at the dance studio, during their dinner break, she loves to talk to friends and be with them. Through COVID-19, actually, they started having chat groups that they get together, they chat, they send videos to each other, they have dance-offs where they have to choreograph and score each other. Even if not in person, she has definitely kept those interactions (p. 4).

4.3.2 Child-Directed Coactivity

From the 191 comments related to coactivity, 131 comments from 34 data sources were related to child-directed coactivity. The child-directed coactivity category includes children and parents' references to physical activity engagement with other children. Child-directed coactivity differs from adult-directed coactivity in that the children initiate and determine the nature of the coactivity. This type of coactivity often takes place on playgrounds, in backyards, and during school recesses.

Child-directed coactivity allows children to collaborate and find ways to be physically active through play and games. I previously discussed games such as golf and grounders. The following dialogue with James demonstrates how he and his friends organize coactivity during a school recess:

> *Myself:* Okay, so when you play basketball how do you guys get organized? Do you play three-on-three, or…?
> *James:* So, we just go out on the court and get organized. We usually have or nominate team captains and they rock-paper-scissor to see who can pick first and then we just make sure that the teams are even. Some people sit and others play and then we swap out. It's pretty organized considering it's a group of middle schoolers who are organizing it. And, it's the kids that ref it so when there's a foul we just say there's a foul and the other team gets the ball. That's what it is, so, for a game of basketball organized by middle schoolers it's pretty fun (p. 9).

Lexi offers another example of how she and her brother found creative ways to infuse their coactivity with games:

> *Myself:* You mentioned earlier that you sometimes like to play games on the trampoline and the swing. Give me an example of a game you like to play.
> *Lexi:* Um, on the trampoline I will sometimes launch him into the air. He finds that fun. And then, on the swing set, I will do, like, different symbols with my hands. So, there is this one called duck. If it's a duck when he comes forward to it, he has to duck or else I tickle him (p. 9).

When I asked the children and parents why child-directed coactivity was important to them, they cited "fun" as the main reason. Engaging in physical activity with others makes physical activity more fun, as Eva's comment exemplifies: "When you're with your friends you have funner things to do, it's way funner in numbers. I think I'm just going to repeat that a bunch of times" (p. 5).

The physical activity journals and the children and parents' transcripts suggest that coactivity, whether adult-directed or child-directed, is the primary mode by which the children engage in physical activity. During the interviews, I asked the children whether they engage in physical activity primarily by themselves or with others. Their responses overwhelmingly supported the latter:

> *Myself:* Would you say you're more physically active by yourself or more so with your friends or family or someone else?
> *Alex:* More with friends and family.
> *Myself:* Yeah? And why do you think that is? Being more active with others?
> *Alex:* It's boring playing by yourself. It will be fun for like five minutes and then you just get bored and want to go inside.

> *Myself:* Okay. So, um, being with others makes it less boring? It takes the boredom out of it?
> *Alex:* Yeah (Alex Williams, p. 11).

The fact that the children prefer coactivity was also supported by the responses in their physical activity journals. During the journaling week, over 80% of the children's physical activity involved at least one other person. Table 4.6 compares the frequency of independent physical activity engagement to coactivity.

The children prefer to engage in game-based physical activity, which requires interactions with others. Children cannot play a game of soccer or take part in a game of tag without getting together with others, as Lexi's comments exemplify:

> *Myself:* If you think about all the physical activity that you do, would you say you do more by yourself or more with other people.
> *Lexi:* Probably more with other people because the sports I play are usually a team. I don't really do physical activity by myself. I'm usually on a team and I have a team, so I don't need to be super independent and I prefer to be with friends.
> *Myself:* Do you feel you might do less physical activity if you didn't have friends to do it with?
> *Lexi:* Probably yeah. I mean, my friends just make it a funner experience for me (p. 14).

Table 4.6

Self-Reported Coactivity Amongst Participating Children.

Pseudonym	Number of weekly physical activities	Number of weekly physical activities with others (coactivity)
Adison	17	11
Alex	16	12
Allie	6	4
David	4	2
Eva	14	8
James	10	7
Janelle	10	9
Jordan	12	8
Kayla	9	8
Kurtis	8	7
Lexi	13	10
Marc	11	11
Michaela	2	2
Riley	22	17
Scarlett	12	11
Zack	33	27
Mean	*12*	*10*

Note. Self-reported physical activity with others (coactivity) as a function of the total number of self-reported weekly physical activities. Numbers determined from the seven-day, physical activity journaling period.

4.4 CHILD CHARACTERISTICS

The children and their parents linked physical activity engagement to five child-level characteristics: physical competence, self-efficacy, sociability, knowledge and understanding, and gender. There were 76 comments from 31 different data sources. These comments covered approximately 7% of the data sources. Table 4.7 summarizes the comments by participants and categories (i.e., physical competence, self-efficacy, sociability, knowledge and understanding, gender). In addition to physical activity journal and transcript comments, I also incorporated step-count data to describe boy-girl step-count differences.

Table 4.7

Child Characteristics Theme: Comment and Data Distribution

Child(ren) Pseudonyms	Parent Pseudonyms	Physical Competence	Self-Efficacy	Sociability	Knowledge and Understanding	Gender
Riley	Tiffany	Qq	q	-	Q	qD
Zack	Cindy	Qq	Qq	Q	-	D
Michaela	Jillian	q	q	-	Q	D
Allie, James	Dora	-	-	Qq	QQ	D
Marc, Jordan	Jamie	q	q	-	QQq	D
Eva, David	Darlene	q	q	Q	QQq	D
Scarlett	Melanie	Q	-	-	Qq	D
Janelle, Kayla	Jeremy	Q	-	-	QQq	D
Kurtis, Adison	John	-	-	q	QQq	D
Alex	Gabrielle	Qq	q	Q	Qq	D
Lexi	Peter	-	q	Qq	Qq	Qq

Note. Q = direct quotation(s) from interview and/or physical activity journal (child[ren]); q = direct quotation(s) from interview (parent); D = Supporting numerical data (i.e., pedometer data) from physical activity journal and/or demographic survey.

4.4.1 Physical Competence

From the 76 comments related to the child, 23 comments from 12 data sources were related to physical competence. I coded all references to the children's skill- and health-related competencies as physical competence. The children spoke about strength, speed, endurance, and hand-eye coordination as important determinants to their physical activity. Scarlett's responses to my questions offers insight into the perceived importance of endurance:

> *Myself:* Okay. Here's a question. Feel free to think about that one for a while because it's kind of a tough one. Can you list some of the personal qualities that you feel are helpful in your physical activity?
> *Scarlett:* Well, I'm a good swimmer and apparently, I have really good endurance for walking because, like, I can walk like this and I don't even get tired and my family will be like ten meters behind me and they are like, how are you so fast? And I'm like, I'm going slow.
> *Myself:* So, being fast and having endurance, you feel those things enhance your capacity to be physically active?
> *Scarlett:* Yeah, and I don't even try. It's just naturally. I don't even know that I'm doing it (p. 4).

The parents of the children spoke about athleticism and its importance in their children's sport participation. In response to my question about what it is that draws her son to team sports, Cindy said:

> So, Zack, from what we've noticed, Zack loves team sports. He, he's really athletic, like ridiculously athletic. And so, he's usually one of the better kids on a team. I think that's part of the reason he likes team sports so much (p. 2).

4.4.2 Self-Efficacy

From the 76 comments related to the child, 17 comments from nine data sources were related to self-efficacy, which refers to an individual's belief in their competence to successfully execute a task (Bandura, 1997). The type of physical activity that the children engage in appears to depend on how competent they feel in that particular physical activity. Darlene's response exemplifies this dependence:

> *Myself:* What do you think motivates Eva and David to be physically active?
> *Darlene:* So, in sports, David really enjoys football and what motivates him, I think is that he's good at it. I think if David and Eva are good at a sport, they are motivated. When they are doing basketball, when Eva was doing it without David, she loved it because she got lots of praise from me. I worked hard in not telling her how she could improve, I just did the straight up praise thing, which she loved. When David joined and he was better than she was, I think, she loved it less, so now it really is in me to reiterate and to tell her how great she is and how wonderful it is (p. 3).

The children and parents feel that physical competence and self-efficacy are linked. As the children's physical competence grows, they become more self-efficacious, which supports continued involvement in physical activity. Cindy's comment demonstrates the link between her son's self-efficacy and physical competence:

> He's just started the last year, we've allowed him to go into the coulees with his buddies on his own. And since he takes his buddies down there. I would say he was not very confident when he first started going down there and he was just watching other kids, kind of do jumps, and he wanted to do it. And then he started trying it, and trying it. And soon enough he's, like, flying over jumps. And you can just see with him, the more confident he gets, the more he's going to try, the more he's going to do, the more often he's going to go down in the coulees and does it. You can just tell he feels good about himself. He enjoyed it. Yeah. I think that would be a really big example of his confidence (p. 5).

Self-efficacy affects physical activity engagement by way of promoting coactivity. Generally speaking, if the children feel that they can successfully perform a specific physical activity, they are more likely to seek out others to engage in the physical activity with. However, Jillian cites low levels self-efficacy as the primary reason why she and her daughter shy away from game-based, adult-directed coactivity found in some organized physical activity. Moreover, she feels that physical competence and self-efficacy have a transgenerational component:

> *Myself:* Obviously, you know her better than anyone, what do you feel drives her away from sport?
> *Jillian:* Hmm. That's a good question. Um, I know for myself, I never loved group sports and I think it was because I felt insecure, I wasn't as good as the other people, especially with balls. I had poor coordination with balls and I always felt

> nervous when things were coming at me, so I stayed away. So, if they have that from me, I can understand that. My mom was the same way, and my dad was very into sports. So, it's almost kind of like the same situation I grew up in. My mom never pushed it that hard. She didn't love group sports, my dad encouraged me, he tried doing basketball with me lots, but kind of gave up because I was just not great with a ball and I feel my girls have that from me (p. 5).

4.4.3 Sociability

Another affective attribute that the children and the parents related to physical activity engagement was sociability. From the 76 comments related to the child, 11 comments from eight data sources were related to sociability. Eva is one of several children that considers herself very outgoing and gravitates towards her friends, which she believes scaffolds her physical activity. The following is an excerpt from my interview with Eva:

> *Myself:* And how do you feel being an extrovert, how do you feel that helps you to be physically active?
> *Eva:* Actually, I'm really proud of it because well, introverts, like I'm pretty sure that they would just stay inside most of the time, away from people (p. 5).

John discussed the difference between his two children. He feels that his daughter Adison is more extroverted than his son Kurtis and he sheds some light on how this relates to their physical activity:

> *John:* For Kurtis, physical activity has more to do with an outlet where he can be, you know, if he's outside its more the quiet solitude of being outdoors. He doesn't gravitate towards big group activities. There was a big group of kids he was around when he's swimming, but I think he likes swimming because it's an individual activity with a group. So, he could interact as little or as much as he wanted to. So, I think they get different things out of it. Adison certainly likes to compete more. Kurtis is a reluctant competitor.
> *Myself:* Um, I know both of them extensively cited friends, so they like to be active with friends. Can you tell me a little bit more about that and how that maybe impacts how they're active?
> *John:* Yeah. So, for Adison, her best friend lives a block away from us and so that's one of her friends that she'll go skateboarding with. Um, so for Adison, like, she'll seek out friends and they'll do physical activity together. Kurtis will do stuff with his friends. I think he does more physical activity at school in things like recess. When his friends come over, their activity seems to centre a little bit more

> around things like playing video games. Now, when, this was a few weeks ago, his friends came back into the community because they kind of dispersed, you know, they'd go to cabins and stuff. You know, a couple of friends came over to the house and grabbed him and they were on their scooters, they went down to the park and playing tag and things like that. Um, but in Kurtis' case, he needs to be invited to go do it, where in Adison's case she'll reach out to friends and try to initiate it. She'll try to get people together and do stuff. I do think the social component is huge (p. 2).

The relationship between the children's sociability and physical activity engagement is largely mediated by coactivity. Extroversion often means that children seek out others, which in turn makes it more likely that they engage in physical activity, as my dialogue with Peter exemplifies:

> *Myself:* Tell me a little bit more about her personality and how that influences her physical activity.
> *Peter:* Very social, outgoing, from what I see, and what I hear from other parents, quite kind to others, so I think that does mesh well with how she engages in physical activity as largely a social outlet and socially motivated. Um, whereas, I mean, my son is a bit more shy. Him jumping into a sport, it's not just the barriers of that sport, but it's the social barriers too because you're going to have to meet more people and talk to other people. For a lot of people, maybe introverts, that could give a little bit of anxiety. Lexi loves the opportunity to meet more people, and go talk to more people, and talk to you for an hour. Yeah, she has no problem with that. I think that's kind of how they influence each other, the social and the physical (p. 7).

4.4.4 Knowledge and Understanding

From the 76 comments related to the child, 32 comments from 22 data sources were related to knowledge and understanding. The children demonstrated knowledge and understanding of the benefits of regular engagement in physical activity. They know that physical activity correlates to various health outcomes. The children mainly spoke about the positive effect of physical activity on health-related components of fitness, such as body composition, endurance, and strength. Janelle cited general health and strength as positive health outcomes:

> *Myself:* And why is physical activity important to you, personally?

> *Janelle:* To stay strong and healthy.
> *Myself:* Stay strong and healthy? Is there any particular activity you can think of that makes you feel strong and healthy?
> *Janelle:* Going on walks and swimming, mainly (p. 4).

Several children also demonstrated that they are capable of discerning between physical activity and sedentary behaviour, as my dialogue with Lexi exemplifies:

> *Myself:* If you had to explain to somebody, someone who has no clue, what physical activity is, how would you do it?
> *Lexi:* Um, physical activity is where you're doing an activity, where you're really moving, and you're burning a lot of energy and you're moving around a lot?
> *Myself:* Give me an example of what a physical activity would be and maybe an example of what it would not be?
> *Lexi:* Um, an example of what it would not be, is sitting on the couch and watching TV. An example of physical activity is maybe playing ringette because that's what I do (p. 2).

The children's knowledge and understanding vis-à-vis physical activity extends beyond their ability to define physical activity and list corresponding health-related benefits. Some of the children demonstrated awareness of how physical activity affects them personally and how they can use physical activity to modulate their mood. As an example, I offer a passage from Riley's transcript:

> *Myself:* What do you feel the benefits are to you of being physically active?
> *Riley:* When I'm physically active, I feel better. Like, when I'm lazy, I feel slightly good, but when I get physically active, I feel good.
> *Myself*: Yeah? Okay. Do you know why that is?
> *Riley:* I don't know. I feel like, let's say I'm having a lazy Sunday, sitting on my couch watching TV all day, relaxing. But then, like, I don't feel good. I have a blah feeling, but when I go and do some physical activity, I feel much better (p. 10).

4.4.6 Gender

From the 76 comments related to the child, four comments from three data sources were related to gender, which represents yet another factor that influences the children's physical activity. Some of the children are more drawn to physical activities in which the

children are primarily of their own gender. My conversation with Lexi exemplifies this preference:

> *Lexi:* They told me about ringette and I still wanted to do hockey, but then they're like, ringette has more girls, and you won't be the only girl there and you'll learn how to skate better.
> *Myself*: Is it important to you, to have other girls there?
> *Lexi:* Yeah, I prefer not to be the only girl.
> *Myself:* Okay, and Ringette offers that?
> *Lexi:* Yeah (p. 6).

Gender appears to affect physical activity by promoting coactivity with other same-gender children and in some cases discouraging coactivity with opposite-gender children. Gender norms related to different forms of physical activity also play a role for some children. For instance, boys taking part in male-dominated coactivities (e.g., hockey) and girls taking part in girl-dominated coactivities (e.g., dance, ringette). The following transcript extract highlights how Lexi and especially her peers tend to favour coactivity with other girls. It also highlights how parental conflict in sports can drive parents to seek out other alternatives for their children:

> *Myself:* I'm just going to pick up on something you said, and she said as well. She definitely does prefer activities where there's girls, that's why she said she was drawn to ringette, why do you feel that is?
> *Peter:* With ringette, she was five. Maybe six, whatever, Grade 1-ish. She said "dad, I want to play hockey" on her way back from gymnastics. Oh yeah, she used to do a lot of gymnastics, I don't know if that was in there. So, I was like, "Oh okay." All the boys in her class played hockey and she wanted to do that too. I kind of rolled my eyes and was like "oh, now I have to learn how to fight other parents and I'll have to do jujitsu and I have to be a hockey dad." I'm looking online and even for Grade 1, there is ice time in the morning before school, which I think is a terrible idea. On the ride home, my wife whispered, "what about ringette" and I looked online, and they had one, maybe two ice times a week and they were all after school, so I was like "there's this thing called ringette, which is kind of like hockey and it's after school, so you don't have to get up early in the morning," which she hates. And, "you get to play with a bunch of girls" and she was like "yeah, I like that." So maybe that was the conversation that sparked it, playing with girls. Um, generally, as peers she prefers females, but compared to her peers, she's one that's much more likely to include boys in the games that they're playing. To go and play with boys, and she's comfortable with it, she'll

> challenge them and doesn't care if they think they're faster than her or can throw farther, probably tell them that they're wrong. Um, yeah, probably because of the experiences she has had and because most peers are females, that's what she's comfortable with. I wouldn't say that there is a strong aversion to boys. With some of her peers, yeah. Even her cousin, she doesn't like the idea of boys even coming to play tag with them. Lexi doesn't care (p. 12).

The influence of gender on physical activity engagement was further evident in the physical activity journals. Table 4.4 shows that out of nine girls, only one accumulated sufficient average daily-steps to meet the step-count threshold that corresponds to 60 minutes of daily moderate to vigorous intensity physical activity. In contrast, six from a total of seven boys accumulated sufficient average daily steps to meet the step-count threshold that corresponds to 60 minutes of daily moderate to vigorous intensity physical activity. Figure 4.4 highlights the boy and girl average daily step-count difference.

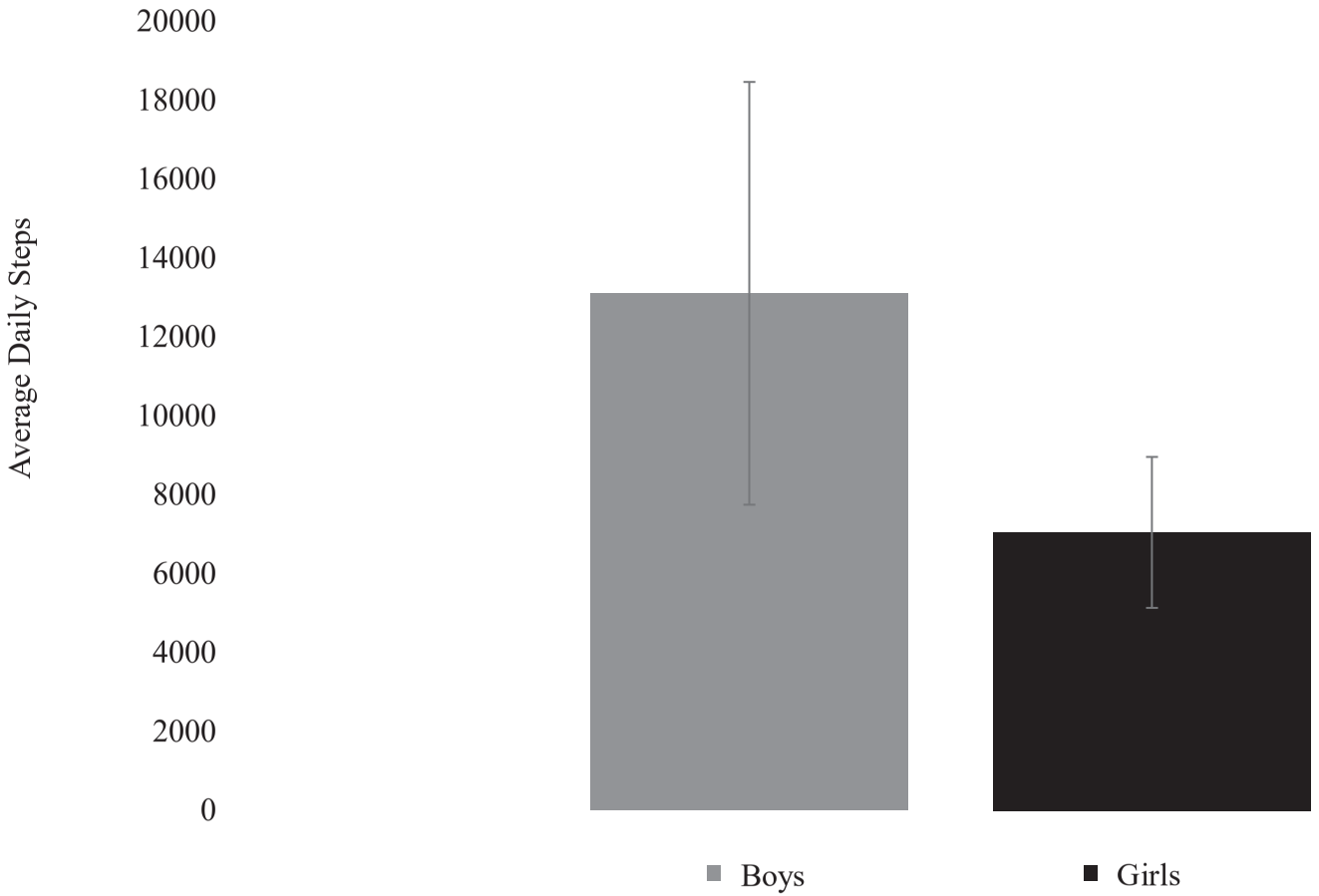

Figure 4.4. Mean steps accumulated by seven boys and nine girls during the seven-day journaling period. Values are expressed as mean ± 1 standard deviation.

4.5 OTHERS

The children and their parents cited *others* as important influencers of childhood physical activity engagement. I divided this theme into two general categories: Family and peers. There were 210 comments from 39 different data sources. These comments covered approximately 15% of the data sources. Table 4.8 summarizes the comments by participants and categories (i.e., family, peers).

Table 4.8

Others Theme: Comment and Data Distribution

Child(ren) Pseudonyms	Parent Pseudonyms	Family	Peers
Riley	Tiffany	QqD	Qq
Zack	Cindy	QqD	Qq
Michaela	Jillian	QqD	QQ
Allie, James	Dora	QQ	QQq
Marc, Jordan	Jamie	QQqD	QQq
Eva, David	Darlene	QQD	QQq
Scarlett	Melanie	QqD	Q
Janelle, Kayla	Jeremy	QQqD	QQ
Kurtis, Adison	John	QQqD	QQq
Alex	Gabrielle	QqD	Qq
Lexi	Peter	QqD	Qq

Note. Q = direct quotation(s) from interview and/or physical activity journal (child[ren]); q = direct quotation(s) from interview (parent); D = Supporting numerical data (i.e., after-tax family income) from physical activity journal and/or demographic survey.

4.5.1 Family

From the 210 comments related to others, 121 comments from 37 data sources were related to family. Parents, and in some cases their grandparents, engage in varied forms of physical activity with the children. This physical activity engagement typically occurs through adult-directed coactivity. Examples include Alex's golf games with his grandfather, Janelle's daily walks with her mom, and Kayla's basketball-skill practice sessions with her dad. By devising ways to engage in physical activity with the children, parents often enable game-based physical activity. This game-based approach to adult-directed coactivity is evident in Janelle's comment on water play:

> We, like, played a game called shark on the boat, an inflatable boat. My dad would, like, pull us in the water and we'd, like, try to stay on the boat. We'd play around on the floaties and go to the island and see how far we can swim (p. 3).

Cindy's comment suggests her family sometimes use competition to make physical activity more challenging. Cindy feels that competition helps to motivate her children:

> We're also known to be a competitive family so there is always some competitive aspect, in a fun way. Um, like for example, we live by the stairs in the coulee. So, if we go for a walk, we race up the stairs or something and my kids respond really well to that (p. 7).

Parents are important promoters of the children's physical activity engagement; however, they can also hinder physical activity engagement by not regularly engaging in adult-directed coactivity. Jillian admits that she feels she may sometimes be a hindrance to her daughter's physical activity:

> *Myself:* Anything else you can think of that perhaps helps or hinders Michaela from being physically active?
> *Jillian:* Um, I would like her to be more physically active, I guess, hindering would be, maybe me. If we were to get out, but if no one else is getting out then she is not. She'll take the initiative sometimes, but if we're all going out, she's happy going out, but if we're not, she's happy to stay home and sit. So yeah, I guess that's a hindrance (p. 6).

The barriers that parents sometimes create for the children is further exemplified by Peter's comment:

> I think I need to make myself aware to not be a barrier myself. There have been a few times, usually when we're winding down for the day. She's really into asking me about movies that I watched or some of my favorite movies, as long as they're appropriate for her and mom will let us. We usually do that the last 30 to 45 minutes of the day, kind of hang out. Right now, we're watching lord of the rings. But she asked a couple of times in the last few days "hey dad, can we just go outside and play volleyball" and I have to remember that's my opportunity to say yes and not be like "hey we're just about to start the two towers, I love this movie." We can always watch the two towers, but fall is going to come, and the weather is going to suck, and we can't go outside. If she has that desire to go outside and do something with me, I've caught myself being a little resistant to it, and I quickly go "yes, get your shoes and let's go outside." Yeah, I want to make sure that I'm not a barrier because she often wants to do stuff with me and [mother] or both. Yeah, trying to make myself available. If I don't make that conscious effort, then I could be a barrier to her for sure (p. 16).

The children also engage in a considerable amount of child-directed coactivity within the family setting. Of the 16 children, 15 have at least one sibling whom they are regularly physically active with; and all of the 16 children referenced child-directed coactivity with cousins at least once during the interviews. Child-directed coactivity helps to nurture the children's motivation to engage in regular physical activity, as Lexi's comment highlights:

> *Lexi:* I like going on the trampoline with [brother] a lot. I go on the swing a lot with him, like, maybe every day. Because we don't have that much other stuff in our backyard, we spend a lot of time on the trampoline and the swings. We play a lot of games on the trampoline and swing, so we don't get bored.
> *Myself*: Yeah? Do you feel your brother helps you be physically active?
> *Lexi:* Yeah, because if I didn't have my brother then I probably wouldn't go outside as much because I would be so bored by myself. All the games we play, I wouldn't be able to play those by myself. Sometimes I try to go outside by myself, but I come running back in the next minute because I find it so boring by myself (p. 8).

For Riley, who was the only child who did not have at least one sibling, child-directed coactivity in the family setting was simply not possible. Riley's mother, Tiffany,

spoke about the negative impact of COVID-19 on Riley's child-directed coactivity, and subsequently her physical activity engagement in general:

> *Myself:* Okay, and you just made the distinction from pre-COVID-19. Can you tell me about some of the differences between now and pre-COVID-19? In terms of physical activity?
> *Tiffany:* She is more inclined to go to the park, to go biking and go skateboarding with friends, but because we have been self-isolating, we have not had contact to get together with other children. So, because of that, she hasn't been doing that because she's an only-child and doesn't want to go do that by herself. So, definitely she would be doing more in terms of swimming, going to the park and riding her bike if she had other kids to do it with. She is still dancing the same amount, but in terms of kids' fun activity she definitely is not so inclined to do it alone (p. 1).

The most frequently cited sibling child-directed coactivities were those that included a game-based component, such as outdoor play and trampoline-based games. Eva explains how trampoline-based games with her brother take form:

> *Myself:* So, you wrote about being physically active with your brother in your journal. Can you give me some examples of activities you like to do together?
> *Eva:* Probably scootering. And definitely the trampoline, because for a while we had this game where we take a ball and if you hit the other person 10 times in a row, if you don't miss, you win. So that took a lot because it was hard to get the ball. And that was, like, a lot of activity. We'd be going outside twice a day at that point because we'd go after supper as well (p. 5).

For Jordan and his brother, trampoline-based games offer them an opportunity to engage in friendly competition, as their step-count challenge highlights:

> *Myself:* One of the days, it looked like you and your brother maybe had a bit of a competition to see who could stay on the trampoline the longest and maybe who could get the most steps. You said you were out there for six hours on the trampoline. Tell me about that day.
> *Jordan:* So, that day we weren't allowed on electronics. Was that a Sunday? I think it was a Sunday. So, we wanted to take 10,000 steps, we took some breaks, but we were just jumping and didn't realize that we got like 20,000. Then, we took the sprinkler and put it underneath the trampoline and that got us another 10,000. Once we got like 30,000, my brother was like: "I want to try to get 40,000" and I'm like [inaudible] because he was already ahead of me in the morning, because he woke up two hours ahead of me, and he was like 5,000 steps ahead of me, and then I think I got like 30,000 or something (p. 6).

Whether skiing, biking, or organized hockey, many physical activities require costly equipment. For those children that take part in organized physical activity, there are also annual memberships and fees. This is especially true for children who engage in a broad range of physical activities. Family finances therefore pose a challenge for some families, particularly those with many children or those that rely on a single income. My conversation with Jeremy highlights how family finances affects his family's physical activity engagement:

> kayaking is one thing we picked up on and we absolutely love it and I'd love to be able to afford six kayaks and a trailer, but it's just not a reality, but that's an example of something that if we could do it, we'd be out on the lake, kayaking around and paddling. So, what else? Hiking, kayaking, golfing is another thing that I love to do so I've always had my kids involved in that at different stages. There are also different financial stages of life as well. I've been self-employed on and off, and then there's been some stints where I have been well employed with computer companies and was able to afford to do a lot more with the kids. Finances of course limits the options, but it hasn't stopped us from being active, it's just, which things that we are going to be able to do (p. 7).

As Jeremy points out in the last sentence, the children and their parents do not perceive family finances to be a limiting factor with respect to the amount of physical activity. Instead, they feel that family finances affect how many different types of physical activity they engage in. In other words, family finances affect physical activity engagement by deterring its variety.

Based on the results from the demographic survey (Figure 4.5), four families reported an after-tax income higher than the Canadian median after-tax income ($101,900 in 2018 [Statistics Canada, 2020]) (Statistics Canada, 2020) (Statistics Canada, 2020) (Statistics Canada, 2020) (Statistics Canada, 2020) (Statistics Canada, 2020) (Statistics Canada, 2020) for families with children, six families reported

an after-tax income lower than the Canadian median after-tax income, and one family did not report their after-tax income.

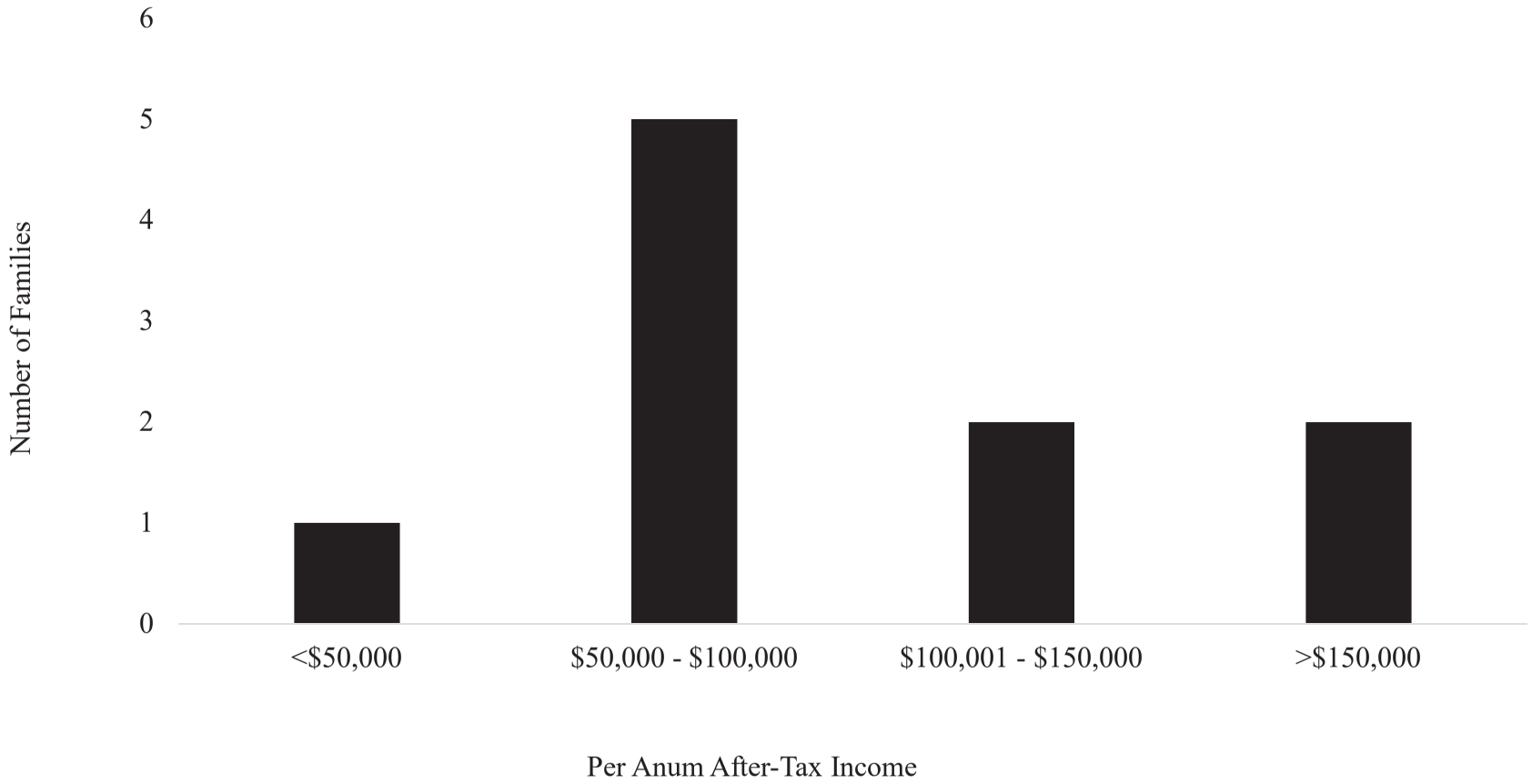

Figure 4.5. Per anum after-tax income of the participating families distributed across four different brackets (<$50,000; $50,000 - $100,000; $100,001 - $150,000; and >$150,000).

4.5.2 Peers

Like family, peers influence the children's physical activity engagement. From the 210 comments related to others, 115 comments from 36 data sources were related to peers. Kayla's comment exemplifies the importance of peers to her physical activity engagement:

> *Myself*: Alright, here's another question. Can you list off a couple of things that help you be physically active?
> *Kayla:* Um, friends, friends, friends, friends (p. 17).

In many cases, peer coactivity manifests as child-directed coactivity, whereby the children and their peers self-organize into various game-based physical activities. In the following transcript extract, Allie discusses how she, her peers, her brother, and her brother's peers engage in child-directed coactivity:

> *Allie:* Um, I play hide and go seek with [Shawna] and a couple of my other friends. Sometimes, [Sue], who's my younger sister. And, um, mantracker, I play it with my brother's friends because I don't have any friends that like to play mantracker.
> *Myself:* I've heard about mantracker a couple of times; can you explain to me how that works?
> *Allie:* Well, mantracker is, you're in two different teams and then one team is trying not to get tagged by the other team. It's kind of like a large game of tag but not really. And then, the point of mantracker is to hide and not get tagged because you were staying in one place most of the time. Like getting up in a tree or hiding behind a bush, that type of thing. Um, when I play mantracker I usually hide between the trees or behind the bushes. Sometimes I go hide behind the lake. They planted a whole bunch of stuff and if you go behind the lake it's really easy not to get found (p. 3).

Peer coactivity is not always child-directed. In many instances, children engage in peer coactivities in organized physical activity and school settings that are primarily structured by adults. In this type of setting, games often incorporate competitive aspects to facilitate specific goals, such as skill development, as Zack's comments exemplify:

> *Myself:* So, [Steve], [Billy] and your buddies on the hockey team, how do they help you be active?

Zack: Um, kind of like competitiveness on the hockey team, like who's going to be the best.
Myself: So, you push each other?
Zack: Yes
Myself: Give me an example.
Zack: Um, running and like doing a drill properly and being the first one done.
Myself: Do you do any scrimmaging, games? Tell me about that?
Zack: We eventually get into a rough time and we hit each other.
Myself: So, you practice the physical stuff related to hockey?
Zack: Yeah (p. 5).

When I asked the children and their parents how peers support physical activity engagement, the responses were quite simple: they feel that peer coactivity is more fun. In many cases, peer coactivity is as much a venue for socialization as it is to partake in physical activity. Dora's comments exemplify this fact:

Myself: Let's chat about James, what do you think his favourite part is about hockey?
Dora: I don't know, I think every kid likes socialization and hanging out with friends. He loves the sport, but let's be honest, it's about hanging out with friends.
Myself: What about Allie?
Dora: I'd say she's the same. (p. 3)

Peers are important motivators for the children's physical activity engagement. My dialogue with Allie exemplifies the link between motivation for physical activity engagement and peer coactivity:

Myself: I'm going to go back a bit to the last question, how do your friends help you be physically active?
Allie: My friends help me be physically active, by kind of like how my family does it, motivating me, wanting to do it with me, like, I'll go over and be like want to go on the bike path and they'll be like sure. Or, they'll ask me. So basically, just motivate me to get off the couch. Or, sometimes my brother can get us outside, like when he's babysitting, although now I kind of babysit myself. But if that didn't happen, he'd make us go outside, even if we didn't want to.
Myself: So, you mentioned motivating, so your parents motivate you, your friends motivate you. Is that important to you? That somebody motivates you?
Allie: Yeah, that's usually what helps me because otherwise I'll just sit on the couch. I don't usually get motivated by sitting on the couch and be like "oh, I'm going to go outside now." My friends usually have to text me and be like: "want to go on a bike ride, or want to go run around?" Sometimes my brother will ask me.

> *Myself:* And what motivates you the most?
> *Allie:* When my friends ask me: "do you want to bike down to the coulees or go to paradise canyon or play at the park?' That type of thing motivates me the most (p. 6).

Whether or not the children engage in coactivity, and particularily child-directed coactivity, partially depends on the characteristics of their peers. The children can only be physically active with peers that share a similar affinity for physical activity. Evidence from the data sources suggest that all of the children have at least one peer that enjoys being physically active. My converstation with Gabrielle reveals that her son and his peers share a love for sport, which translates into frequent child-directed coactivity:

> *Myself:* Okay. Yeah. And yeah, it looks like he's had, from his journal, at least a couple of sessions playing basketball. So, does he kind of initiate those sessions? Does he go "I'm going to go play basketball" or does he get pulled in with others. How does that take shape?
> *Gabrielle:* It depends on if he's playing on the driveway, he usually just walks out, picks up a basketball and plays in the driveway. But when he and his friends get together there is almost always sports involved. And, um, sometimes he initiates that and sometimes they text him and just want to get a group together and then they end up playing dunk ball in the drive way or something like that.
> *Myself:* Um, tell me a little bit about his friend group. You mentioned already that they're all super into sports. Any other physical activities that they like to do with each other?
> *Gabrielle:* Um. Basically, anything that is active. They have all been friends with each other since they were in Kindergarten. I don't know, they've known each other all their lives. They all live within bike riding distance from each other so they, pre-COVID-19 of course, they got to get together a lot and do things like that. Um, they're just like a really socially active, physically active group of kids (p. 6).

The importance of peer characteristics extend beyond simply the affinity for physical activity. As Cindy points out, if her son's personality complements that of his peers, it helps to avoid conflict and support continued child-directed coactivty:

> I find that he jives better with kids that are not as competitive as he is, because when you have two like Zack is, it always ends in a fight, not a fist fight but they just go at each other. I find usually a personality that's not quite as competitive as he is, works best (p. 6).

4.6 COMMUNITY

Childhood physical activity takes place within a dynamic community setting. The community resides within a physical environment that contains features that promote and also deter childhood physical activity. Within the community exist different organizational spheres. I coded children and parents' comments related to these spheres as either school or physical activity organizations. There were 147 comments from 35 different data sources related to community. These comments covered approximately 12% of the data sources. Table 4.9 summarizes the comments by participants and categories (i.e., physical environment, school, physical activity organizations).

Table 4.9

Community Theme: Comment and Data Distribution

Child(ren) Pseudonyms	Parent Pseudonyms	Physical Environment	School	Physical Activity Organizations
Riley	Tiffany	Qq	Q	QqD
Zack	Cindy	Qq	Qq	QqD
Michaela	Jillian	q	-	qD
Allie, James	Dora	QQ	QQ	QQqD
Marc, Jordan	Jamie	Qq	QQ	QqD
Eva, David	Darlene	QQq	QQq	QQqD
Scarlett	Melanie	Qq	Qq	QD
Janelle, Kayla	Jeremy	QQq	QQq	QQqD
Kurtis, Adison	John	QQq	QQ	QD
Alex	Gabrielle	QQ	Qq	QD
Lexi	Peter	Qq	Qq	QqD

Note. Q = direct quotation(s) from interview and/or physical activity journal (child[ren]); q = direct quotation(s) from interview (parent); D = Supporting numerical data (e.g., sport participation history) from physical activity journal and/or demographic survey.

4.6.1 Physical Environment

Sixty-three comments from 30 data sources referenced features of the physical environment or place of residence (i.e., location) as important contributors to the children's physical activity. Game-based, child-directed coactivity in particular, takes place primarily outdoors, as James' comment exemplifies:

> *Myself:* So, it is fair to say you're doing a lot of activity outside?
> *James:* Yes, I do almost all my physical activity outside. The only physical activity I don't do outside is walking around my house. (p. 10)

Access to amenities such as parks and playgrounds are perceived by many children and parents as important contributors to physical activity, primarily by ensuring they can engage in game-based coactivity. John's response to my question demonstrates how he values the amenities near his family's residence:

> *Myself:* Tell me a little bit more about your neighborhood and some of the amenities or areas that you have that would be a good area for being physically active. I know they mentioned there's a park there.
> *John:* Yeah. There's the school and it has a sizeable green space and playground area. But then kitty corner to the school, there's, you know, a whole city block that's a park. It's a mix of just pure green space and then there's also some play equipment. A lot of people in the area use it. I know Adison and I, this was a few weeks ago, there was a group of people, moms and kids from her class, that were playing, what's the name of the game? Ultimate Frisbee, kind of like football Frisbee, so we joined in and did that. I've seen older kids there with everything from volleyball nets, they'd be playing spike ball, they could be throwing a baseball around, throwing a football around. So, it's a good space for that. Um, we're not too far of a walk down the hill to be able to get to the pathway system, depending on which way you go. We're close to [local post-secondary institution], which is a big campus so it's kind of a nice area to walk around. In someone like Adison's case, there's a lot of good spots to go skateboarding. There's a lot of good sidewalk areas that are quite flat. It won't be open this year, but there's an outdoor pool down the hill. There are two small community centers close by that run different kinds of programs, so the kids are going to be in some sports camps there this summer. Um, and one of them is where Kurtis has his basketball and the other one is where Adison had her volleyball. So, there is quite a few community areas around here. There's a tennis court down the hill as well (p. 9).

In Contrast, not having access to safe outdoor spaces limits children's physical activity by deterring child-directed coactivity, as Janelle illustrates:

> *Myself:* Um. Tell me about your town. Tell me about some of the things you can do in [current residence]. Things you enjoy doing that are physically active.
> *Janelle:* Well, it's nice because I can tell my mom I'm going out with friends and she doesn't have to follow us around. Before, in [past residence], we always had to have an adult with us. So, I like the freedom to be able to go to the park and tell my mom that I'm going to the baseball diamond to go play baseball and stuff.
> *Myself:* Okay. So, you feel a bit safer in [current residence] compared to [past residence]?
> *Janelle:* Yeah. Yeah, it's really nice because when we lived in [past residence] our mom would have to be out, and when she'd have to go inside to do house stuff then we weren't allowed outside at all (p. 13).

The children's preference for the outdoors can discourage physical activity during poor weather. Of the 16 children, 13 offered specific examples of when poor weather kept them indoors and physically inactive. Lexi's response to my question of what hinders her from being physically active, exemplifies the impact of weather:

> Um, well, the weather definitely gets in my way all the time. We once had so much fun with my cousins on the trampoline and then it started to get cloudy and rain and hail and we had to go inside and sat on the couch and watched a movie. If that hadn't happened, we would've been outside for maybe, like, another hour. So, the weather really affects it (p. 18).

The children's preference for outdoor physical activity leads to seasonal variations in physical activity for some. As Kurtis points out, his physical activity is typically lower in the winter months:

> *Myself:* Do you feel that weather and the seasons impact your physical activity?
> *Kurtis:* Yeah, I'd say they do.
> *Myself:* Yeah? How so?
> *Kurtis:* Well, the weather, if it's bad you can't really do much. When the weather is bad, sometimes my dad will take us out for a drive. Like we did that one drive on [local road], we went around [urban centre]. And yeah, it's more just staying inside during bad weather. During the good weather, which is spring and summer, those are probably the best ones. During fall, I sometimes go down to my uncle's farm and see what's going on with that?
> *Myself:* Okay.

> *Kurtis:* And then during winter, sometimes we go snowshoeing. So, it goes like. This is kind of the cycle: Spring, there's quite a bit, summer there's a lot. Autumn, there's less and then winter there is even less. So, it grows and then it shrinks.
> *Myself:* So, you mean in terms of physical activity, hey?
> *Kurtis:* Yeah.
> *Myself:* So, most physical activity in the summer?
> *Kurtis:* Yeah, spring and summer. So, in the spring it will grow and during the end of spring it will grow even bigger. In summer, it's just huge and then in autumn, it kind of fades away. And, the cycle just keeps repeating (p. 14).

The seasons particularly affect physical activity in smaller rural communities where often few indoor amenities exist. Gabrielle exemplifies the impact of lack of indoor amenities on physical activity and mental health in her community:

> *Gabrielle:* I feel that all of the things that are offered here are outdoor things, and so when it's raining or lightning or thundering, you can't go golfing, you can't go in the pool, you can't be on the baseball diamond. Um, but if the weather is nice or even halfway decent, people seem to be very active. It's always been known as an older town with lots of elderly people, but it's kind of shifted. There is a lot of young families that live here and there is lots of activity. Soccer is a huge thing, we have soccer diamonds, soccer is a huge thing in town. So, it's a super sporty town, and if you don't play sports you go, and watch sports and that has been hard on people with COVID-19 because there are just not the same things to go and watch and spend your time doing. We have tennis courts, nature trails, yeah. I feel for the size of the town, there are lot of amenities that people can take advantage of, if the conditions are right and the weather is nice.
> *Myself:* So, if the conditions are nice. So, in the winter perhaps there could be more things that would welcome physical activity?
> *Gabrielle:* Yeah, everybody always wishes there was a roof over the swimming pool so we can use it year-round. Definitely I've noticed mental health suffers here in the wintertime, people get those winter blues.
> *Myself:* And do you feel that's related to the amenities, or lack thereof?
> *Gabrielle:* I think definitely the lack of things available for people to do, activity wise, is related to that (p. 7).

Living in secluded areas can also be a deterrent to physical activity. This is because coactivity often becomes contingent on parents' willingness and ability to drive their children to places where they can be physically active with others. Darlene cited living on an acreage in a rural area as a hindrance to her children's physical activity:

> My kids, they will play with just about anyone, like they want to be with other kids, they'd happily go outside if there were other kids around, but we don't have

> any. So, their playdates consist of what I'm willing to drop-off and pick-up or other parents [are willing to drop-off or pick-up] (p. 12).

4.6.2 School

Thirty-six comments from 22 data sources referenced school as an important contributor to the children's physical activity. Adult-directed and child-directed coactivity often takes place in the school setting. Adult-directed coactivity takes place in physical education class where teachers offer instruction and guide the children's through a multitude of different activities. When I asked the children about their favourite aspects of physical education class, they referenced game-based physical activities. Games such as soccer and dodgeball are amongst the most popular with the children. Kurtis' response serves as an example of the children's attraction to the game-based physical activity that occurs during physical education class:

> *Myself:* Um, so going back before COVID-19, tell me how you were physically active at school.
> *Kurtis:* Well, gym, that's one thing I forgot. So, gym, I always find that the best time of the day. If it's dodgeball, it's just a lot of fun going to the gym.
> *Myself:* What's your favourite part about gym? You mentioned dodgeball, any other reasons?
> *Kurtis:* Well, dodgeball, other games, we learn stuff. It's just an exciting experience (p. 12).

Kurtis and many other children thoroughly enjoy physical education class in school, but their sentiments are not necessarily shared by all of the children, as Riley's comments suggest:

> *Myself:* Um, School, tell me about school, what kind of physical activity do you do there?
> *Riley:* Well, I kind of like gym, I don't like basketball though. In gym class. I don't like gym class that much. So, I don't invest in gym class.
> *Myself:* Do you have gym everyday?
> *Riley:* Well, normally we would have gym everyday when we actually go to school. Normally, actually we don't have gym everyday. I don't really like dodgeball because I'm super competitive in it. I'm really good at dodging but I'm not the best thrower (p. 8).

The perceptions and experiences of the children and their parents suggests that they value the child-directed coactivity that occurs during recess the most. I should note that not all children like to be active during recess. Two of the 16 children said they prefer to relax and read during recess rather than engage in physical activity. For the remaining 14 children, recess is a time to be coactive. Recess, albeit short in many cases, allows the children to collaborate and devise different games. The most popular child-directed physical activity for the children is soccer. Zack explains how a game of recess soccer takes form:

> *Myself:* Tell me what a game looks like, how do you get it organized.
> *Zack:* Usually it starts with four people and eventually more kids join and we split up the teams.
> *Myself:* Do you keep score? What happens?
> *Zack:* Sometimes we keep score, sometimes we don't.
> *Myself:* How long is your recess?
> *Zack:* The lunch recess is 25 minutes and two 13-minute recesses.
> *Myself:* So, you have to get organized quick to get your game going?
> *Zack:* Yep (p. 7).

Many of the children feel that the brevity of recess limits their ability to capitalize on their desire to engage in child-directed coactivity. They feel that recess is too short to accumulate sufficient amounts of physical activity. As Lexi points out, their games are often interrupted by the bell.

> *Myself:* How long again are your recess breaks?
> *Lexi:* The morning recess is 15 minutes, the lunch recess is 30 minutes and the, um, afternoon recess, the last recess, is 15 minutes.
> *Myself:* Do you wish that they sometimes were longer?
> *Lexi:* Yeah. I kind of wish the lunch was an hour and the other two were 30 minutes.
> *Myself:* Why do you wish they were longer?
> *Lexi:* I don't know, I just love running around with my friends and stuff.
> *Myself:* So, if they were longer, what would you spend that time doing?
> *Lexi:* Um, we'd probably play, like, because we would play hide and go seek tag and we'd have so much fun doing that, but then we'd want to play a different game, maybe just tag so we'd find everybody, and then we'd find a different game

> to play. We'd get excited about it and the minute we start; the recess bell would ring to go inside. So, then we don't have time to play it.
> *Myself:* So, the recess bell interrupts your play, hey?
> *Lexi:* Always (p. 17).

Children and parents insist that recess meaningfully contributes to the children's physical activity. They also feel that recess physical activity helps them focus on the academic subjects. Similar to children, parents feel that children could benefit from more recess time, as Gabrielle's comments suggest:

> *Myself:* Okay. Um, how do you feel he's active at school?
> *Gabrielle:* I think school, I wish that he had more breaks. I feel like they expect him to sit in a classroom for a long time before they let him out for lunch. Even though they're a junior high, they just kind of. In [rural town], I don't know if it's typical in other places too, but in [rural town], they start junior high in Grade 6, and I feel like that's so young. They still have this energy that needs to get burned off. Yeah. We have struggled with that as far as kids' behaviour at school and teachers expecting so much of them when I feel like if they got more breaks they would be better behaved and less issues in class. I mean they do what they can, I guess, they provide a lot of opportunities for the kids to be physically active. Sometimes I have problems with him and be like "you have to take care of yourself and your diabetes and eat your lunch before you go and play" Because they're all like, "we just have 45 minutes to play" and they're all just gobbling up their lunch or skipping lunch or whatever because they want to go out be active and play basketball or whatever (p. 8).

4.6.3 Physical Activity Organizations

Organized physical activity refers to physical activity that takes place within a predominantly adult-directed environment, such as sport organizations and youth groups. 58 comments from 25 data sources referenced physical activity organizations as an important contributor to the children's physical activity engagement. In the demographic survey, I asked parents to share the children's past and current memberships to physical activity organizations. Figure 4.6 shows the children's diverse exposure to organized physical activity. 15 of the 16 children had been exposed to at least one form of organized physical activity prior to their participation in this investigation. Basketball, soccer, and

baseball/softball were the three most popular organized forms of physical activity with respect to total number of children who participate in them.

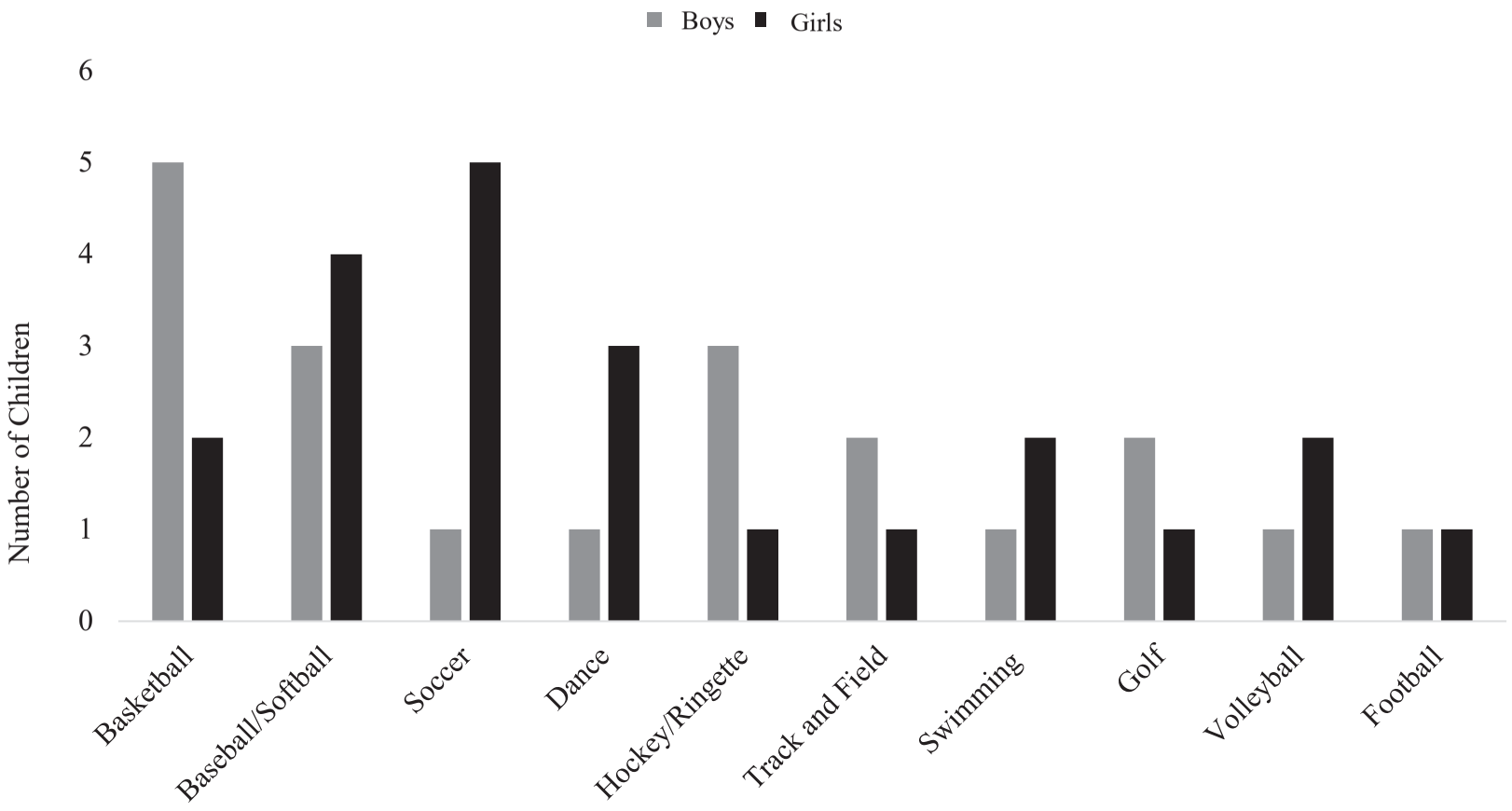

Figure 4.6 Number of children engaged in various organized forms of physical activity. Participation includes past and current participation.

The children's involvement in physical activity organizations promotes their physical activity by providing a framework for adult-directed coactivity. In fact, adult-directed coactivity occurs primarily in physical activity organizations. My exchange with Dora highlights why she feels that her children's enrollment in soccer and dance is important:

> *Myself:* How do you feel, you know organized sport, so hockey and dance, how does that help James and Allie be physically active?
> *Dora:* It's a commitment, right? You're guaranteed, you're committed.
> *Myself:* So, having the structure in place?
> *Dora:* Yes (p. 3).

The adult-directed coactivity that occurs in physical activity organizations, according to the children, makes physical activity more fun by way of promoting game-based physical activity. Whether during practices or competitions, there are often games involved, as Jordan's comments about summer basketball camp highlight:

> *Myself:* Tell me about those basketball camps.
> *Jordan:* They're like an all-day thing. I think it starts at nine and goes to three and then we have like an hour lunch. It's three hours then a one-hour lunch and then two hours. We just, like, do a lot of games and just working on drills, especially on the first day or two, and then closer to the end. It was a one-week thing. It goes every single day. I think Friday was a half day. It's like school basically, but school for basketball. It's pretty fun and it's at the [local facility] and you can just kind of eat anywhere.
> *Myself:* What makes it fun?
> *Jordan:* Um, doing it with friends and just doing mini games and there's, like, little competitions. And at the end, you get, like, shirts and hats and Gatorade and stuff like that (p. 12).

Several children referenced competition and particularly winning, as benefits of the game-based, adult-directed coactivity that is typical for organized physical activity. Competing and winning provides these children with a sense of purpose for engaging in physical activity. The importance of winning is exemplified in Jamie's comments about her two children:

> *Myself:* What do you think their favourite aspect is about being on those teams?
> *Jamie:* Um, well doing well, it's always a bonus to win, they always love to win, but I think the big draw is hanging out with friends, I guess. Yeah (p. 10).

Competitive elements and the desire to win also deters some children from participating in organized physical activity. Participating in organized physical activity sometimes means that children must qualify to be on the team. If coaches feel that children cannot contribute to a winning team, they are sometimes precluded from participating. My dialogue with Jeremy outlines the issue of 'making the team' and the negative impact it has on his daughter's involvement in basketball:

> *Jeremy:* Um, they are, especially Janelle. She's in Grade 7 this year and, um, all the cool girls play basketball, and the basketball team has been the same ten girls for the last few years, and it has been very difficult to break into, especially because it's been the same coaches. And so, this last year, for school basketball, they didn't even have a tryout. They had a one-day tryout and then took the same girls. They took them through a few drills and had them play one-on-one against each other. Janelle hasn't had a lot of game play experience because of that, so that doesn't show very well on the team, playing basketball. But I know there's three or four girls that I know she could have beaten had they, you know, looked at individual skills and looked at potential growth rather than where they are at right now.
> *Myself:* So, do you feel accessibility is an issue?
> *Jeremy:* Um, for sure. Um, and again, it's because there aren't enough girls to have two teams and of course at school there's only one team. In spring league there's 15 girls that would like to play, but they only take 10 of them so those other 5 girls don't have the opportunity to develop. They generally get lost and that's what happens with every group, you know. There's not enough for two teams so the ones that would love to play but are slow in development or didn't get the interest until later (p. 4).

Although most of the comments related to physical activity organizations were related to the children's engagement in various sport organizations, sport is not the only type of organized physical activity. Several of the children belong to youth groups that often engage in game-based, adult-directed coactivity. The main difference between these groups and organized sport is the reduced emphasis on competition. Jillian described how her daughter's youth group incorporates physical activity:

Myself: Can you describe that youth program a little bit more?
Jillian: They have it, kind of set up with young women and young men and once a week, they get together. Some activities are just smaller, and they just have their age. I think they do two activities where it is just their smaller group and one activity where it's all the kids. Once a month, all the young men and women get together.
Myself: You mentioned fishing was one of the activities?
Jillian: Yeah, they've gone tobogganing, snow shoeing, trying to think what else. Yeah, stuff like that or service activities, picking up garbage, stuff like that. This week they're doing yard work (p. 4).

4.7 PUBLIC HEALTH RESTRICTIONS

Public health restrictions related to the global COVID-19 pandemic have considerably influenced the children's physical activity. There were 75 comments from 28 different data sources related to public health restrictions that were implemented to combat the COVID-19 pandemic. These comments covered approximately 10% of the data sources. Table 4.10 summarizes the comments by participants and categories (i.e., physical separation, closures, cancellations). Public health restrictions impacted the children's physical activity engagement through physical separation, closures, and cancellations.

The children and their parents completed the investigation requirements (i.e., physical activity journals, demographic surveys, interviews) between June 5, 2020 and July 10, 2020. During this time, the provincial relaunch transitioned from Stage 1 to Stage 2 (June 12, 2020). During Stage 1, day camps and summer school resumed operations with occupancy limits. Playgrounds also opened during this time. During Stage 2, public health authorities permitted team sports to resume practices and games. Fitness and sport centres, including gyms and arenas resumed operations with occupancy limits. Public health authorities also set a 200-people maximum limit for audience-type community outdoor events, such as festivals, firework displays, rodeos and sporting events, and

outdoor performances. Additionally, public health authorities offered more flexible cohort guidelines, including multiple household cohorts of a maximum of 15 people, and a 50-player region-only cohort limit for competitive sports (Government of Alberta, 2020).

Prior to Stage 1, the province was in the pandemic response stage, which started on March 16, 2020 and ended on May 13, 2020. During this time, public health authorities put in place the strongest public health guidelines to manage COVID-19. These guidelines included school closures, facility closures, and team sport suspensions. Throughout the initial pandemic response, Stage 1, and Stage 2, public health authorities mandated two meters of physical distancing. At different time-points, several jurisdictions in the province also implemented bylaws that mandate masks be worn in public indoor spaces (Government of Alberta, 2020).

Table 4.10

Public Health Restrictions Theme: Comment Distribution

Child(ren) Pseudonyms	Parent Pseudonyms	Physical Separation	Closures	Cancellations
Riley	Tiffany	q	Qq	Qq
Zack	Cindy	Qq	Qq	Qq
Michaela	Jillian	q	Qq	-
Allie, James	Dora	-	QQ	QQ
Marc, Jordan	Jamie	QQ	Qq	QQq
Eva, David	Darlene	-	QQq	QQq
Scarlett	Melanie	Q	Q	q
Janelle, Kayla	Jeremy	Q	QQ	Qq
Kurtis, Adison	John	Qq	QQq	Qq
Alex	Gabrielle	-	Q	Q
Lexi	Peter	Qq	-	-

Note. Q = direct quotation(s) from interview and/or physical activity journal (child[ren]); q = direct quotation(s) from interview (parent).

4.7.1 Physical Separation

Seventeen comments from 13 data sources referenced temporary physical separation guidelines as important deterrents to the children's physical activity engagement. During the initial pandemic response (March 16 to May 13, 2020), public health guidelines stipulated that households remain fully separated from others. For the children, that meant no physical interactions with individuals that were not part of their household, such as peers and extended family. Towards the end of the initial pandemic response, the guidelines allowed for cohort formation, which permitted limited household interaction. Despite this, the requirement for physical separation eliminated much of the normal interactions that children had outside of the household, as John points out:

> *Myself:* Okay, um. I'm going to go to COVID-19. How has COVID-19 impacted physical activity for the two?
> *John:* Their physical activity has definitely dropped off quite a bit. Um, and, you know, it's been a mix of, you know, where they can go to even be physically active with others. That really tethered them to home (p. 4).

During the initial pandemic response, many parents simply did not feel comfortable allowing their children to interact with large groups of children. Cindy points out that because of this, the extent and variety of child-directed coactivity was much more restricted:

> But I also learned with where we're at with COVID-19 right now, he's doing a lot of the same things because, you know, some families aren't letting their kids play with other kids. And so, we have certain families that he's hanging out with. And those kids do the same things. And it's also stuff that's right within our neighbourhood pretty much that they were doing, aside from golfing. Everything was accessible from home. So that was a bit different then I think what would typically be (p. 1).

With the introduction of cohorts and the progression into Stage 1 of the relaunch, the opportunities for children to gather with peers and extended family members slowly increased. Many of the children and parents made reference to the relaunch as a return to

almost normal, pre-COVID-19 interactions with others, especially outdoors. Jillian's comments reveal her daughter's re-engagement with her peers at the start of Stage 1:

> *Myself:* Can you speak maybe to her friends, and, um, what type of physical activities she likes to do with her friends?
> *Jillian:* Um, the frisbee golf thing that they went on last week, the youths from our church, they get together every week and do an activity. During COVID-19, they weren't doing anything, but now that the restrictions have lifted, they can do stuff outside like frisbee golf and biking. It's not always physical activity, I think the week before they had gone fishing, but often times it is. So yeah, they get together once a week and do some type of activity and often it is physical (p. 4).

4.7.2 Closures

During the initial pandemic response and Stage 1 of the relaunch, public health authorities mandated that schools and other facilities (e.g., gyms, fitness centers, pools) close to the public. 37 comments from 21 data sources referenced school closures as largely a deterrent to the children's physical activity engagement.

When schools across the province closed on March 16, 2020, the children and their teachers transitioned to home-based, online-learning. For most of the children, that translated to one or two hours of video-conferencing with additional tasks to be completed outside of that. The educational focus for the students was on the core subjects (e.g., math, English language arts, social studies, science), as Darlene's comments highlight:

> *Myself:* What is their school format now under COVID-19, or what was it before they ended for summer?
> *Darlene:* Straight online. Um, they would get their assignments at the beginning of the week for the whole week and they would meet their teacher, Eva would meet her teacher everyday for the group, the whole class, they would meet and read a book. David would meet twice a week with his class, and they would, um, what would they do? They would do a bunch of different things.
> *Myself:* And would they do anything for gym?
> *Darlene:* No, mandated only LA. No, that must not be true, that must only be for my grade, LA and Math. They did do social and science for an hour of each [day], I'm not sure, but not gym, no art, no extra, no music.
> School closures forced the children into the home during much of the day. (p. 10)

Most children and parents felt that this transition had a negative effect on their physical activity engagement. The children felt that it robbed them of any opportunity to engage in the child- and adult-directed coactivity that normally occurs during physical education class and recess. John referenced the lack of structure outside of school as a deterrent to his children's physical activity engagement. John tried his best to replicate their school schedule at home, but with his own work transitioning to home, it soon became unsustainable:

> Well, I think [physical activity] dropped a little bit too because without some certain structure. Like school is a good example of that, there is structure to do things. It's tricky because, you know, I'm still working. I do a little work from the office and then work at home. But, during my workday, which would be their school days, it's a little harder for me to go "hey guys, we're going to have the equivalent of recess." For a while I was trying to do a bit of a gym class with them around 1:30 or 2:00 o'clock and I'd give them a series of activities to do. Like, run around the block, do a series of resistance exercises, and run around the block again and do some other types of activities, but it's hard to substitute what they might do for a regular daily physical activity. It's not very interactive and it's not very interesting to them. So, I think that's been the challenge and because, you know, during the lock down period, people weren't active and people were out, but kind of avoiding each other. So, it's hard to get them engaged in doing activities and it's kind of awkward to be out and be spaced out. So, there's a psychological piece to what should you be doing, and shouldn't you be doing. That started to ease up now, but I think it's also a slow ease back into those type of activities, you know, active things (p. 5).

The new online-learning format also meant that school days were often much shorter, which created more free time for the children. Many of them, including James used the time to engage in child-directed coactivity with peers:

> *Myself:* How has COVID-19 impacted your physical activity?
> *James:* I think it has made me more physically active because there's nothing else to do, nothing to get in the way. I got a new bike and that's all that I do right now is go bike riding. That's made me more physically active because there's nothing else to do. I got my bike like three or four weeks ago and I've been going down to the river bottom with my friends or jumping on the trampoline. Sometimes we play a game of hit where you jump on the trampoline and you hit each other like in hockey. I think it has made me more physically active because I have more time to be physically active. That's what I think (p. 10).

Being home during the school week also gave many families the opportunity to reconnect and be physically active, primarily by way of adult-directed coactivity. My dialogue with David outlines how he cherishes the extra family time:

> *Myself:* Okay. How has COVID-19 affected physical activity with your family? Do you do more? Do you do less?
> *David:* I think I do more because I hang out with them more and we spend more time together. We have more time to think about going camping or going for walks. And, we go on our walks because we are not at school.
> *Myself:* And do you enjoy that extra time with family?
> *David:* Yeah (p. 4).

For other children, public health restrictions meant that their parents were working from home and often had little time to be coactive with their children. As a result, much of the extra, non-academic free time translated to screen time. My dialogue with Alex and his mother Gabrielle outlines how video games became a way to continue communication with friends:

> *Myself:* So, two hours a day of what would normally be six hours a day, I'm assuming on a school day. What did you do with the extra time?
> *Alex:* Nothing.
> *Gabrielle:* Too much Fortnite.
> *Myself:* Fortnite?
> *Alex:* It was also bad weather during school, mostly.
> *Gabrielle:* It was bad weather, but that was one of the only ways that those friends could communicate with each other was to hop on an online video game and chat with each other through the microphone, because they couldn't see each other in person.
> *Myself:* I'm going to quickly go back here. So, we talked about being physically active with friends. How did COVID-19 change that for you?
> *Alex:* Um, for like three and a half months, I didn't see them, I was just talking to them.
> *Myself:* So, talking to them over video games?
> *Alex:* Yeah, and over the phone (p. 12).

4.7.3 Cancellations

During the initial pandemic response and Stage 1, physical activity and sport organizations were mandated to cease face-to-face operations. For the children, this

meant no youth group gatherings, sport practices, or competitions. 32 comments from 19 data sources referenced organized physical activity cancellations as primarily a deterrent to the children's physical activity engagement.

Like school closures, public health authorities' cancellation of organized physical activity had the effect of forcing children to find alternatives. Many children struggled initially, and their physical activity engagement decreased as a result. Jamie's comment exemplifies the drastic shift in her son's physical activity engagement after public health guidelines forced the cancellation of his sports:

> *Myself:* You mentioned earlier that Jordan is doing quite a bit of organized sports right now, how has COVID-19 impacted that, especially when it comes to being physically active with friends?
> *Jamie:* Oh, drastically because, well, it was club-ball season when it all kind of went down so we went from running around and having practices every day and tournaments every weekend to nothing. He went from doing physical activity literally every day and almost every weekend to abruptly doing nothing. So, huge impact. Yeah (p. 9).

Organized physical activity cancellations reduced the children's physical activity engagement by way of limiting opportunities for adult-directed coactivity. However, the effects of that were not entirely negative. Many of the children instead sought out different ways to be physically active. This physical activity primarily took the form of family- and peer-based coactivity. Cindy commented favourably on the shift from the adult-directed coactivity that occurs during organized physical activity and school to the child-directed coactivity that occurs with peers. She even suggested that this shift increased her son's physical activity engagement:

> I think you got from Zack that he's like a super organized team sports guy, right? So, he is kind of like your typical hockey player. He's kind of told where to be, what time to be there, what to do. And, that's kind of what he does. This has been actually kind of good for him, because all of a sudden, it's like he and his buddy, they're just down in the coulees for two, three hours, you know, just figuring stuff out. And he's at the park playing soccer with tons of different age groups of kids.

> It's just neighbourhood kids and playing with kids that aren't as athletic. And, you know, then when he's in school. So, I don't really know how much physical activity he's getting in school. I would assume he's probably getting more now because he's not doing much school. I would be really interested to see, to be honest, you know, like where he's active. I would think he's more active when he was in school, but I don't know because it's so coached and organized. So maybe he's not, right (p. 1)?

Children and parents also highlighted that because of both school closures and organized physical activity cancellations, more of their physical activity took place outdoors. Especially as the cold winter weather ended in late April and early-May. Figure 4.1 supports this fact as the three most popular activities during the seven-day physical activity journaling period were outdoor play, trampoline, and golf. Golf courses in the province were the first sporting facilities that were permitted to open during the late stages of the initial pandemic response, and many of the children took advantage. My dialogue with Dora captures the importance of the outdoors during the initial pandemic response and Stage 1:

> *Myself*: COVID-19, can you describe how that has impacted your physical activity as a family and then individually for James and Allie.
> *Dora:* I'd say as a family we do more family stuff. We have gone for more bike rides and family walks. For them as individuals, if it wasn't COVID-19, we would have more structure but because of COVID-19 we have more unstructured physical activity and I think that's just as important. Them running around at the park and being creative is just as important as having structure.
> *Myself:* You feel that there have been any shifts in the type of physical activity? You already mentioned unstructured versus structured.
> *Dora:* Right, at the beginning it was still winter and cold out and you couldn't be around anyone so absolutely that made a difference. They weren't out biking with friends or running around with friends, but we were creative, we actually built a ski hill in our yard because we have a pretty good side yard. We built up snow with a jump and they spent hours out there doing that for a couple of weeks (p. 4).

CHAPTER 5: DISCUSSION

Chapter 5 provides a detailed response to the research questions I posed at the outset. The questions that I posed were as follows:

I. What childhood physical activity preferences are evident in children and their parents' perceptions and experiences?

II. What proximal processes related to childhood physical activity are evident in children and their parents' perceptions and experiences?

III. How do the child characteristics that children and their parents perceive as important physical activity determinants promote and deter childhood physical activity engagement?

IV. How do the contextual elements that children and their parents perceive as important physical activity determinants promote and deter childhood physical activity engagement?

V. How do the temporal elements that children and their parents perceive as important physical activity determinants promote and deter childhood physical activity engagement?

Research Question I, II, III, IV, and V align with sections 5.1, 5.2, 5.3, 5.4, and 5.5, respectively. In each section, I summarize the findings and discuss the connections to theory and the research literature. I conclude each section with a succinct hypothesis that answers the research question.

5.1 PHYSICAL ACTIVITY ENGAGEMENT

Seven of 16 children accumulated sufficient average daily steps to meet the step-count threshold that corresponds to 60 minutes of daily moderate to vigorous intensity physical activity. Translated to a percentage point, this equates to 44%, which is slightly higher than the guideline adherence reported by Colley et al. (2007 [between 2007 and 2015, 35.6% children accumulated 60 minutes of daily moderate to vigorous intensity physical activity when averaged over one week]) (Colley et al., 2017) (Colley et al., 2017) (Colley et al., 2017) (Colley et al., 2017) (Colley et al., 2017) (Colley et al., 2017) (Colley et al., 2017) . My analysis of the physical activity journals revealed that the children spent the majority of their physical activity minutes at a perceived level of exertion of 5, 6, and 7 of a maximum of 10, which equates to moderate intensity physical activity (Yelling et al., 2002). In short, the children's physical activity engagement does not drastically differ from that of their counterparts across Canada.

When it comes to physical activity preferences in Canadian children, most of the data is based on memberships to sport organizations (e.g., Canadian Fitness & Lifestyle Research Institute, 2018a, 2018b; ParticipACTION, 2018). In the local context, soccer is the most popular sport by active memberships (Lethbridge Sport Council, 2019). Organized sport, albeit a relevant setting for physical activity engagement, is not the only place where childhood physical activity occurs. Outside of the sporting domain, physical activity preferences are more difficult to measure and therefore the number of studies are less numerous. Resaland and colleagues' (2019) study of over 1,000, 10-year-old Norwegian children evaluated physical activity preferences. They asked children to rank their preferred physical activities from least preferred to most preferred. The children awarded the highest preference ranks to play- and game-based physical activities such as

soccer, dodgeball, swimming, and water play. The children ranked other physical activities that did not include play or game components (i.e., jogging, rope-skipping) much lower. Children's affinity towards game-based physical activity aligns with the perceptions and experiences of the children and parents in this investigation. The children value the enjoyment and meaningfulness that game-based physical activity fosters.

Within a bioecological framework, the children's physical activity engagement represents a developmental outcome. Sufficient daily physical activity engagement is desirable because it is associated with many positive health outcomes (Carson et al., 2017; Janssen & Leblanc, 2010), as I discussed in Chapter 2. The developmental outcome determines the nature of the bioecological processes that underpin it. Bioecological processes are therefore unique to specific developmental outcomes (Bronfenbrenner & Morris, 2006). For instance, the bioecological processes that lead to reading acquisition are unique to that developmental outcome. They are not likely to contribute to the acquisition of other abilities, such as riding a bicycle or learning how to swim. Physical activity engagement has a unique bioecological fingerprint, which I describe in the forthcoming sections.

5.1.1 Hypothesis I

The children's physical activity engagement varies in type and intensity. The children prefer game-based physical activity because it fosters a sense of enjoyment and meaningfulness.

5.2 PROXIMAL PROCESS

Children, along with their parents, highlighted that they prefer to be physically active with others; that is, engage in coactivity. Past research has investigated the link between childhood physical activity and coactivity. This research has primarily assessed

whether coactivity improves childhood physical activity. Some studies (e.g., O'Connor et al., 2009; van Sluijs et al., 2011) found a minimal effect of coactivity interventions on childhood physical activity. In other words, the amount and intensity of physical activity did not drastically differ between children who had ample opportunity to engage in coactivity and children who had limited opportunity.

Other studies linked coactivity to increased physical activity. For example, O'Dwyer et al. (2012) studied the effect of a parent-child, active-play intervention on childhood physical activity. They recruited 77 British families and randomly assigned them to either an intervention or control group. The intervention group participated in a 10-week, active-play, coactivity program, whereas the control group maintained their usual routine. The researchers found that sedentary time decreased, and physical activity engagement increased in those families that participated in the intervention.

Rhodes and Lim (2018) offered one possible explanation for the conflicting evidence on the efficacy of coactivity. They wrote that there is a lack of understanding regarding the possible mechanisms that determine how coactivity leads to increased physical activity engagement in children. The inability to substantiate a statistically significant, positive coactivity-effect might simply be due to the lack of understanding of how coactivity exerts its influence on childhood physical activity engagement. The perceptions and experiences of the children and parents in this investigation suggest that a game-based orientation may be an important aspect of meaningful coactivity.

There continues to be a need for researchers to hone coactivity theory, and more precisely, the understanding of how coactivity leads to physical activity engagement in children (Rhodes & Lim, 2018). The results of my investigation, in conjunction with bioecological theory offers some insight into how coactivity may support physical

activity engagement. Key to this explanation is children's attraction to game-based physical activity. Game-based physical activity occurs primarily through coactivity as recess soccer games or a playground-tag games cannot occur without the reciprocity offered by other individuals. Game-based coactivity, whether directed by adults or children, constitutes a proximal process and represents what I hypothesize to be the main bioecological mechanism that underpins childhood physical activity engagement.

As I discussed in Chapter 2, a developmentally effective proximal process must be specific to the developmental outcome, it must include elements of reciprocity, it must be frequent and long-lasting, and it must become progressively more challenging over time (Bronfenbrenner & Morris, 2006). Coactivity and the game-based physical activity that it enables, contains all the elements of a developmentally effective proximal process. First, coactivity demands simultaneous physical activity engagement of the individuals involved. It thereby requires reciprocity and is specific to physical activity engagement (i.e., the developmental outcome).

Second, game-based physical activity that is facilitated through coactivity challenges the children. When children chase one another in a game of tag or attempt to score a goal against an opponent in a soccer game, they must possess the necessary skill-related competencies (e.g., running speed, agility, balance) and health-related competencies (e.g., cardiovascular fitness, strength). Task success depends on children's ability to dynamically mobilize these competencies. As children learn to run faster and strike soccer balls with greater skill and force, their games become naturally more challenging. In other words, the challenges unique to a specific game are commensurate with the competencies of the children involved. Games progress in difficulty and

complexity often due to the fact that many of these competencies (e.g., speed, strength) naturally improve as children physically mature (Balyi et al., 2013).

Third and last, it is difficult to infer the frequency and long-term nature of coactivity based on evidence from a seven-day physical activity journal. Doing so would require a longitudinal approach. However, subjective evidence from the interviews and physical activity journals suggests coactivity amongst the children may be frequent and long-lasting. Over the course of the journaling week, children were coactive 10 times on average (see Table 4.6), which equates to at least once every day. Furthermore, more than half of the children (nine of a total of 16) felt that the journaling week accurately reflected their typical physical activity engagement. This suggests that for many children, coactivity is a regular part of their childhood.

One-hundred thirty-one comments from a total of 191 related to coactivity were in specific reference to child-directed coactivity. Children cherished this form of coactivity and spoke favourably about its non-coercive nature. Self-determination theory may explain why children enjoy this form of coactivity and how it may be particularly effective in promoting physical activity. Self-determination theory is a composite of several sub-theories (Deci & Ryan, 1985). The psychological needs sub-theory postulates that feelings of competence, relatedness, and autonomy underpin motivation. Child-directed coactivity leaves children largely to their own devices. Many of the children spoke about the collaborative nature of child-directed coactivity, whether that occurs by taking turns or voting on activities. This leaves children with a degree of freedom to align their chosen activities with their internalized goals. Adult-directed coactivities are more likely to align with curriculum, parent, and sport-specific goals. Autonomy, therefore, may be better supported by child-directed coactivity, which subsequently nurtures

motivation for continued engagement in physical activity. Future autonomy-focused, self-determination theory research will likely shed light on whether child- or adult-directed coactivity is a more effective vehicle for supporting physical activity engagement.

5.2.1 Hypothesis II

Coactivity represents the primary vehicle for the children's physical activity engagement. This is because coactivity facilitates game-based physical activity, which is the children's preferred form of physical activity.

5.3 CHILD CHARACTERISTICS

The characteristics of the children play an important part in their physical activity engagement. These characteristics promote or deter coactivity, which determines the children's physical activity engagement. On a more specific level, there appears to be an interdependence between the children's perceived physical competence and self-efficacy. The interplay between these two characteristics subsequently affects coactivity. The children's sociability and their gender further impact coactivity. I discuss these connections between child-level characteristics and coactivity in the following paragraphs.

Physical competence is an important determinant of children's physical activity engagement (Whitehead, 2010a). Physical competence refers to children's movement proficiency (i.e., skill-related competencies) and their capacity to sustain metabolically demanding tasks ([i.e., health-related competencies] Balyi et al., 2013; Timo et al., 2016).

In Chapter 2, I discussed two general conclusions that researchers have drawn regarding physical competence. First, children with higher levels of objectively-measured, physical competence tend to engage in more physical activity than their less physically-competent counterparts (Figueroa & An, 2017). Second, children with higher

levels of both objectively- and subjectively-measured physical competence tend to be more active later in life; that is, five years later (Timo et al., 2016) and even 20 years later (Lloyd et al., 2014). In other words, physical competence has both an acute and latent effect on physical activity engagement.

The literature offers strong support for the relationship between physical competence and childhood physical activity engagement (e.g., Figueroa & An, 2017; Timo et al., 2016); however, the exact mechanisms are less obvious. It is possible that those children who are more physically active simply have more opportunity to hone their physical competence than those that are less physically active. Correlational and causal-comparative studies (e.g., Figueroa & An, 2017; Loprinzi, 2015) offer limited evidence for the direction of the relationship between physical competence and physical activity. The perceptions and experiences of the children in this investigation offers some insight into the direction of this relationship. Their comments suggest that they see physical activity engagement to be a consequence of physical competence. Put differently, many of the children refrain from engaging in a particular physical activity if they do not perceive themselves as possessing the necessary physical competencies.

The construct of self-efficacy proposed by Bandura (1997) may help to connect physical competence to physical activity engagement. Suton et al. (2013) and Manley et al. (2014) reported that children who demonstrated high levels of self-efficacy for skill- and health-related competencies accumulated more physical activity than children who demonstrated low levels. Darlene's comments regarding her children's sport participation and Cindy's comments (p. 95) about her son's bicycle rides demonstrate their belief that having the necessary skills to excel, determines the children's engagement in various physical activities. If children believe that they can succeed at a task, they are much more

likely to engage in that task (Bandura, 1997). For instance, children that have learned to ride a bicycle attribute their task success to their physical competence. They may even attribute their task success to more specific competencies, such as balance and cardiorespiratory fitness. Over time, their belief in the ability to succeed becomes stable and children express self-efficacy. This self-efficacy is task-specific; meaning that self-efficacy for riding a bicycle does not translate to self-efficacy for other tasks, such as reading and writing.

Self-determination theory sheds further light on the interaction between physical competence, self-efficacy, and childhood physical activity engagement. The psychological needs sub-theory outlines that in order for individuals to be motivated to engage in a task, they need to feel competent in that task (Deci & Ryan, 1985). Those that feel competent are much more likely to be motivated to complete that task. Extended to childhood physical activity, those who feel they have the necessary skills to kick a soccer ball or swim across a pool are more likely to have the necessary motivation to play a game of soccer or join a competitive swim team, which then promotes their physical activity engagement.

It is important to underline that physical competence and self-efficacy are context- and task-specific. The children in this investigation prefer to engage in game-based coactivity, which calls on a very specific expression of physical competence and self-efficacy. For instance, playing a game of tag requires the capacity to dynamically react to others. In this situation, agility and speed are important skill-based competencies. Game-based coactivity also requires a willingness to engage with others, which is perhaps why children and their parents referenced sociability as another physical activity determinant.

In the context of this investigation, sociability refers to children's propensity to interact with others (Garcia et al., 2016). What the results suggest is that sociability helps children engage in physical activity. This is primarily the case because children prefer being physically active with others (i.e., coactivity). Physical activity therefore hinges on their willingness to engage with others. The link between sociability and other personality traits and childhood physical activity engagement has been the topic of investigation of several studies (e.g., Anderson et al., 2004; Irwin et al., 2015; Tucker et al., 2011); however, the results have been mixed. The children and parents' comments regarding the importance of sociability warrants further investigation.

Knowledge and understanding with respect to the benefits of regular engagement in physical activity presented itself as an important theme during the interviews. In *The Concept of Physical Literacy*, Margaret Whitehead highlights two forms of knowledge and understanding related to physical activity. The first refers to the ability to read the environment and respond to it with the appropriate movements (Whitehead, 2010a). A soccer player that dodges another player after anticipating a tackle exemplifies this form of knowledge and understanding. The second form of knowledge and understanding refers simply to children's general awareness of the concepts and benefits related to physical activity (Whitehead, 2010a). For instance, knowing how to define cardiovascular endurance and understanding its long-term benefits (Francis et al., 2016).

Health-related fitness knowledge, which relates to the second form has been subjected to research (e.g., Chen et al., 2017; Ferkel et al., 2014; Haslem et al., 2016). These studies concluded that health-related fitness knowledge can successfully predict physical fitness and physical activity participation in children and adolescents. Generally, moderate to high health-related fitness knowledge translates to physical activity

engagement whereas low health-related fitness knowledge translates to sedentary behaviours. These results suggest that promoting knowledge and understanding may help to curb physical inactivity trends in children and adolescents.

During my interviews with the children, it became obvious that many of them had a general awareness of the concepts and benefits related to physical activity. For instance, most of them understood the difference between physical activity and sedentary behaviour. They could also articulate many of the health-related benefits of physical activity, such as enhanced cardiovascular function and lower incidence of obesity. Some children (e.g., Riley, p. 98) further understand that the way they feel on a given day is often related to whether they engaged in physical activity. In other words, they understand that they can modulate mood with physical activity. What children and parents' perceptions and experiences did not reveal was whether their physical activity engagement was an outcome of their knowledge and understanding or whether it was the reverse. In fact, none of the children or parents made direct reference to knowledge and understanding as something that influences their physical activity. For the children of this investigation, this means that their knowledge and understanding might simply be a by-product of physical activity engagement.

The final child characteristic that emerged from the data sources was gender. Although only four comments from three data sources were related specifically to gender, I felt that the comments were too important to ignore. With respect to gender, large descriptive studies have demonstrated that girls and especially adolescent girls are much less likely to meet the Canadian physical activity guidelines (i.e., Cameron et al., 2016; Colley et al., 2017). The reasons for this are complex but appear to be related to personal and social factors (Corr et al., 2018; Laird et al., 2016).

Corr et al. (2018) gathered the results from qualitative studies relating to adolescent girls' perceptions of physical activity participation. They concluded that the amount and type of physical activity engagement was primarily influenced by the girls' perceived physical competence. Many girls simply did not want to engage in physical activities for which they felt they lacked the necessary physical competencies. Jillian (p. 96) spoke about the impact that low levels of perceived physical competence had on her physical activity engagement. In her interview responses, Jillian blames her unwillingness to participate in team sports as a child on her poor ball control. She speculated that poor perceived physical competence may also explain her daughter's lack of interest for team sports. In Jillian and her daughter's case, a low level of perceived physical competence likely affects physical activity engagement by limiting their desire to engage in game-based, adult-directed coactivity.

In relation to social factors, parents, family, and peers play an important role in enhancing physical activity in girls (Laird et al., 2016). Generally, there is a positive relationship between physical activity engagement in girls and support from their parents, family, and peers. The support can take the form of financial support, encouragement, and sharing in the experience (i.e., coactivity). It is important to stress that this support needs to be perceived as such by the girls. A parent or a peer that feels they are supportive, may in fact be discouraging physical activity. For example, overbearing parents that focus solely on their daughter's sport performance may feel as though they are supportive but are instead actively discouraging physical activity.

Lexi and Peter's comments (p. 99) related to gender exemplify the importance of social factors, and particularly peer-support by way of coactivity. Their comments suggest that there is a preference to engage in coactivity with those of the same gender;

that is, girls prefer to be active with other girls. It is difficult to ascertain what this might mean for Lexi and her peers in the future. One possible outcome is that their girl cohort continues to support each other's physical activity through regular coactivity. Another possible outcome is that within a context where there is significantly lower physical activity engagement among adolescent girls (Cameron et al., 2016; Colley et al., 2017), the opportunities to engage in gender-specific coactivity may evaporate, which might then lead to reduced physical activity engagement. Although there were few references to gender, my findings suggest that researchers need to shed more light on how gender impacts coactivity.

The bioecological model stipulates that the biopsychological characteristics of children carry substantial sway over the trajectory of their development (Bronfenbrenner & Morris, 2006). Biopsychological characteristics constitute a child's physical and psychological attributes, which the bioecological model divides into three categories: dispositions, resources, and demand.

The children and their parents cited self-efficacy and sociability as important dispositions related to childhood physical activity. In line with the bioecological model, dispositions are the most influential person characteristics. Promotive dispositions set proximal processes in motion and ensure that they remain in motion. In contrast, disruptive dispositions can reduce the quality or even prevent the occurrence of proximal processes (Bronfenbrenner & Morris, 2006). According to the children and their parents' perceptions and experiences, the continuity and quality of physical activity by way of coactivity is contingent on sociability and self-efficacy. In other words, children who are self-efficacious and sociable may be more likely to seek out others to be physically active with than their less self-efficacious and sociable counterparts.

The second category—resource—represents the biopsychological liabilities that enhance or constrain the capacity of the individual to engage in proximal processes (Bronfenbrenner & Morris, 2006). The bioecological model postulates that there are developmental assets that evolve over time and thus enhance the quality of proximal processes (Bronfenbrenner & Morris, 2006). The resources that were evident in the perceptions and experiences of the children and their parents were physical competence and knowledge and understanding. As children undergo normal growth and development, these resources gradually evolve (Bronfenbrenner & Morris, 2006). A bioecologically grounded hypothesis might then suggest that the extent by which these resources develop is proportional to the extent to which children engage in coactivity. The bioecological model further postulates that the products of development often serve as further producers of development (Bronfenbrenner & Morris, 2006). In other words, if physical competence and knowledge and understanding lead to coactivity, it will likely lead to subsequent development of further physical competence and knowledge and understanding.

The bioecological model is an interactive model (Bronfenbrenner & Morris, 2006). Different components often interact and jointly exert their influence on development. Several children and their parents shared perceptions and experiences that suggest an interaction between resource and disposition. These children and their parents spoke specifically about the connection between competence and self-efficacy. The children's belief in their ability to succeed in various physical activities appears to be underpinned by skill- and health-related competencies. In relation to physical activity, the children and their parents felt that physical competence and self-efficacy generally promoted coactivity. Their perceptions and experiences did not reveal a link between

knowledge and understanding, physical activity engagement, and coactivity. More research is thus needed to establish how such a link might take form.

Demand characteristics are those that invite or discourage proximal processes (Bronfenbrenner & Morris, 2006). In the context of this investigation, demand characteristics might determine who children engage in coactivity with. The sole demand characteristic that emerged from the children and their parents' perceptions and experiences was gender. Two sets of interview comments revealed a direct link between gender and coactivity. Not the amount of coactivity, but rather the parties involved in the coactivity. Lexi and Peter's comments (p. 99) suggest that coactivity tends to be gender-homogenous.

5.3.1 Hypothesis III

The characteristics of the children exert influence over their physical activity engagement. The effects of these characteristics are primarily indirect; that is physical competence, self-efficacy, sociability, and gender promote and deter the extent and type of coactivity, which in turn influences physical activity engagement.

5.4 CONTEXTUAL CHARACTERISTICS

The context influences the children's physical activity in three ways: First, it contains individuals that engage in coactivity with the children; and second, it is the setting in which coactivity occurs. Simply put, the context represents opportunities and spaces for coactivity. The context also incorporates governments and institutions that influence childhood physical activity through guidelines and restrictions. The children and their parents made frequent reference to family, peers, the physical environment, school, physical activity organizations, and public health restrictions as important contextual determinants of childhood physical activity.

Research shows that family and peers play an important role in children's physical activity engagement (e.g., Jerina et al., 2018; Pawlowski et al., 2018). The research suggests that the more time children spend with family and peers, the more physically active they are (Garcia et al., 2016; Jerina et al., 2018); however, the amount of physical activity depends on the personal characteristics of the children, their family, and their peers. Promotive personal characteristics include sociability, popularity, peer and family physical activity engagement, and parental education (Garcia et al., 2016; Jerina et al., 2018; Pujadas-Botey et al., 2016).

There is evidence that coactivity is the primary mechanism by which family and peers impact childhood physical activity (e.g., O'Dwyer et al., 2012; Rhodes & Lim, 2018). Children who have peers and family members that they can be coactive with are more likely to engage in physical activity than those who do not. When it comes to the perceptions and experiences of the investigation's children and their parents, coactivity occurred almost exclusively with family and peers. Adult-directed coactivity primarily occurred in parent-child or grandparent-child dyads, whereas child-directed coactivity occurred in peer-child, sibling-child, or cousin-child dyads. In some instances, dyads would also combine (e.g., peer-parent-child triad).

Research suggests that family support, and particularly financial support further impacts physical activity engagement (e.g., Forthofer et al., 2017; Laird et al., 2016; Pujadas-Botey et al., 2016). The greater a family's financial means, the more likely it is that they can afford organized physical activity memberships, sporting equipment, and access to recreation facilities. According to the children's parents, family finance affects physical activity. They felt that much of the physical activity that their children engage in can be attributed to their ability to afford those physical activities. The parents perceive

that family finances do not affect the amount of physical activity that the children engage in, but rather the type. Inexpensive physical activities such as biking and playing on playgrounds tend to be more frequent than expensive activities, such as skiing and kayaking.

Children cited family members and peers as strong motivators to their physical activity (e.g., Allie's comment, p. 108). The third psychological need postulated by self-determination theory that I have not discussed is relatedness (Deci & Ryan, 1985). For individuals to be motivated to engage in a behaviour, they need to feel a sense of belonging (Deci & Ryan, 1985). They need to feel that the experience is shared by others. By allowing children to jointly experience physical activity with their peers and family members, coactivity fulfills that psychological need of relatedness and therefore nurtures the motivation to be physically active.

Pivoting away from peers and family, the physical environment represents the next major contextual element that the children and their parents cited as an important determinant to childhood physical activity. One feature of the physical environment that children and parents referenced was access to safe amenities. Access to safe amenities is one of the most frequently cited correlate of childhood physical activity engagement (e.g., Dawson-Hahn et al., 2015; Harrington et al., 2016; Jerina et al., 2018; Kim et al., 2017; Pereira et al., 2017). Children who have access to physical activity conducive spaces (e.g., playgrounds, parks, pools) in places that they or their parents perceive as being safe are more likely to engage in physical activity. The perceptions and experiences of the children and parents in this investigation go beyond validating the correlation between childhood physical activity engagement and access to safe amenities. Their perceptions

and experiences point out that safe amenities promote childhood physical activity by creating spaces where the children can engage in game-based, child-directed coactivity.

A second feature of the physical environment that children and parents referenced was the weather. On weather, researchers have established correlations similar to access to safe amenities (e.g., Oliveira et al., 2014; Stanley et al., 2013). Many physical activities that children take part in, take place outside. When there is good weather, children venture outside and are more likely to engage in physical activity then when the weather is poor (Pawlowski et al., 2018). The perceptions and experiences of the children and parents in this investigation reveal that, for almost all of them, physical activity engagement rises and falls in accordance with weather conditions. They are more physically active when the weather is favourable (i.e., warm and dry), and less physically active when the weather is unfavourable (i.e., cold and wet).

Canadian children spend approximately half of their waking hours in school (Patton & McDougall, 2009). As a result, many of the children and parents referenced school as an important childhood physical activity determinant. Through curricular and extra-curricular activities, schools play a critical role in fostering positive physical activity behaviours (Culpepper et al., 2011; Ordóñez Dios et al., 2019). Non-curricular time, such as recess also plays an important role by allowing children to engage in play and game-based physical activity (Pawlowski et al., 2018). My conversations with parents and children were mostly about the latter. My investigation highlights that the children use this time to interact with peers, and most of them frequently engage in game-based, child-directed coactivity (e.g., soccer, football, tag).

Canadian researchers point out that over three-quarters of Canadian children participate in at least one organized physical activity over the course of the year

(Canadian Fitness & Lifestyle Research Institute, 2018a). Canadian researchers and their counterparts abroad also point out that in order for organized physical activity participation to be effective in promoting childhood physical activity, children should participate in as many forms as possible (Jayanthi et al., 2015; Jayanthi et al., 2013). Children that diversify their organized physical activity participation tend to be more movement skill proficient, exhibit greater fitness, and engage in more physical activity than children who specialize in one sport from an early age (DiFiori et al., 2014; DiStefano et al., 2018; Jayanthi et al., 2015).

Like school, physical activity organizations are further settings where children engage in coactivity. Much of that coactivity takes the form of adult-directed coactivity; that is, physical activity with other children under the instruction of adult volunteers and coaches. The children reported that they engage in a diverse number of organized forms of physical activity (Figure 4.6). For some children, sport organizations have negatively impacted their desire to be physically active. Sport celebrates those that are successful and often inadvertently or actively excludes participation on the basis of physical competence. In Janelle's case (p. 119), not making the basketball team meant that she has become disenfranchised with the sport, which has the potential of leading to more widespread aversions to physical activity in the future.

We highlighted the importance of schools and physical activity and sport organizations as settings for coactivity in a recently published article (Schaerz & Balderson, 2020). We invited a small sample of prepubescent boys to individual interviews to determine what bioecological mechanisms underpin their physical literacy journey. We learned from the children that schools and physical activity organizations create a space for meaningful and reciprocal peer-child interactions. Similar to the

children in this investigation, the three prepubescent boys spoke about the importance of recess and the game-based, child-directed coactivity that occurs during that time.

The global COVID-19 pandemic and the corresponding public health restrictions that were instituted further affected the children's physical activity. Coactivity requires that the parties involved can freely interact with one another. For popular games such as tag, the individuals involved need to be able to physically touch each other. The public health requirements for physical separation discouraged many of those types of games. Furthermore, schools and physical activity organizations were forced to cease operations, which had the effect of eliminating almost all settings where coactivity occurs. By virtue of physical separation, closures, and cancellations, public health restrictions related to the COVID-19 pandemic generally had a negative effect on the children's physical activity. In many cases, the children's physical activity time was replaced by screen-time. However, in a few cases, reduced school commitments led to more free time, which translated to more family and peer-coactivity.

From a bioecological perspective, the context consists of nested systems that interact to exert their influence on developmental outcomes (Bronfenbrenner & Morris, 2006). The innermost system, or microsystem, includes the developing child and the individuals that the child interacts with. The interaction of the biopsychological characteristics of the child and those the child interacts with, determines the form, power, content, and direction of proximal processes (Bronfenbrenner & Morris, 2006). The developing child often finds themselves in several microsystems. The home typically represents one microsystem and peer-groups at school or in physical activity organization represent others. The microsystem also incorporates features of the physical environment

that the developing child might interact with. These features can either promote or deter proximal processes (Bronfenbrenner & Morris, 2006).

According to the children and their parents' perceptions and experiences, coactivity occurs within family and peer microsystems. Each of these microsystems has its own unique characteristics, which then shapes the nature of coactivity. Parents and grandparents often take on an authoritative role, which creates a parent-child microsystem that promotes adult-directed coactivity. In microsystems that do not include adults (i.e., peer-child, sibling-child, and cousin-child microsystems), the interactions are more collaborative and take the form of child-directed coactivity. Coactivity hinges on features of the physical environment. The children and their parents reported that access to safe amenities and good weather positively influenced the frequency and duration of coactivity.

The mesosystem is a cluster of microsystems in which the developing child is directly situated. Stability between the microsystems that make up the mesosystem has a positive effect on the trajectory of a child's development (Bronfenbrenner & Morris, 2006). The results from this investigation suggest that together, school and physical activity organizations establish a stable ecosystem that fosters coactivity. Physical activity and sport organizations provide opportunities for adult-directed coactivity, whereas schools provide opportunities for both adult- and child-directed coactivity.

Under normal circumstances, the children move between microsystems within the mesosystem, which results in varied and frequent coactivity. However, the public health restrictions that were instituted to combat the COVID-19 pandemic destabilized the mesosystem. This meant that simultaneous school-based and organized physical activity-based coactivity was no longer possible. These closures and cancellations and their effect

on coactivity exemplify how structures of the macrosystem can undermine the stability of the nested systems that it subsumes (Bronfenbrenner & Morris, 2006).

5.4.1 Hypothesis IV

The children's physical activity engagement is context-specific. Elements within the children's context, including peers, family, the physical environment, physical activity organizations, schools, and public health restrictions indirectly affect their physical activity engagement by creating opportunities and settings for coactivity.

5.5 TEMPORAL CHARACTERISTICS

As part of this investigation, I sought to learn what temporal elements were evident in the perceptions and experiences of the children and their parents, and how these elements affect the children's physical activity. In short, I learned that time has an indirect, but considerable effect on the children's physical activity. More specifically, temporal elements are imbedded in features of the children's characteristics and their context. These features include physical competence, the physical environment, schools, and public health restrictions.

The bioecological model stipulates that time can directly or indirectly affect development (Bronfenbrenner & Morris, 2006). The perceptions and experiences of the children and their parents suggest that physical activity is indeed influenced by time. For at least one child, time appears to impact the expression of physical competence, which subsequently impacts organized physical activity engagement. Balyi and his co-authors (2013) point out that the rate at which children develop plays an important role in their physical competence. Children reach physical maturity across broad time spans, with some developing faster and some slower. Children of the same chronological age might therefore be separated by several years in biological age (Balyi et al., 2013). In cases

where physical activity is contingent on possessing certain skills, late development can prove to be detrimental. Jeremy spoke about this in relation to his daughter's exclusion from playing organized basketball (p. 119). He suggests that children who are slow to develop might not express certain skills that other children of the same chronological age do. In most cases, this is simply because some children develop at a slower rate and not because they lack the potential.

For many of the children, physical activity varies as a function of the seasons. This is evident in Kurtis' seasonal fluctuations in physical activity (p. 111). In most of Canada, weather that is conducive to outdoor physical activity occurs more frequently in the summertime when it is warm and dry. Most children therefore perceive summertime as a more appropriate time to engage in physical activity. The desire to engage in outdoor physical activity is more infrequent during the wintertime when the weather tends to be cold and wet. Weather trends, which in Canada are linked to time (i.e., the seasons), constitute a salient temporal determinant of the children's physical activity engagement.

The impact of time on development is primarily due to its effect on proximal processes; that is, the frequency and duration of proximal processes over time (Bronfenbrenner & Morris, 2006). Children and parents feel that there are contextual features that limit the frequency and duration of coactivity. Several of the children and parents (e.g., Lexi, p. 114) spoke unfavourably about the brevity of school recess. For many children, recess is their favourite time of the day because it allows them to engage in games-based, child-directed coactivity. However, because recess is typically only 15 minutes in length, the children feel that they simply do not have enough time to be coactive. The combined school recess time amounts to only about half of the 60-minute physical activity guideline (Canadian Society for Exercise Physiology, 2018).

The bioecological model further postulates that features within the nested contextual systems can change over time (Bronfenbrenner & Morris, 2006). The public health restrictions related to the COVID-19 pandemic are the best examples of how macrotime influenced the children's physical activity. Between the start of the pandemic in March and the data-collection time, the province of Alberta moved through three different phases. In each of the phases, the public health restrictions differed significantly. During the initial pandemic response, the restrictions were most severe. Public health authorities mandated that schools and organized physical activity close or cease face-to-face operations. This had the effect of eliminating or at the very least discouraging coactivity amongst children. When Alberta moved into Phase 1 of the relaunch in mid-May, the children's interactions with peers and extended family started to normalize, which made limited coactivity possible again. As public health restrictions eased again with the entry into Phase 2 in early June, organized physical activity became possible, which further increased opportunities for coactivity. The frequency of the children's coactivity generally increased as the public health restrictions related to the COVID-19 pandemic changed over time.

5.5.1 Hypothesis V

Time is a pervasive influencer of the children's physical activity engagement. Temporal elements (i.e., recess time constraints) may impact the duration of some children's coactivity. Temporal elements (i.e., alignment between biological and chronological age) may also influence the time at which children express certain child characteristics (i.e., physical competence), which can promote or deter physical activity engagement. Time can also affect features of the macrosystem (i.e., public health restrictions), which in the case of the children led to fluctuations in coactivity.

CHAPTER 6: CONCLUSION

The existing body of knowledge provides overwhelming evidence to suggest that childhood physical activity engagement is multifactorial (Sterdt et al., 2014). Indeed, the list of childhood physical activity correlates is long, with many systematic reviews suggesting as many as a dozen different correlates (e.g., Corr et al., 2018; Hesketh et al., 2017; Oliveira et al., 2014). These correlates can be divided into two categories: Child-level correlates and context-level correlates.

Frequently cited child-level correlates include motivation, physical competence, self-efficacy, knowledge, and understanding (Fenton et al., 2014; Figueroa & An, 2017; Haslem et al., 2016; Manley et al., 2014). Researchers generally point out that children with high levels of objectively measured child-level characteristics (e.g., high motivation for physical activity, high degree of physical competence) tend to engage in greater amounts of physical activity. Conversely, low levels of objectively measured child-level characteristics correlate to childhood physical inactivity. Child-level characteristics are incorporated into the concept of physical literacy, which was first proposed by Margaret Whitehead (2001). The concept suggests that these child-level characteristics interact to produce an individual that engages in physical activity with poise throughout the lifecourse (Whitehead, 2001, 2007, 2010c).

With respect to context, researchers often point to family, peers, organized physical activity, and school (Schaerz & Balderson, 2019). Children who have peers and family members that are physically active, tend to be physically active themselves (Garcia et al., 2016; Strutz et al., 2018). If those same children participate in a diverse number of organized physical activities, they often continue to be physically active into adulthood (Kjønniksen et al., 2009; Robertson-Wilson et al., 2003). Researchers have

further linked school-based curricular and non-curricular activities to childhood physical activity. Schools that foster a culture of physical activity through initiatives such as run clubs, step-challenges, or general health promotions have been very successful in increasing childhood physical activity (e.g., Cluss et al., 2016; Ordóñez Dios et al., 2019).

The majority of childhood physical activity research has focused on determining what factors affect childhood physical activity. Few have focused on how these factors interact and by what mechanism they influence childhood physical activity. Even fewer studies have directly sourced children and parents and formulated conclusions based on their perceptions and experiences. The purpose of my investigation was to address both gaps by employing a bioecologically-oriented theoretical framework. I sought to learn directly from parents and children how the childhood physical activity determinants that they perceived as important impacted their physical activity engagement.

First, I learned that physical activity engagement amongst the children is diverse. All of them enjoy taking part in many different types of physical activity, ranging from ringette to outdoor play. I further learned that the children were most strongly drawn to game-based physical activity. The reason for this is quite simple: game-based physical activity is more fun, which makes it more meaningful. Game-based physical activity most often requires that children find other persons to be physically active with. For that reason, the children's physical activity occurred primarily through coactivity (i.e., physical activity involving at least two individuals). The children and their parents spoke about two different forms of coactivity: Adult-directed and child-directed coactivity. Adult-directed coactivity involves both child-adult and child-child interactions, but the structure of the activity is determined by the adult (e.g., sport competition, playing catch with a parent). Child-directed coactivity typically occurs through child-child interaction

whereby the children determine the structure of the activity (e.g., playground tag games, recess soccer games). Importantly, both forms of coactivity can enable game-based physical activity.

The second thing that I learned was that the impact of childhood physical activity determinants was primarily indirect. Child-characteristics, family, peers, and the community influence physical activity by promoting or deterring the frequency and duration of coactivity. For instance, children and their parents feel that the desire to be physically active with others hinges on characteristics such as sociability. Being sociable therefore leads them to engage in coactivity, which subsequently contributes to their physical activity engagement. To offer another example, school does not directly impact the children's physical activity; instead, it contains spaces (i.e., physical education class, recess) that are fertile settings for coactivity.

Third and last, the COVID-19 pandemic provided compelling evidence for how features of the macrosystem dramatically influence children. The public health restrictions that authorities instituted to combat the COVID-19 pandemic led to an overnight collapse of many of the structures that facilitate coactivity. The most important structures that were impacted were schools and physical activity organizations. Between March and June of 2020, public health authorities mandated that schools and physical activity organizations cease operations, which had the effect of pushing coactivity into the home. Although some children took advantage of the newly gained available time to engage in coactivity with family, most of them felt that the public health restrictions caused them to be more sedentary.

My intent for undertaking this investigation was not to produce generalizable results. I instead sought to situate the existing body of knowledge related to childhood

physical activity in the perceptions and experiences of children and their parents. In accordance, I offered five hypotheses in the previous section that I hope inspire qualitative and quantitative researchers to shed further light on the bioecology of childhood physical activity. I provide a list of example questions that researchers may wish to further investigate.

I. What do observations of children in various settings (e.g., playground, school, organized physical activity) reveal about the nature of coactivity?
II. How do the perceptions and experiences pertaining to coactivity differ between physically active and inactive children?
III. How does the frequency and quality of coactivity predict childhood physical activity engagement in large samples of children?
IV. What do large-sample, mediation analyses reveal about the interaction between childhood physical activity determinants, coactivity, and childhood physical activity engagement?

In addition to hypotheses and potential research questions, I also offer the following practical advice for parents, educators, and coaches:

I. Parents can promote their children's physical activity by engaging in coactivity with them. To maximize the effect of child-parent coactivity, parents should seek ways to incorporate games. Parent-child coactivity might take the form of a game of catch or an outdoor scavenger hunt.
II. Educators can promote childhood physical activity by maximizing child-directed coactivity in both curricular and non-curricular settings. Educators might structure

lessons in ways that allow for periodic free time during which children are allowed to take charge.

III. Coaches can promote childhood physical activity by applying a game-based approach to skill-development. Coaches can do this by seeking ways to convert drills to games. Such games should emphasize the development of physical competence over competition and winning.

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APPENDIX 1: JOURNAL EXCERPT

Task	Notes	Bracketing
June 15th, 11:00am. Interview with Riley and Tiffany Dogio.	Had my first two interviews and it went reasonably well. Riley (child) offered lots of factual information but when it came to examples and elaborations, Tiffany (Riley's mom) offered more insight. I suppose this is expected as prepubescent children are often not yet as capable when it comes to abstraction. I noticed after the fact that, at least in two spots, I posed leading questions that may have affected the content of the interview. I must be aware of this and eliminate, or at least minimize, those types of questions.	I am a proponent of the multi-sport model for sport participation; that is, I believe that pre-adolescent children should not specialize in one sport but instead should focus on doing as many activities as possible. Based on her data, Riley focuses solely on one sport and I believe that to have negative consequences. In other words, I'm biased towards the multi-sport model. After I completed the interview and listen to the audio to find out whether this influenced my line of questioning. I believe that I stayed neutral and open minded through the entire interview and thus successfully bracketed my bias.
June 15th, 2:00pm. Interview with Cindy and Zack Johnson.	My next interview was with Cindy (mother) and Zack (son) Johnson. I noticed some similarities but also differences between these two and my last interviews with Tiffany and Riley. For one, the experiences were much different it terms of type of activity. Zach primarily plays hockey, where Riley is a dancer. Nonetheless, both cited coactivity with parents and peers as important to their physical activity. Again, I found myself asking a handful of leading questions. At least this time, I was simply confirming what was either written in the journal or evident from previous comments. For instance, confirming that COVID-19 had increased the variety of Zack's physical activity. I also noticed that I sometimes ask questions that elicit binary responses (i.e., yes or no). I always follow up by asking the interviewees to elaborate and/or offer examples. Perhaps I can eliminate the need for the former by rewording how I phrase the latter. As far as new insight, for both Zack and Riley, COVID-19 has significantly impacted their physical activity. I will need to wait until the analysis to ascertain the promotive and/or disruptive effect of COVID-19.	

APPENDIX 2: RECRUITMENT POSTER

APPENDIX 3: PHYSICAL ACTIVITY JOURNAL AND RATING OF PERCEIVED EXERTION SCALE

DAY 1

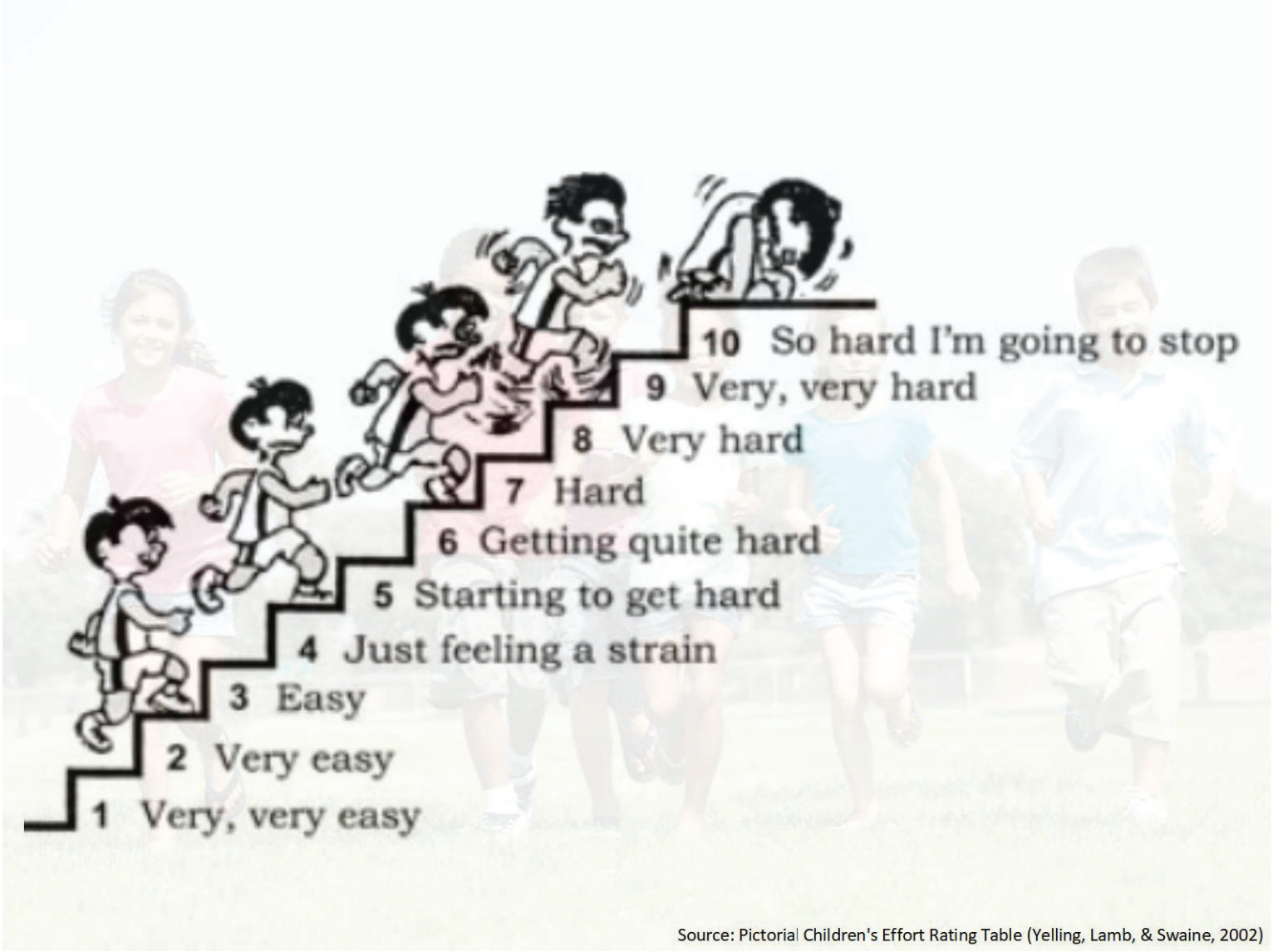
Date: _____

Pedometer Tracking Log			
What time did you put the pedometer on?	What time did you take the pedometer off?	How many steps did you take?	Did you wear the pedometer all Day?
			□ Yes, I never took it off □ No, how many hours missing: _____

Adapted from: Healthy Active Living and Obesity Research Group (2017)

Physical Activity Information		
What physical activity did you partake in?	How long did you partake in the physical activity?	What was your perceived level of exertion? Use the scale at the end of the journal to rate your level of exertion.

Provide a little bit more information about your physical activity. What affected your choice of physical activity? Who were you physically active with? How did the physical activity make you feel?



Source: Pictorial Children's Effort Rating Table (Yelling, Lamb, & Swaine, 2002)

APPENDIX 4: APPROVAL FROM UNIVERSITY OF LETHBRIDGE OFFICE OF RESEARCH ETHICS

University of Lethbridge

Office of Research Ethics
4401 University Drive
Lethbridge, Alberta, Canada
T1K 3M4
Phone: (403) 329-2747
Email: research.services@uleth.ca
FWA 00018802 IORG 0006429

Tuesday, 19 May 2020

Student Investigator:	Simon Schaerz, Doctoral Student, Faculty of Education
Faculty Supervisor:	Daniel Balderson, Faculty of Education
Study Title:	Childhood Physical Activity Engagement: A Qualitative Bioecological Exploration of Children's Perceptions and Experiences
Action:	Approved
HPRC Protocol Number:	2020-048
Approval Date:	May 19, 2020
Final Report Due:	On or before May 31, 2021

Dear Simon,

Your human research ethics application with co-investigator Daniel Balderson titled "Childhood Physical Activity Engagement: A Qualitative Bioecological Exploration of Children's Perceptions and Experiences" has been reviewed and approved on behalf of the University of Lethbridge Human Participant Research Committee (HPRC) for the **approval period May 19, 2020 to May 31, 2021**, and assigned Protocol #2020-048. The HPRC conducts its reviews in accord with University policy and the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (2018).

Please be advised that any changes to the protocol or the informed consent must be submitted for review and approval by the HPRC before they are implemented. A final report will be required and is due to the Office of Research Ethics no later than May 31, 2021.

We wish you the best with your research.

Sincerely,

Susan Entz, M.Sc., Ethics Officer
Office of Research Ethics
University of Lethbridge
4401 University Drive
Lethbridge, Alberta, Canada
T1K 3M4

APPENDIX 5: CONSENT AND ASSENT FORMS

University of Lethbridge
Faculty of Education

INFORMED CONSENT FORM FOR PARTICIPANTS

Childhood Physical Activity Engagement: A Qualitative Bioecological Exploration of Children's Perceptions and Experiences

I am inviting you to participate in a study entitled *Childhood Physical Activity Engagement: A Qualitative Bioecological Exploration of Children's Perceptions and Experiences.* My name is Simon Schaerz and I am the researcher who will be conducting this study. I am a doctoral student in the Faculty of Education at the University of Lethbridge and you may contact me if you have questions by phone (403.360.3736) or email (simon.schaerz@uleth.ca).

As a graduate student, I am required to conduct research as part of my degree. I conduct all of my research under the supervision of Dr. Daniel Balderson. You may contact Dr. Balderson at 403.329.5180 or by email (daniel.balderson@uleth.ca).

The purpose of this research study is to document the perceptions and experiences of children and their parents with respect to their physical activity engagement. This research is important because it provides insight into what children and parents deem important when it comes to being physically active. The results of this study may help to inform the development of future interventions that promote physical activity engagement in children.

If you agree to participate in this research, I will ask you to take part in a 30-45-minute interview over Zoom. In the interview, I might ask you to talk about your child's physical activity participation and about the reasons why he or she partakes in physical activity. I will audio and video record the interview and later use the recording in my analysis. I will conduct all of the interviews between June 1, 2020 and August 31, 2020.

There are no anticipated risks to your participation in this research. There are also no direct benefits to participating in this research. I will share the final report with you and your child upon completion of the study. The results might benefit your child's continued engagement in physical activity.

As a way to compensate you for any inconvenience related to your participation in the study, you will receive a $5.00 gift card to Starbucks. It is important to know that it is unethical to provide undue compensation or inducements to research participants and, if you agree to participate in this study, this form of compensation must not be coercive. If you would not participate if I did not offer compensation, then you should decline participating.

Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time until September 21, 2020 (3 weeks after the conclusion of the interviews), without any consequences or any explanation. If you wish to withdraw from the study you can contact me over phone or email and I will exclude your data from the study and shred and/or delete it as soon as possible.

I will collect and analyze the interview transcripts as part of this study. In order to protect your anonymity, I will conceal your name using a pseudonym. This will ensure that your participation and comments are concealed from anyone other than you (the parent/caregiver) and myself (the researcher). I may choose to publish direct quotes from the interview in academic reports and presentation. Before doing so, I will send the quotation(s) of interest to you and ask you and your child for permission to use the quotation.

I will protect your confidentiality and the confidentiality of the data by keeping the digital data (i.e., consent forms, assent form, master list, audio files, interview transcripts) on a password-protected computer that only I have access to. I will delete the data at the end of the 5-year maximum retention period.

I anticipate publishing the results from this study in academic reports and presentations. At no time, however, will I reveal names, identifying information, and/or specific locations. I will make the final report available to all participants by email after completion of the study.

In addition to being able to contact me and my supervisor at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Office of Research Ethics at the University of Lethbridge (Phone: 403-329-2747 or Email: research.services@uleth.ca).

This research study has been reviewed for ethical acceptability and approved by the University of Lethbridge Human Participant Research Committee.

A copy of this consent form will be given to you to keep for your records and reference.

_____
_

I have read (or have been read) the above information regarding this research study on children's physical activity engagement and consent to participate in this study.

_____ (Printed Name of Participant)

_____ (Signature of Participant)

_____ (Date)

_____ (Printed Name of Researcher)

_____ (Signature of Researcher)

_____ (Date)

A copy of this consent form has been given to you to keep for your records and reference.

University of Lethbridge
Faculty of Education

PARENTAL/GUARDIAN CONSENT FORM FOR CHILD PARTICIPANTS

Childhood Physical Activity Engagement: A Qualitative Bioecological Exploration of Children's Perceptions and Experiences

I am inviting your child to participate in a study entitled *Childhood Physical Activity Engagement: A Qualitative Bioecological Exploration of Children's Perceptions and Experiences.* My name is Simon Schaerz and I am the researcher who will be conducting this study. I am a doctoral student in the Faculty of Education at the University of Lethbridge and you may contact me if you have questions by phone (403.360.3736) or email (simon.schaerz@uleth.ca).

As a graduate student, I am required to conduct research as part of my degree. I conduct all of my research under the supervision of Dr. Daniel Balderson. You may contact Dr. Balderson at 403.329.5180 or by email (daniel.balderson@uleth.ca).

The purpose of this research project is to document the perceptions and experiences of children with respect to their physical activity engagement. This research is important because it provides insight into what children deem important for them when it comes to being physically active. The results of this study may help to inform the development of future interventions that promote physical activity engagement in children.

If you agree to permit your child to participate in this research, I will ask him or her to wear a pedometer for one week, keep an activity journal, and take part in a 30-45-minute interview over Zoom. In the interview, I might ask your child to talk about his or her physical activity participation and about the reasons why he or she partakes in physical activity. I will audio and video record the interview and later use the recording in my analysis. I will conduct all of the interviews between June 1, 2020 and August 31, 2020.

There are no anticipated risks to your child while participating in this research. There are also no direct benefits to participating in this research. I will share the final report with you and your child upon completion of the study. The results might benefit your child's continued engagement in physical activity.

As a way to compensate your child for any inconvenience related to his or her participation in the study, he or she will receive a $25 gift card to Sport Chek. It is important to know that it is unethical to provide undue compensation or inducements to research participants and, if you agree to having your child be a participant in this study,

this form of compensation to him or her must not be coercive. If your child would not participate if I did not offer compensation, then you should decline permission.

Your child's participation in this research must be completely voluntary. If you do decide to allow your child to participate, you may withdraw your permission (and your child from the study) at any time until September 21, 2020 (3 weeks after the conclusion of the interviews), without any consequences or any explanation. If your child wishes to withdraw from the study you can contact me over the phone or email and I will exclude his or her data from the report and shred and/or delete it as soon as possible.

I will collect and analyze the interview transcripts as part of this study. In order to protect your child's anonymity, I will conceal his or her name using a pseudonym. This will ensure that your child's participation and comments are concealed from anyone other you (the parent/caregiver) and myself (the researcher). I may choose to publish direct quotes from the interview in academic reports and presentation. Before doing so, I will send the quotation(s) of interest to you and your child and ask you for permission to use the quotation.
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I will protect your confidentiality and the confidentiality of the data by keeping the digital data (i.e., consent forms, assent form, master list, audio files, interview transcripts) on a password-protected computer that only I have access to. I will delete the data at the end of the 5-year maximum retention period.

I anticipate publishing the results from this study in academic reports and presentations. At no time, however, will I reveal names, identifying information, and/or specific locations. I will make the final report available to all participants by email after completion of the study.

In addition to being able to contact me and my supervisor at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Office of Research Ethics at the University of Lethbridge (Phone: 403-329-2747 or Email: research.services@uleth.ca).

This research study has been reviewed for ethical acceptability and approved by the University of Lethbridge Human Participant Research Committee.

A copy of this consent form will be given to you to keep for your records and reference.

I have read (or have been read) the above information regarding this research study on children's physical activity engagement and consent for my child to participate in this study.
.

_____ (Printed Name of Child Participant)

_____ (Printed Name of Parent/Guardian)

_____ (Signature of Parent/Guardian)

_____ (Date)

_____ (Printed Name of Researcher)

_____ (Signature of Researcher)

_____ (Date)

A copy of this consent form has been given to you to keep for your records and reference.

University of Lethbridge
Faculty of Education

CHILD ASSENT FORM

Simon Schaerz
Ph.D. Student
University of Lethbridge
403-360-3736
Simon.schaerz@uleth.ca

Why are you here?
My name is Simon Schaerz from the University of Lethbridge. I want to see if you would like to be in my study. I want to learn what it means to you to be physically active.

What is expected of you?
If you agree to be in my study, I will ask you to wear a pedometer for one week and fill out a Physical Activity Journal that you will send to me by email. You will be allowed to keep the pedometer after completion of the study. After that I will schedule a 30-45-minute interview with you over Zoom during which I'll ask you questions about your physical activity. I do not expect any harm to happen to you from being in my study.

Who will know you are in my study?
Other people will not know that you are in my study. I will put your answers with the answers of others who are in my study so no one can tell what answers came from you. When I tell other people about my research, I will not use your name.

Where will the study take place?
You can wear the pedometer while you are doing your regular daily routine. You will complete the Physical Activity Journal daily at home on the computer or on paper. The interview will take place in your home over Zoom, which is a video-conferencing program.

Do I have to be in the study?
No. Your parents or guardian have to agree for you to be in my study and then you get to decide if you want to be in my study. If you don't want to be in my study, no one will be mad at you. If you want to be in the study and then change your mind later, you can do that too. You can stop being in my study at any time by telling me.

Will the study help me?
This study has no potential benefits to you, but you will help us in better understanding

childhood physical activity. As a thank you for devoting your time to this study, you will receive with a $25 gift card to Sport Chek. You will receive the gift card even if you chose to withdraw from the study.

What if I have questions?
You can ask me questions at any time. My phone number and email address are at the top of this page. You can also ask your parents or guardians if you have any questions because the study has been explained to them. If you want, you can also contact the Office of Research Ethics at the University of Lethbridge at 403-329-2747 or research.services@uleth.ca to ask questions.

I will give you a copy of this form in case you want to ask questions later.

Agreement
I have decided to be in the study even though I know that I don't have to do it. Simon Schaerz has answered all my questions.

_____ _____
Printed Name of Participant Date

_____ _____
Signature of Participant Date

_____ _____
Printed Name of Researcher Date

_____ _____