An Evaluation of Preschool Children's Physical Activity within Indoor Preschool Play Environments

by

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Abstract

This observational study provides a multiple case comparison of the physical activity of preschool children during designated 'free play' within indoor play spaces at their preschool. The study assessed three recreational preschool program sites within the Municipality of Strathcona County, Alberta including the Ardrossan Recreation Complex, the Kinsmen Leisure Centre, and the Strathcona Olympiette Centre. The study sample was comprised of preschool children, aged three to five years, (n=125) enrolled in these programs from September 2014 to June 2015. Video observations were recorded each month over this nine month period; these video observations were in lieu of direct observation. Brown et al.'s (2006) Observation System for Recording Physical Activity in Children – Preschool (OSRAC-P) was used to collect information about the type and intensity of physical activity, the physical environment, and the social context in which play occurs. Three research questions guided this work:

1. How physically active are preschool children during designated free play time in indoor play spaces at their preschool?
2. What types of play activities promote the highest and lowest levels of physical activity among preschool children during designated free play time in indoor play spaces at their preschool?
3. What types of physical activity do preschool children engage in during designated free play time in indoor play spaces at their preschool?

A descriptive analysis of the level and types of physical activity and types of play activity, including frequency and Pearson Chi-square testing, was completed. Findings indicated that participating preschool children were largely sedentary during designated free play time within indoor play settings. One site, however, provided evidence that indoor play spaces can

promote higher levels of physical activity. Statistically significant differences were found in levels and types of physical activity and play activities when comparing the sites, suggesting that the specific preschool site significantly influences physical activity and play of preschool children. OSRAC-P variables related to social context were analyzed and revealed that a focus on active play opportunities, teacher facilitation during play, and higher social interaction may stimulate increased physical activity. These associations require further testing to ensure generalizability. Given these findings, further investigation is also needed to identify the specific correlates that influence young children's physical activity during free play within indoor play spaces. Future research needs to consider both the immediate play setting and the role of the broader levels of influence including public policy.

Preface

This thesis is an original work by Barbara Hughes. The research project, of which this thesis is a part, received research ethics approvals from both the University of Alberta Research Ethics Board ("Evaluation of a Play-Based Preschool Recreation Program: Exploring the Impact of Community Investment in Play-Based Learning on Health and Health Equity", Pro00047981, July 4, 2014) and the MacEwan University Research Ethics Board ("Evaluation of a Play-Based Preschool Recreation Program: Exploring the Impact of Community Investment in Play-Based Learning on Health and Health Equity", 14-15-006, September 8, 2014).

Dedication

To my family, who inspire me every day to live life with grace, humour, and courage.

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Table of Contents

List of Tables

List of Figures

Glossary of Abbreviations

ARC:	Ardrossan Recreation Complex
BEACHES:	Behaviours of Eating and Activity for Children's Health Evaluation System
FATS:	Fargo Activity Timesampling Survey
KLC:	Kinsmen Leisure Centre
MVPA:	Moderate to vigorous physical activity
OSRAC-P:	Observational System for Recording Physical Activity in Children - Preschool
PA:	Physical activity
SOC:	Strathcona Olympiette Centre
SOPLAY:	System for Observing Play and Leisure Activity in Youth
WHO:	World Health Organization

Chapter 1 - Introduction and Significance

1.1 Background Information

In Canada, estimates suggest that 36% of two to three year olds and 44% of four to five year olds do not engage in regular physical activity (PA) (Human Resources Development Canada and Statistics Canada, 2010). Research also demonstrates a significant rise in sedentary behaviours, or behaviours that require low energy expenditure, including TV watching and eating (Tremblay, Colley, Saunders, Healy, & Owen, 2010). In total, children under four years of age spend 73%-84% of their waking hours being sedentary (Reilly et al., 2004; Vale, Silva, Santos, Soares-Miranda, & Mota, 2010). This pattern of inactivity, coupled with increased sedentary activities, negatively affects children's physical, psychosocial, and cognitive development (Timmons et al., 2012).

Adverse outcomes associated with physical inactivity, including high blood pressure, cardiac dysfunction, and obesity, are also being diagnosed at younger ages (Knowles et al., 2013; Ostchega et al., 2009). Research also demonstrates that healthy behaviours learned in childhood will persist as individuals age (Malina, 1996; Singer, Moore, Garrahie, & Ellison, 1995), impacting health and disease states throughout the entire lifespan. The impact of inactivity on a child's development and health, both in childhood and throughout life, provides a critical reason for promoting PA among young children.

In Alberta, it is estimated that approximately 94,300 children under five years of age receive some form of organized care (Friendly, Grady, Macdonald, & Forer, 2015). Many of these children will receive care in a variety of preschool settings. In Alberta, a 'preschool program' is "a child care program provided to preschool and kindergarten children for less than four hours per child in each day the program is provided" (Friendly et al., 2015, p. 83).

Preschool programs provide a significant setting in which to promote increased PA among young children for a number of reasons: (a) there is a large number of preschool children participating in preschool programming; (b) preschool children spend a large amount of time in this setting; and (c) attaining adequate levels of PA among preschool children is a known and growing concern. Preschool settings provide an opportunity to ensure that the physical preschool environment and facility policies and practices work collectively to support a high level of PA

among young children. This statement is supported by evidence demonstrating that preschool environments have a strong influence on young children's PA levels (Pate, McIver, Dowda, Brown, & Addy, 2008; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004).

This project acknowledges that preschool children are influenced by their day-to-day environments; that the preschool setting itself will impact how children learn and play, which has the potential to impact health behaviours, including participation in PA. This project considers how a preschool environment, specifically indoor play spaces, might affect PA among young children during designated free play time.

1.2 Rationale for Research

Play has been promoted by public health practitioners as a means to increase PA (Alexander, Frolich, & Fusco, 2012; Frohlich, Alexander, & Fusco, 2013). Specific attention has been given to active play (Brockman, Fox, & Jago, 2011; Brockman, Jago, & Fox, 2010; Engelen et al., 2013; Floyd et al., 2011; Nicaise, Kahan, & Sallis, 2011; Schoeppe, Duncan, Badland, Oliver, & Browne, 2014), which is defined as vigorous activity occurring within a playful context (Brockman, Fox et al., 2011; Simons-Morton et al., 1990). A large body of research focuses on how active play can be structured to promote PA; for example, designing physical education to incorporate activities and intensities that maximally impact PA. It should be noted that active play can also be unstructured, voluntary, and spontaneous in accordance with the tenets of free play (Hyndman, Benson, & Telford, 2016), for example, children playing at the neighbourhood playground.

Observational studies demonstrate that preschool children typically self-select sedentary activities during free play (Fees, Fischer, Haar, & Crowe, 2015; Van Cauwenberghe, Gubbels, De Bourdeaudhij, & Cardon, 2011). In response to this finding, public health practitioners are attempting to better understand the factors that influence play and PA among preschool children; their aim is to advance supportive policy and built environments in order to create settings that spontaneously promote increased PA in children (Fenton, 2012). Much of this research focuses on outdoor environments where a relationship between play and increased PA has been established (Cleland et al., 2008; Sallis, Prochaska, & Taylor, 2000). Outdoor play, however, is decreasing (Clements, 2004; Tandon, Zhou, & Christakis, 2012) due to a number of factors including neighbourhood and playground safety concerns such as a shortage of play spaces,

poorly maintained playgrounds, and fear of crime and dangerous neighbourhoods (Bring-Isler et al., 2010; Brockman, Jago, & Fox, 2011; Ergler, Kearns, & Witten, 2013; Kalish, Banco, Burke, & Lapidus, 2010; Pellegrini & Smith, 1998a; Veitch, Salmon, & Ball, 2010; Veitch, Salmon, & Ball, 2007). Given the decrease in outdoor play, there is a need to investigate the value of indoor settings as a means to create intuitive environments that consistently promote PA among young children. This study specifically focuses on indoor preschool play spaces. The PA of preschool children engaged in free play within these indoor play spaces will be evaluated.

1.3 Scope of the Project

In order to understand how to create indoor environments that promote PA, research is first needed to characterize the PA of children inside existing indoor spaces and to identify the factors within these spaces that influence PA. This project observes preschool children within indoor play spaces during designated free play time, as identified by preschool program directors. Three indoor play spaces from preschools offered by the Recreation, Parks and Culture department of the Municipality of Strathcona County are included. First, this study describes the PA of preschool children at play in each of these indoor play spaces. Based on this analysis, the project then considers possible influences on PA within these indoor play spaces.

1.4 Research Questions

The research questions that are addressed as part of this research are:

1. How physically active are preschool children during designated free play time in indoor play spaces at their preschool?
2. What types of play activities promote the highest and lowest levels of PA among preschool children during designated free play time in indoor play spaces at their preschool?
3. What types of PA do preschool children engage in during designated free play time in indoor play spaces at their preschool?

1.5 Theoretical Framework

The Life Course Health Development Model (Halfon & Hochstein, 2002), and the settings approach (Green, Poland, & Rootman, 2000) guided and informed the research questions, the research design, and the methodology. The Social Ecological Model then provided a theoretical framework for understanding and discussing the study results (Bronfenbrenner, 1994; McLeroy, Bibeau, Steckler, & Glanz, 1988). This section will provide a brief description of these models/approaches and how they apply to the research presented within this thesis.

1.5.1 Life Course Health Development Model. The Life Course Health Development Model (Halfon & Hochstein, 2002) studies the interactions between social and biological exposures from gestation to adult life that lead to disease states (Ben-Shlomo & Kuh, 2002; Kuh, Ben-Shlomo, Lynch, Hallqvist, & Power, 2003;). It suggests that health is determined by multiple factors including genetic, biological, behavioural, social, and environmental elements (Halfon & Hochstein, 2002). The Life Course Health Development Model proposes that the influence from these factors changes over time as an individual grows and develops, and that critical development periods are the key to the health of an individual throughout their life course (Kuh et al., 2003). This framework incorporates three models to explain how the life course might influence health: 'latency' is exposure to physical and/or social triggers at one point in life that increases the risk of an adverse health outcome later in life; 'cumulative' is multiple exposures in life that combine to impact health; and 'pathways' is a dependent sequence of exposures that impact subsequent life exposure to increase/decrease probability for an adverse health outcome (Hertzman & Power, 2003; Kuh et al., 2003). The concept of critical or sensitive periods suggests that exposures during a specific time period may result in adverse or protective adaptations within development that will impact subsequent health outcomes (Kuh et al., 2003, p. 780). The Life-Course Health Development Model acknowledges that individual biological development takes place in a social context that structures life chances (Kuh et al., 2003).

Ultimately, this model assisted in understanding the scope of the problem of physical inactivity, which extends beyond health outcomes in childhood to impact health through adulthood. This underlines and provides support to the need for investigational research and interventions that promote increased PA among young children, and research to drive these

strategies. Section 2.5 outlines the patterns of behaviour, including engagement in PA, and development of obesity that emerge in childhood and track through life.

1.5.2 Settings approach. The settings approach is grounded in the Ottawa Charter with the statement that "health is created and lived by people within the settings of their everyday life; where they learn, work, play and love" (World Health Organization (WHO), 1986, p. 3). Individuals are influenced by the larger social units in which they live, work, and play (Dooris, 2005; Green & Tone, 2010; Green et al., 2000). The approach considers the contribution of settings on health and wellness (Dooris, 2005; Raingruber, 2014), and appreciates that health is determined by a complex interaction of environmental, organizational, and personal factors (Dooris, 2005).

The Jakarta Declaration identifies possible settings as municipalities, cities, communities, schools, markets, workplaces, and health care facilities (WHO, 1997). Health promotion strategies that adopt the settings approach stem from a systems perspective that considers the relationships within and between settings (Dooris, 2005). Green and Tone (2010) note that the settings approach "…involves ensuring that the ethos of the settings and all the activities are mutually supportive and combine synergistically to improve…health and wellbeing" (p. 435).

The settings approach provides a theoretical rationale for focusing this study on preschool settings. These settings play a significant role in the lives of many preschool children, both in terms of children participating and the time in which they are present in preschool settings (Section 2.6 provides further detail). The settings approach also supports investigating the relationship between play and PA as a primary relationship within the setting: play is a primary occupation for preschool children and, as a result, a systems approach must consider how play interacts with and influences PA.

1.5.3 Social Ecological Model. The Social Ecological Model proposes that change is the result of reciprocal interaction between an individual and their environment. In other words, individuals adapt and change as the social environment around them changes and, at the same time, individuals within a population are critical to generating change within their surrounding environment (McLeroy et al., 1988). The Social Ecological Model posits that multiple levels of influence within the environment act on individual behaviour (Bronfenbrenner, 1979). These levels include (a) the microsystem, or the roles that a person plays in their social context such as

interactions with family and friends; (b) the mesosystem, which consists of the interrelations between the settings in an individual's environment such as school, church, and the workplace; (c) the exosystem, which are the forces within the broader social system including norms, standards, and social networks; and (d) the macro-system, which incorporates cultural influences such as beliefs and values (Bronfenbrenner, 1994; Bronfenbrenner, 1979; McLeroy et al., 1988). It is through these spheres of influence that individual and collective well-being is influenced (Raingruber, 2014; Viswanath, Rimer, & Glanz, 2015); ultimately, "behavior change is expected to be maximized when environments and policies support healthful choices, when social norms and social support for healthful choices are strong, and when individuals are motivated and educated to make those choices" (Sallis, Owen, & Fisher, 2008, p. 466).

Bronfenbrenner (1974) also specifically considers the social ecology of the environments that children find themselves in on a daily basis. This model describes two concentric layers, the first being an immediate setting such as the home, school, or playground. This immediate setting has three dimensions, including: (a) design of the physical space and materials; (b) people with differing roles and interactions with the child; and (c) the social meaning of the activities being performed by the people, both with each other and with the child. The second concentric level is the supporting layer that shapes and limits what can be done in the immediate setting. This includes geographical and physical factors, as well as institutional rules and regulations including "…arrangements and customs that determine where the child can be, what activities they can engage in, and with what people" (p. 2).

This child-specific Social Ecological Model provides a framework to discuss the results of this thesis (presented in Chapter 5). The indoor preschool play space serves as the immediate setting. The discussion considers how the results apply to the three dimensions of influence as noted above; specifically, what can be inferred from the results regarding the design of the physical space, the various roles and interactions, and the social meaning of activities?

1.6 Outline of Chapters

Chapter 2 provides a review of the current literature regarding the scope of the problem of inactivity among young children and how it impacts health and development. The importance of focusing on preschool children, and the value of preschools as a health promotion setting is

outlined. Play as a potential strategy for improving PA levels among young children is also explored.

Chapter 3 describes the methodology used to observe and measure the children's PA within the indoor preschool play environments. An overview of the project is provided. The design of the project, including research sites and the participants, is described. Methodology for data collection, coding, and analysis is reported in detail.

Chapter 4 presents the research results. This chapter describes the PA of preschool children while playing in indoor play spaces. This includes an assessment of intensity and type of PA occurring, and the types of play that promote high and low levels of PA. In addition, results of an analysis of the play context are presented. This analysis was completed to provide insights into the possible connections between play and PA within the preschools' indoor free play spaces.

Chapter 5 discusses key findings from the results. Bronfenbrenner's Social Ecological Model specific to children will be used to guide the discussion; specifically, the design of the physical space, the roles and interactions with the child, and the social meaning of activities. This chapter also presents the study limitations along with implications for future research and practice.

Chapter 2 - Literature Review

This chapter summarizes the current literature regarding the scope of the problem of physical inactivity among Canada's preschool children and how it impacts their physical, psychosocial, and cognitive development. Following this, the research supporting young children as the target population for this study and the value of selecting preschool environments as a health promotion setting will be discussed. Finally, the value of play for improving PA levels among young children will be considered.

2.1 Physical Activity Defined

The World Health Organization (WHO) defines PA as "any bodily movement produced by skeletal muscles requiring energy expenditure – including activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits" (WHO, 2014, para. 1). PA is essential to health (WHO, 2003) and is one of four major modifiable factors in the prevention of non-communicable diseases, along with tobacco use, unhealthy diet, and harmful use of alcohol (WHO, 2010a). Inadequate PA is the fourth leading cause of death worldwide (WHO, 2010b); with 6-10% of worldwide deaths from non-communicable diseases resulting from physical inactivity (WHO, 2009). In spite of this, 31% of the world's population is not meeting the minimum recommendations for PA (Hallal et al., 2012).

2.2 Physical Inactivity among Children and Youth in Canada

The scope of physical inactivity among Canadian children and youth has been clearly established. The 2014 Global Summit on the Physical Activity for Children presented the world's first-ever Global Matrix, which reported the status of PA among children and youth from fifteen countries representing five continents (Active Healthy Kids, 2016a; Global Summit on the Physical Activity for Children, 2014; Tremblay et al., 2014). It should be noted that children and youth were collectively considered; grades specific to preschool children were not provided as part of the matrix.

The Global Matrix considered nine common indicators including: overall physical activity; organized sport participation; active play; active transportation; sedentary behaviour; family and peers; school; community and built environment; and government strategies and investments (Active Healthy Kids, 2016a; Tremblay et al., 2014). A comparison of all participating countries concluded that the grades for overall PA were consistently low/poor (D/F). Ten of the fifteen countries reported low or failing grades for overall PA. This included Canada, whose grade for overall PA was low (D-) with only 20-39% of Canadian children and youth meeting PA guidelines (Active Healthy Kids, 2016a; Tremblay et al., 2014). Canada also reported low or failing grades for active transportation (D) and sedentary behaviour (F). Canada's highest grades were for indicators that support PA including family and peers (C), school (C+), community and built environments (B+), organized sport participation (C+), and government strategies and investments (C). Canada's grade for active play was not available (Active Healthy Kids, 2016a).

A second addition of the Global Matrix, released in 2016, included thirty-eight participating countries and considered the same nine common indicators. (Active Healthy Kids, 2016b). The Global Matrix 2.0 found that the global average grade for overall PA and sedentary behaviours was D, while the global average grade for indicators related to supports for PA was C. Again, Canada reported low or failing grades for overall PA (D-), active play (D+), active transportation (D), and sedentary behaviour (F); while Canada's grades for family and peers (C+), in-school supports (B), community and built environments (B-), organized sport participation (B), and government strategies and investments (B-) were all above the global average (Active Healthy Kids, 2016b; ParticipACTION, 2016).

Interestingly, the second Global Matrix demonstrated that lower-income countries had higher grades for overall physical activity, active transportation, and sedentary behaviours and lower grades for supports from family and peers, community and the built environment, and government strategies and investments when compared to higher income countries (Active Healthy Kids, 2016b). This speaks to an interesting paradox: countries with higher supports and infrastructure for PA, including Canada, have lower rates of PA, while countries with less support and infrastructure have higher rates of PA (Active Healthy Kids, 2016b). These results "suggest that autonomy to play, travel, or chore requirements and/or fewer attractive sedentary pursuits, rather than infrastructure and structured activities, may facilitate higher levels of

physical activity" (Active Healthy Kids, 2016b, para. 3). This paradox highlights the need to understand the conditions that impact PA among children.

2.3 Physical Inactivity among Canadian Preschool Children

The Global Matrix demonstrated a global trend towards physical inactivity among children and youth. In line with this trend, PA among Canadian children and youth is also inadequate. It is important, however, to specifically define the extent of physical inactivity among preschool children (aged three to five years) given the objectives of this study.

The Canadian Society for Exercise Physiology (CSEP) published the first evidence-based Canadian PA Guidelines for the Early Years (Aged 0–4 years) (CSEP, 2012) and the Canadian Sedentary Behaviour Guidelines for the Early Years (Aged 0–4 years) (CSEP, 2012; Tremblay, LeBlanc et al., 2012). The Canadian PA guidelines promote 180 minutes of PA, at any intensity, spread throughout the day for children under age four, with a progression in intensity to at least 60 minutes of moderate to vigorous physical activity (MVPA) by five years of age (CSEP, 2012). In Canada, estimates suggest that 84% of three to four year olds meet the recommended guidelines of 180 minutes of PA at **any** intensity (Colley et al., 2013). However, when PA intensity is included in the guideline, only 14% of five-year-old children achieve the recommended 60 minutes of MVPA (Colley et al., 2013).

Compounding the problem of physical inactivity, in Canada there has also been a significant rise in sedentary behaviours or those that require low energy expenditure (Tremblay et al., 2010). The sedentary behaviours guideline recommends limiting sedentary activities and restricting screen time for children under four years of age; including zero screen time for children under two years of age and less than one hour per day for children between two and four years of age (CSEP, 2012; Tremblay, LeBlanc et al., 2012). In spite of this recommendation, estimates suggest that Canadian children between three and five years of age spend over seven hours each day in sedentary activity (Garriguet et al., 2016). In 1971, American children began watching television at an average age of four years; 35 years later, that average age was five months old (Zimmerman, Christakis, & Meltzoff, 2007) with 90% of American children starting to watch television before two years of age (Christakis, 2009). In Alberta, most preschool aged

children report more than one hour of screen time each day (Carson, Spence, Cutumisu, & Cargill, 2010).

The foundation of this study is on the problem of physical inactivity among preschool children. In order to understand the gravity of this issue, it is important to understand the role of PA in health and development during childhood. The next section of this chapter will detail the importance of PA on young children's physical and mental health, body weight, motor skill development and physical literacy, and cognitive performance.

2.4 Impact of Physical Activity on Young Children

A growing body of evidence demonstrates that PA affects health and development in early childhood. PA has the potential to impact physical health, the maintenance of healthy body weight, the development of fundamental movement skills, mental and psychosocial health, and cognitive development.

2.4.1 Physical health. PA has been linked to improved cardiac markers among preschool children (Knowles et al., 2013; Metcalfe, Voss, Hosking, Jeffery & Wilkin, 2008). For example, Metcalf et al. (2008) found that male preschoolers participating in at least 56 minutes of moderate intensity PA every day had a healthier metabolic status. This effect was similar for female preschoolers that engaged in at least 42 minutes of moderate to vigorous physical activity (MVPA) every day (Metcalfe et al., 2008). Knowles et al. (2013) demonstrated an inverse relationship between total PA and diastolic hypertension in children as young as five years of age; every additional 15 minutes/day spent in MVPA decreased diastolic blood pressure by 0.55 mmHg. Janssen and Leblanc (2010) suggested that even low volumes of MVPA may be beneficial for high-risk children including those with known high cholesterol and obesity.

Adverse outcomes associated with physical inactivity are being diagnosed at younger ages (Knowles et al., 2013; Ostchega et al., 2009). The prevalence of high blood pressure, once largely only seen in adults, is increasing in children (Ostchega et al., 2009). Childhood hypertension is associated with an increased risk for cardiovascular disease and premature mortality (Franks et al., 2010). Similarly, Whitaker et al. (1997) demonstrated that 58% of obese children as young as five years of age had at least one of the following cardiovascular risk factors – increased diastolic blood pressure, increased systolic blood pressure, increased low-

density lipoprotein (LDL) cholesterol, decreased high-density lipoprotein (HDL) cholesterol, increased triglycerides, and high fasting insulin concentration. Twenty-five percent of these same children had two or more of these cardiovascular risk factors (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). It is highly likely that an early onset of cardiovascular risk factors will support the premature development of health problems that will increase the overall risk of cardiovascular morbidity and mortality (Reilly et al., 2003). It is worth noting that this study was conducted in the late 1990s and likely underestimates the current effects of increased rates of obesity among children who are living in increasing 'obesogenic' environments (Reilly et al., 2003).

2.4.2 Healthy body weight. Physical inactivity is directly related to a dramatic increase in overweight and obesity rates in children worldwide (Shields, 2006; WHO, 2006). The WHO projected that, globally, 20 million children under the age of five years were overweight in 2005 (WHO, 2006). This number is estimated to increase to almost 60 million children by 2020 (Onis, Blössner, & Borghi, 2010). In Canada, overweight and obesity rates among children have been increasing steadily (Shields, 2006); approximately 15% of two to five year olds are overweight and 6% are obese (Public Health Agency of Canada, 2011; Shields, 2004). A long list of adverse physiological health outcomes associated with childhood overweight/obesity include: cardiovascular complications such as high blood pressure, dyslipidemia, left ventricular abnormalities; an increased risk for type one and two diabetes; various respiratory complications such as asthma and sleep apnea; and orthopedic complications including systemic inflammation, back pain and exercise intolerance (Reilly et al., 2003).

There is evidence to support a strong inverse relationship between PA and overweight/obesity in children (Dencker et al., 2006; Hanley et al., 2007; Stevens et al., 2007). Literature focused specifically on preschool aged children (3.1 - 4.9 years) demonstrates that a higher baseline PA among preschool children resulted in smaller gains in BMI over time (up to seven years later) (Moore et al., 2003). An earlier study also demonstrated that a high level of activity at three years of age was associated with a decreased percentage of body fat at eight years of age, although this result was only found in boys (Ku, Shapiro, Crawford, & Huenemann, 1981).

2.4.3 Motor skill development and physical literacy. Motor skill development between three and five years of age is characterized by the development of perceptual abilities and a

variety of motor skills (Colella & Morano, 2011). Fundamental motor skills are primarily gross motor skills that relate to locomotion and object control, including walking, running, catching, throwing, and jumping (Stodden et al., 2008). Fundamental motor skills are learned through regular PA and serve as important precursors to more refined and complicated motor skills (Stodden et al., 2008). It is through PA and movement that children learn spatial and temporal elements of movement (Colella et al., 2011). These skills contribute to the development of motor skill competency that ultimately leads to a higher participation in PA and lifelong physical literacy (Stodden et al., 2008; Wrotniak, Epstein, Dorn, Jones, & Kondilisc, 2006).

Evidence demonstrates that participation in PA can improve motor skill development (Jones et al., 2011; Reilly et al., 2006; Venetsanou & Kambas, 2004) and, conversely, that better developed motor skills promote increased participation in high intensity PA (Williams et al., 2008). A randomized control trial, examining the use of structured PA to improve motor skill development, randomly assigned preschool aged children in a child care setting to either structured PA sessions (three/week) or to usual care in a child care facility (Jones et al., 2011). After a 20-week test period, preschoolers participating in structured PA sessions had improved scores on the Test of Gross Motor Development. Another non-randomized trial found a significant improvement in motor development scores for preschool children enrolled in bi-weekly dance classes when compared to children engaging in regular preschool activities (Venetsanou & Kambas, 2004). Finally, Reilly et al. (2006) found that enhanced PA programming in a nursery setting significantly improved the fundamental movement skills of participating children as compared to controls, although the improvement in fundamental movement skills did not increase overall PA levels.

2.4.4 Mental health. Individual studies demonstrate that increased PA supports psychosocial wellbeing in early childhood (Buss, Block, & Block, 1980; Lobo & Winsler, 2006). For example, an ethnographic observation study of preschools with and without systematic PA programs concluded that engaging in daily PA strengthened the children's sense of self-efficacy (Pape et al., 2016). A group of preschoolers randomly selected to participate in a dance program showed significant increases in their social competence and externalizing behaviours when compared to controls (Lobo & Winsler, 2006). Finally, teachers rated active preschoolers as more outgoing and less socially withdrawn (Buss et al., 1980). In spite of these findings, a recent systematic review found no consistent evidence across published studies to support the benefits

of PA on psychosocial well-being in early childhood (Hinkley et al., 2014). This review suggests that inconclusive findings associated with PA and psychosocial wellness in young children may be due to: (a) a small number of observational studies; (b) the lack of consistent measures of PA and psychosocial wellbeing; and (c) the possibility that benefits of PA on psychosocial wellbeing need time to accrue throughout childhood (Hinkley et al., 2014).

There is, however, evidence linking PA to psychosocial well-being in older children. For example, a systematic review investigating the health benefits of PA in school-aged children identified six studies that demonstrated a small-to-modest relationship between depression and PA (Janssen & LeBlanc, 2010). Further, three randomized control trials demonstrated that a prescription of aerobic exercise (60-90 minutes per week) over an 8-12 week period produced a significant improvement in one or more depressive symptoms (Annesi, 2005; Goldfield et al., 2007; Norris, Carroll, & Cochrane, 1992).

2.4.5 Cognitive development. Evidence demonstrates the beneficial effect of PA on cognitive development in children less than five years of age (Carson et al., 2016; Tandon et al., 2016). Carson et al. (2016) found that increased or higher frequency/duration PA had a positive impact on cognitive development outcomes in the domains of executive function and language. Tandon et al. (2016) also concluded that PA, specifically opportunities to use fundamental movement skills, were beneficial for cognitive outcomes including self-regulation, sustained attention, and working memory among young children.

The positive impact of PA on cognitive development has also been supported through research (Becker, McClelland, Loprinzi, & Trost, 2014; Niederer et al., 2011). An analysis of 245 preschool aged children (mean age: 5.2 years) examined the relationship between aerobic fitness, agility, and dynamic balance on cognitive measures including attention and spatial working memory (Niederer et al., 2011). The results demonstrated that higher aerobic fitness was related to increased attention ($r=0.16$, $p=0.03$) while faster performance on the agility test was associated with increased performance in both attention ($r=0.20$, $p=0.01$) and working memory ($r=-0.17$, $p=0.01$). Becker et al. (2014) demonstrated that active play led to stronger self-regulation which ultimately resulted in higher academic achievement in literacy and math scores.

2.5 Life Course Perspective – Health Behaviours for Life

As outlined in the previous section, PA is an important factor in the health and development of young children; this alone provides sufficient cause to promote PA among young children. The life course perspective provides a second important reason to support increased PA among young children.

Research in the area of the life course perspective demonstrates that behaviours learned in childhood persist as the child ages, and will ultimately impact health and disease in later life (Malina, 1996; Singer et al., 1995). As noted in Section 1.5.1, the Life Course Health Development Model posits that events in early life can influence biological systems in ways that have lifelong effects (Kuh et al., 2003). Subsequently, understanding the health risks and behaviours that are established in early life could improve health throughout an individual's life.

For example, research has shown that participation in PA has been found to persist as a child ages (Edwards et al., 2013; Janz et al., 2009). A study assessing patterns of PA in early childhood followed 372 three-year-old children over a four-year period (Edwards et al., 2013). PA was assessed annually from three to seven years of age using accelerometers over a three-day period. Additional measures collected included child characteristics such as height, weight, sex, and race. This study concluded that boys who were most active at three years of age remained more active in the following years. Interestingly, this same trend was not found in girls (Edwards et al., 2013). Research has also demonstrated a relationship between PA and body mass that persists throughout childhood (Janz et al., 2009). This study found that MVPA at five years of age was a predictor of adjusted fat mass at eight and eleven years of age. Five-year-old children engaging in the most MVPA had a lower fat mass at both age eight and eleven.

In regards to body mass, research has demonstrated that childhood obesity, which is established through health behaviours related to nutrition, physical inactivity, and sedentary activities, typically persists through to adulthood (Freedman et al., 2005; Guo, Chumlea, & Roche, 2002; Singh, Mulder, Twisk, van Mechelan, & Chinapwa, 2008; Stettler & Iotova, 2010). The Bogalusa Heart Study, a cohort study conducted between 1973 and 1996, assessed 2,610 participants (aged two to seventeen years) both in childhood and again in adulthood (Freedman et al., 2005). Measures of weight, height, and triceps skin fold thickness were assessed in childhood. These were compared to measures of adiposity including triceps and subscapular skin fold thickness in adulthood. This analysis found that childhood obesity was significantly

associated with adult obesity; the strength of this correlation increased as the age of the child increased. BMI levels of children as young as two to five years of age were modestly associated with adult adiposity. Overweight two to five year olds (BMI >95th percentile) were over four times more likely to be overweight adults than children with BMIs <50th percentile. This is in line with research that suggests that the critical period for development of obesity or a 'tipping age' in which a child is most at risk for becoming overweight may be less than five years of age for 90% of children (Harrington et al., 2010).

The importance of PA in childhood development, in collaboration with life-course research that demonstrates that health patterns persist through life, highlights the need to promote PA at a young age. Health and development in young children benefit from PA, but beyond that the health of the adult also depends on the health behaviours and risks established in childhood. Both of these factors emphasize the importance of prevention and intervention for young children as a vulnerable population.

2.6 Preschool Settings as a Target Environment

This thesis provides an assessment of PA among children in preschool play spaces. Preschool settings provide a strategic environment to encourage increased activity in young children for a couple of key reasons; first, there is an increasing number of children participating in preschool recreation and child care programs for extended periods of time on a daily basis. Second, research has clearly demonstrated a need for increased PA in preschool settings.

In Canada, the employment rate of mothers with young children has increased. In 1995, 61% of mothers whose youngest child was under two years of age and 68% of mothers whose youngest child was between three and five years of age were employed (Ferns & Friendly, 2014). By 2012 employment rates for mothers had increased to 69.7% of mothers whose youngest child was under two years old and 76.6% for mothers whose youngest child was between three and five years old (Ferns & Friendly, 2014).

In Alberta, there are approximately 94,300 children aged three to five years whose mothers are employed (Friendly et al., 2015). Many of these children receive care in a variety of preschool settings. It should be noted that preschools are distinguished from daycares in that the duration of care is limited. In Alberta, a 'preschool program' is defined as "a child care program provided to preschool and kindergarten children for less than four hours per child in each day the

program is provided" (Friendly et al., 2015, p. 83). Conversely, 'daycare programs' are defined as "facility-based programs that serve infants, toddlers and pre-school-aged children…typically provid(ing) care throughout the day, from the morning to early evening" (Government of Alberta, 2015, para. 1).

There are 14,986 part-day preschool **spaces** available in regulated child care centres in Alberta; with a total of 728 part-day, centre-based preschool **programs** (Friendly et al., 2015). Given the number of children and the available centre-based preschool programs, these facilities may serve as ideal locations for health promotion.

Finally, there is a common belief that preschool children (three to five years of age) are naturally physically active (Benham-Deal, 1993; Dwyer, Higgs, Hardy, & Baur, 2008; Sallis, Patterson, McKenzie, & Nader, 1988). For example, in 1992, the American Academy of Pediatrics, Committee on Sports Medicine and Fitness wrote, "…it is likely that most preschool children achieve adequate levels of physical fitness when allowed to express their innate curiosity and natural propensity for active exploration in a safe environment" (p. 1002). However, research has clearly demonstrated that a majority of young children are not achieving adequate levels of PA. As noted previously, only a small percentage of five-year-old children are meeting the recommended targets for daily PA (Colley et al., 2013) with a significant proportion of the young child's day being spent in sedentary activities (Garriguet et al., 2016). Research has also demonstrated a spontaneous decrease in PA between approximately three to five years of age for both boys and girls (Edwards et al., 2013; Taylor, Williams, Farmer, & Taylor, 2013). It is not known what causes this decline in PA, but it has been suggested that it might be linked with the transition into school settings (Edwards et al., 2013).

The rates of inactivity do not improve in child care settings. Brown et al. (2009) demonstrated that the activity levels of preschool children in daycare settings were largely sedentary with 89% of their time spent sitting/squatting, lying, or standing still and only 11% of their time spent walking, running, crawling, jumping/skipping, or climbing. In 2017, Schlechter et al. concluded that children participating in preschool programming spent 70% of their time sedentary (Schlechter, Rosenkranz, Fees, & Dzewaltowski, 2017)

Research has shown that the specific preschool program attended by a young child had more influence on the level of PA than the personal characteristics of the child, including age, ethnicity, and gender (Pate et al., 2008; Pate et al., 2004). Variability in PA unrelated to the

children's individual characteristics suggests that the preschool environment, including related day-to-day policies and practices, has a significant influence on overall levels of PA. The next section will consider other influences on PA among preschool children.

2.7 Influences on Physical Inactivity in Preschool Children

A review of the correlates of PA demonstrates that the influences on PA in young children are complex and multidimensional (Hinkley, Crawford, Salmon, Okely & Hesketh, 2008). Perceived barriers to PA specific to preschool children have been identified at the intrapersonal, interpersonal, and environmental levels (Dwyer, Higgs et al., 2008; Dwyer, Needham, Simpson, & Henney, 2008; Tremblay, Boudreau-Lariviere, & Cimon-Lambert, 2012).

Intrapersonal factors include preschooler's preference for less active activities, and individual characteristics including personality traits such as shyness and anxiety, and health and disability limiting the child's participation in PA. Interpersonal factors include time restrictions, parental fatigue, differing views of value of PA between parents and other child care providers, family composition including single parenting and multiple children of differing ages, cultural values preferring educational achievement, and limited financial resources. Limiting factors in the physical environment were identified as weather considerations, lack of safety including risk of injury and strangers, need for constant supervision, lack of awareness of available resources to support PA, lack of resources for preschool children, and access issues including resources being far from home and community programming being scheduled during the day when parents work (Dwyer, Higgs et al., 2008; Dwyer, Needham et al., 2008; Tremblay et al., 2012).

Preschool teachers identified barriers to PA that were specific to centre-based early childhood education programs including: inadequate quantity and quality of equipment, budget restrictions, insufficient space in both indoor and outdoor settings, daycare requirements and safety concerns, and weather (Ernst, 2014; Van Zandvoort, Tucker, Irwin, & Burke, 2010). Facilitators of PA were identified as resources including workshops, printed materials and the internet, music, and the childcare providers themselves (Van Zandvoort et al., 2010). Again, this research is focused on centre-based early childhood education programs including both school based preschools and daycare facilities. The generalizability of these specific barriers to municipal recreation preschool programs would need to be established.

Perceptions around PA in young childhood can also serve as barriers to adequate activity (Tremblay et al., 2012). Research has shown that between 55% and 75% of parents believe that their children are sufficiently active (Zecevic, Tremblay, Lovsin, & Lariviere, 2010) in spite of strong evidence that children are not active enough (Colley et al., 2013; Reilly et al., 2004; Vale et al., 2010). Research also demonstrates that many parents with an overweight child consider their child to be normal weight (Tremblay, Lovsin, Zecevic, & Lariviere, 2011) and that parents perceive girls to be less physically active than boys (Zecevic et al., 2010). Further, parents see their role primarily as facilitators of activity by providing opportunities to participate in structured activity (Hinkley, Salmon, Crawford, Okely, & Hesketh, 2011) rather than informal or unstructured activity. The importance of modelling PA is not as well recognized by parents (Irwin, He, Bouck, Tucker, & Pollett, 2005), which is contrary to research that suggests children are two times more likely to be active if their parents are also active (Zecevic et al., 2010).

Another environmental factor demonstrated by research is that opportunities for outdoor play at childcare centres are dependent on the caregiver's decision and preference, which is influenced by factors such as not liking cold weather, intolerance to noise, and the effort required to prepare children for outdoor play (Copeland, Kendeigh, Saelens, Kalkwarf, & Sherman, 2012; Copeland, Sherman, Kendeigh, Kalkwarf, & Saelens, 2011). Copeland et al. (2012) also demonstrate that child care providers do not perceive themselves as models of PA. While not specific to preschool settings, this research provides evidence that PA levels of young children can be strongly influenced by the adults, including parents, caregivers, and teachers in their environment. The impact of preschool teacher perceptions and preferences on child PA needs to be tested in preschool settings specifically.

2.8 The Role of Play in Promoting Physical Activity

Play is a primary pursuit for preschool children. Young children engage and interact with the world around them through play (Ginsburg, 2007). As a result, a comprehensive assessment of the influences on PA among preschool children requires an exploration into the relationship between play and PA; how does play facilitate or inhibit PA? This line of inquiry requires an understanding of play itself.

The United Nations (UN) recognized the importance of play by declaring it to be a fundamental right (UN, 1990, Article 31). The UN Convention of Rights of the Child identifies 'play' as:

> "…any behaviour, activity or process initiated, controlled and structured by children themselves; it takes place whenever and wherever opportunities arise. Caregivers may contribute to the creation of environments in which play takes place, but play itself is non-compulsory, driven by intrinsic motivation and undertaken for its own sake, rather than as a means to an end. Play involves the exercise of autonomy, physical, mental or emotional activity, and has the potential to take infinite forms, either in groups or alone. These forms will change and be adapted throughout the course of childhood. The key characteristics of play are fun, uncertainty, challenge, flexibility and non-productivity. Together, these factors contribute to the enjoyment it produces and the consequent incentive to continue to play. While play is often considered non-essential, the Committee reaffirms that it is a fundamental and vital dimension of the pleasure of childhood, as well as an essential component of physical, social, cognitive, emotional and spiritual development." (UN, 2013, p. 5-6).

As young children interact with the world through play, they are given an opportunity to create and imagine (Ginsburg, 2007). Through play children develop confidence and resiliency (Band & Weisz, 1988; Erickson, 1985; Herwitz, 2003), learn how to share, negotiate, and resolve conflict, develop decision making and self-advocacy skills, and discover their own interests (Erickson, 1985; Herwitz, 2003; McElwain & Volling, 2005; Pellegrini & Smith, 1998b). In spite of these benefits of play, it is estimated that children's play has decreased by 25% between the early 1980s and late 1990s (Burdette & Whitaker, 2005). This decrease in play may be the result of increased formal education in the early years to optimize cognitive development, increasingly competitive educational systems, and standardized testing that focuses on curriculum related skills (Frohlich et al., 2013).

There is no single definition of play (Sutton-Smith, 2001). However, eight characteristics of play have been described: play (a) is pleasurable with the activity itself being more important than the outcome(s) associated with it; (b) is intrinsically motivated, self-chosen, and self-directed; (c) is spontaneous; (d) requires active engagement on the part of the player; (e) is all-engrossing; (f) can have a private reality; (g) is non-literal; and (h) can include elements of make-believe (Hirsch-Pasek & Golinkoff, 2008; Gray, 2013; Rubin, Fein, & Vandenberg, 1983). Further descriptors of play refer to it as creative and imaginative with few formal rules (Berinstein & Magalhaes, 2009), and an opportunity for children to experiment with unfamiliar and challenging activities and roles in their environment (Sutton-Smith, 2001).

Berkhout, Hoekman, and Goorhuis-Brouwer (2012, p. 1329) describe five types of play specific to four to six year old children, including:

1. Sensory play – exploration and play with various materials including water, sand, and play dough;
2. Motor (active) play – gross motor including running, sliding, and jumping;
3. Construction play – building or creating with materials such as blocks, boxes, and Lego™;
4. Make-believe play – fantasy play and role playing, typically including props such as dolls, cars, or costumes;
5. Participation in arts and games – includes crafting, colouring, board games, and playing on the computer.

It should be noted that these types of play should incorporate the characteristics of play as described above in order to adhere to the values of play; i.e., play should be pleasurable, self-directed, actively engaged in, be all engrossing, etc., regardless of the specific type of play being demonstrated. Berkhout et al. (2012) demonstrated that when provided with diverse play opportunities children will engage in a variety of play activities from all of these categories. The freedom to move from one type of play to another in response to stimulating environments is defined as free play (Herwitz, 2003). Free play needs to be unstructured, voluntary, and spontaneous play that is player/child initiated, directed, and controlled (Ginsburg, 2007).

Public health practitioners promote play as a means to increase preschool PA (Alexander, Fusco, & Frohlich, 2015; Frohlich et al., 2013). Particular attention has been given to the use of motor or active play to promote PA. Active play is broadly defined as vigorous activity that

occurs within a playful context and is performed above the resting metabolic rate (Brockman, Fox et al., 2011; Simons-Morton et al., 1990). There is a large body of research focused on structuring and directing active play to maximize PA (Alexander et al., 2015; Frohlich et al., 2013). Significant attention is focused on defining the amount of time children should be engaging in active play, the most effective types, intervals, and intensities of activities, and the locations in which active play should occur in order to optimize PA (for example, see: Brockman, Fox et al., 2011; Brockman et al., 2010; Engelen et al., 2013; Floyd et al., 2011; Nicaise et al., 2011; Schoeppe et al., 2014; Smith et al., 2014). It should be noted, however, that while active play can be structured and adult-led (for example, games such as 'Follow the Leader'), it can also be unstructured, voluntary, and spontaneous in accordance with the tenets of free play (for example, children spontaneously building snow men after a large snowfall) (Hyndman et al., 2016).

There is a pervasive belief that preschool children achieve adequate levels of PA through unstructured, free play; that active play is innate (Centre of Excellence for Early Childhood Development, 2011). Research has demonstrated that this is not the case (Fees et al., 2015; Van Cauwenberghe et al., 2011). Observation studies, measuring activity levels of preschool children have demonstrated that preschool children are largely sedentary during free play. Van Cauwenberghe et al. (2011) used both accelerometers and direct observation to evaluate the PA of 31 toddlers (aged one to three years) during indoor free play. This study found that participating children were largely sedentary (50.4% of the total observation), with only 36.3% of the total observation spent in slow/easy activity and 13.3% spent in moderate to fast movement. The physical activity types that were most commonly observed included sit and squat (24.3%), stand (24.3%) and walk (33.1%). In support of these findings, a 2015 study measured toddlers' PA during free play and concluded that participants were sedentary for 74% of the total observation (Fees et al., 2015). This study states that preschool children predominantly self-select sedentary activities during free play and determines that providing opportunity for free play is not sufficient for preschool children to achieve adequate levels of PA.

In light of these findings, the environmental and social factors that impact PA in preschool children during free play need to be understood (Cardon, Van Cauwenberghe, Labarque, Haerens, & Bourdeaudhuij, 2008; Larson, Normand, Morley, & Hustyi, 2014). The objective guiding such an investigation is that "descriptive information about the predictors of

PA might prove useful in guiding social and physical manipulations for increasing PA" (Larson et al., 2014, p. 839).

Evidence clearly demonstrates that the influences on physically active play are complex and multidimensional (Davidson & Lawson, 2006; Hyndman et al., 2016). A review by Hyndman et al. (2016) used a Social Ecological Model to outline influences of play in school playgrounds. The intrapersonal level included individual characteristics of the child such as body mass index, age, gender, enjoyment of socializing, self-efficacy, freedom to make up rules, positive feelings towards active play, low motivation, and preference for sedentary activities. Interpersonal factors, or the relationships that influence play, included peer and teacher support, teamwork, encouragement from teachers, and bullying. Influences within the physical environment, or playground facilities, were availability of green spaces, sports equipment, moveable and fixed equipment, playground design, weather, and children's perspectives of the play space including enjoyment, satisfaction, and variety and sense of choice. Finally, the organizational influences included policy regarding increasing opportunity for active play through a mix of free play on school playgrounds and structured physical education classes, safety rules, weather policies, access to facilities or equipment, and activity appropriate dress codes (Hyndman et al., 2016). Again, the generalizability of these barriers to preschool children and preschool play settings specifically needs to be established.

2.9 Creating Settings That Naturally Promote Physical Activity

By understanding the correlates of play and PA in preschool children, public health strategies can advance beyond traditional behaviour change initiatives to those that focus on the role of supportive policy and built environments for creating settings that spontaneously promote increased PA in children (Fenton, 2012). Ideally, built environments would support active play without eliminating the opportunity for free play (i.e., unstructured, voluntary, and spontaneous). For example, an Australian school-based intervention, introduced 'loose materials' to outdoor breaks to promote PA through free play in children aged five to seven years (Engelen et al., 2013). The 'loose' materials had to meet seven criteria including: (a) no obvious play value, (b) encourage cooperation and gross motor development, (c) be multipurpose, (d) could be used in challenging, creative, and uncertain ways, (e) promote interesting sensory experiences, (f) any possibility for the potential hazards associated with their use had to be identifiable and

manageable by the children, and finally, (g) be inexpensive or recycled items. In addition, staff and teachers providing supervision to outdoor breaks were provided training to examine perceptions and beliefs around the benefits of free play and the consequences of preventing free play and healthy risk taking. After thirteen weeks of intervention, the children at test schools demonstrated a small but significant increase in total PA and MVPA with a decrease in overall sedentary activity during break times. This increase was maintained two years after the initial intervention.

Within the context of built environments, attention is being given to the elements within the play environment that facilitate and inhibit PA among preschool children (Gubbles, Van Kann, & Janesen, 2012; Nicaise et al., 2011). For example, a 2011 study assessed 51 four and five year old children during outdoor, unstructured play (Nicaise et al., 2011). This study found that large, open spaces, portable equipment, manipulative objects, and riding vehicles were all associated with higher rates of MVPA during outdoor play. A 2012 study in The Netherlands (Gubbels et al., 2012) observed the intensity of PA in both indoor and outdoor play settings. In total, 175 two to three year old children from nine child care centers were observed. This study found portable jumping equipment and a structured track on the playground produced higher intensity PA during outdoor play; while portable slides, fixed swings, and sandboxes all decreased activity levels outdoors. Findings from the indoor play setting demonstrated that riding toys and a small playing area resulted in lower intensity PA.

A 2014 systematic review identified preschool playground characteristics that promoted higher levels of PA (Broekhuizen, Scholten, & Vries, 2014). This review categorized playground characteristics as (a) hardware, permanent playground characteristics such as size and surface type; (b) software, playground equipment and activities; and (c) orgware, which incorporates the organizational structure supporting the playground including supervision and duration of recess. This review considered experimental and observational studies that provided both contrary and complimentary findings. Results from observational studies suggested that both hardware and orgware impacted the PA levels of preschool children; this included playground size, decreased playground density, and increased time spent in recess; experimental studies, however, did not support the association between hardware/orgware and PA. On the other hand, both observation and experimental studies supported an association between access to play equipment and preschool children's PA levels.

Much of the built environment research focuses on outdoor environments where it is felt that the use of gross motor skills dominates (Storli & Løge Hagen, 2010), and where research has demonstrated a relationship between play and increased PA (Cleland et al., 2008; Sallis et al., 2000). Research has demonstrated that among five and six year olds, every hour spent outdoors was associated with ten minutes of MVPA (Larouche, Garriguet, & Tremblay, 2016).

In spite of the association between outdoor play and increased PA, children are spending less time outdoors (Clements, 2004; Tandon et al., 2012). An examination of data from 8,950 preschool aged children from the Early Childhood Longitudinal Study – Birth Cohort demonstrated that almost half of American preschool children did not play outside on a daily basis. Factors that decreased the likelihood of outdoor play included being female, of non-white race/ethnicity and having a working mother (Tandon et al., 2012).

The influences of outdoor play include those that generally impact PA and play, as noted earlier in this literature review, including intrapersonal, interpersonal, and environmental factors. There are, however, influences that are specific to outdoor play including safety concerns related to neighbourhoods and playgrounds such as shortage of outdoor play and green spaces, run-down playgrounds, dangerous neighbourhoods, concerns about traffic safety, fear of crime, pollution, perceived need for adult supervision during outdoor play, and weather (Bring-Isler et al., 2010; Brockman, Jago et al., 2011; Ergler et al., 2013; Kalish et al., 2010; Pellegrini & Smith, 1998a; Veitch et al., 2010; Veitch et al., 2007). Parents report that outdoor play is typically supervised and close to home; as parental concerns for safety increase, the frequency for outdoor play decreases (Kalish et al., 2010).

Given these unique barriers to outdoor play, efforts to address physical inactivity must consider both indoor and outdoor built environments in order to develop comprehensive strategies to promote PA. Consideration needs to be given to the possible value of indoor play environments as settings in which PA might be encouraged through play. There is research to suggest that there are some circumstances when indoor spaces may support PA in young children (Larouche et al., 2016); this study found that three and four year old children were more active indoors and less active outdoors when compared to five and six year olds (Larouche et al., 2016). The reason for this finding may be that while older children are required to sit in classrooms for a large part of the day, preschool children (aged three and four years) are likely

to be encouraged to move about and play while indoors. Conversely, when outdoors, preschool children's movements are typically more restricted and supervised than those of older children (Janssen, 2017). In this study, however, indoor spaces proved to be beneficial in facilitating PA within young children.

Child-focused indoor play facilities, including indoor playgrounds and trampoline parks, leisure pools, and indoor recreational programming, for example, may serve as settings that can be intentionally designed to promote increased PA through unstructured active play. Specific research is needed to evaluate the relationship and correlates between play and PA in indoor play spaces, and more broadly to assess how indoor play impacts general health and development. This thesis will begin to address the relationship between play and PA during designated free play time within multiple indoor preschool play spaces.

2.10 Conclusion

This chapter described the current literature outlining the problem of inactivity and its effect on child development. The importance of targeting young children and the value of preschools as a health promotion setting was outlined. The role of play on PA was explored; literature suggests that free, unstructured play in outdoor play spaces may increase PA. Along with this, research is beginning to identify the elements of these outdoor play spaces, such as size of the play space and play equipment, that influence activity levels. Ultimately, however there is limited evidence suggesting how to develop and sustain active play among children (Hyndman, Telford, Finch, & Benson, 2012). While comprehensive strategies are needed to promote outdoor play and further research is needed to maximize the value of outdoor built environments, there is an additional opportunity to investigate the potential role of indoor place spaces in increasing PA through unstructured, active play. The research presented in this study begins to consider the impact of indoor play spaces on preschool children's PA, specifically during designated free play time. The next chapter will describe the methodology that was used to explore this relationship.

Chapter 3 – Methodology

3.1 Overview

This thesis was part of a larger study entitled "Evaluation of a Play-Based Preschool Recreation Program: Exploring the Impact of Community Investment in Play-Based Learning on Health and Health Equity", hereafter referred to as the Love to Play study. The Love to Play study occurred from September 2014 to June 2015, and was a joint initiative between the University of Alberta, MacEwan University, and the Parks, Recreation and Culture department of Strathcona County, funded by the Canadian Institutes of Health Research (CIHR) and the Alberta Centre for Child, Family, and Community Research (ACCFR). The study used mixed methods and multiple concurrent analyses to evaluate how an innovative preschool program (Love to Play) influenced preschool children's play behaviours and health (Nykiforuk & Hewes, 2014a).

The Love to Play physical space, located in the Ardrossan Recreation Complex (ARC), was intentionally designed to provide a sensory environment that would encourage dynamic play opportunities for children (Nykiforuk & Hewes, 2014a). The impetus for its' development began in 2009, when the Government of Alberta launched a 5-year project aimed at evaluating early childhood development and identifying the environmental factors that influence it (Early Childhood Education Mapping Project Alberta, 2014). In order to accomplish this, data from 70,000 kindergarten-aged children from across the province was assessed. Early reports provided community level data on five areas of development including: (a) physical health and well-being; (b) social competence; (c) emotional maturity; (d) language and thinking skills; and (e) communications skills and general knowledge (Early Childhood Education Mapping Project Alberta, 2011, 2014). From this data, it was determined that 21% of kindergarten children within the municipality of Strathcona County experienced difficulty with one or more of the five developmental domains. In response to this finding, Strathcona County's Recreation, Parks, and Culture department developed the Love to Play recreational preschool program at ARC, to create a community resource targeting childhood development through play-based learning (Nykiforuk & Hewes, 2014a). ARC is a rural facility located in the County and was chosen purposefully to address needs that were experienced most acutely by children in rural areas of the County.

Initially, the Love to Play preschool program was to be implemented exclusively at ARC and consisted of programming, curriculum, and a physical play space that provided opportunity for free play and learning through play (Strathcona County, 2014a). The Love to Play preschool program began in January 2014. Shortly after, the Strathcona County decided that the Love to Play program would be a county-wide program and that the curriculum would be implemented at all other Strathcona County preschool programs; in addition to the curriculum and programming, ARC would have the unique Love to Play indoor play space.

The objective of the overarching Love to Play study was to assess the value of an innovative preschool program from stakeholders' perspectives and, more specifically, how it impacted play and early childhood health and development among children enrolled (Nykiforuk & Hewes, 2014a). Two additional recreational preschool programs offered by Strathcona County, including the Kinsmen Leisure Center (KLC) and the Strathcona Olympiette Centre (SOC). Initially, these sites had not adopted the Love to Play programming. However, prior to the start of the Love to Play study, the Love to Play program had been expanded to include all preschool programs in the Strathcona County.

The overarching Love to Play study followed a mixed-methods design, comprised of four major activities:

1. Pre-post semi-structured interviews with parents and instructors at all three preschool sites (Nykiforuk & Hewes, 2014b). Parent interviews explored perceptions around play behaviours at home and in other settings, the benefits of play, and how play impacts health of children. Similarly, instructor interviews collected information on their work experience and explored perceptions of play in preschool environments and how play affects health of children.
2. An audit of each site using the Children's Physical Environment Rating Scale (Moore, 2010) to assess the quality of indoor spaces at each site (Nykiforuk & Hewes, 2014c).
3. Multiple observations of participating children playing in the preschool spaces (Nykiforuk & Hewes, 2014a). This was accomplished with video observation.
4. Use of Mosaic Approach participatory strategies to obtain the children's perspective on their play and play spaces in the preschools (Nykiforuk & Hewes, 2014a).

The evaluation coincided with the first offering of the Love to Play program in Strathcona County. As such, results will guide the development of future play-based preschool programming and spaces in Strathcona County and will ultimately provide evidence that could influence the design of preschool settings more broadly.

Using data collected in Part 3 (Video Observation) of the larger project, this research considered how indoor play environments influence active play. This was achieved through assessment and observation of the intensity and types of PA performed by children in each of the preschool settings. The specific research questions addressed in this research included:

1. How physically active are preschool children during designated free play time in indoor play spaces at their preschool?
2. What types of play activities promote the highest and lowest levels of PA among preschool children during designated free play time in indoor play spaces at their preschool?
3. What types of PA do preschool children engage in during designated free play time in indoor play spaces at their preschool?

3.2 Study Design

This observational study assessed PA levels of preschool children within indoor play environments during designated free play time. A multiple case comparison of three preschool programs, including ARC, KLC, and SOC was completed.

A randomly selected group of children was observed during designated free play within the indoor play spaces at each site. Designated 'free time' was a part of daily preschool programming as determined by the director of the Strathcona Country preschool programs. The observation during this time, provided frequency measures of PA, including type and intensity, and types of play activities. These were used to provide a descriptive analysis of PA within each of the indoor play environments.

All three sites are guided by the same mission statement and curriculum; the distinguishing factor between these sites was the unique indoor play environment available at each site. A multiple case comparison allowed for an analysis of the similarities, differences and patterns in PA and play in each of the indoor play environments at the participating preschools.

3.3 Research Sites

Three recreational preschool programs, including ARC, KLC, and SOC were included in this multiple case analysis. All three preschools were guided and managed by the Recreation, Parks, and Culture department of the Strathcona County. All of these preschool programs required registration with a maximum enrollment of 20 children (aged three to five years) for each session. Programming occurred once a week from 9 am to 3 pm over three terms per year including Fall (September to November), Winter (January to March), and Spring (April to June). Programming was taught by one lead and one assistant instructor.

These sites all promoted learning through play (Strathcona County, 2014a) and had the same mission statement "to encourage play, healthy lifestyles, and nurture a generation of creative and global youth. With an abundance of experiences that promote children's intellectual, emotional, physical and social development, they will attain the necessary skills to thrive" (Strathcona Country, 2014b, p. 2).

All three preschool sites adopted the Love to Play curriculum framework. This framework focused on the five developmental domains identified in the Early Child Development Mapping Project; including: (a) emotional maturity; (b) social development; (c) language and thinking skills; (d) communication skills and general knowledge; and (e) physical health and well-being (Strathcona County, 2014b). Strategies to achieve the goals in each of these domains were developed by the lead teacher in each program; the learning environment was planned to encourage children's exploration through play (Strathcona County, 2014b). Other key elements of the Love to Play curriculum included providing a learning environment that offered options to the children; integrating multiple forms of activity in individual and group settings; creating an "atmosphere that values new ideas and innovative ways to approach routines" (p. 7); introducing "open ended materials that have a multitude of functions and encourages investigation" (p. 7); and encouraging risk assessment. Teachers developed learning plans that outlined daily play activities and how these activities supported the central developmental domains.

The research described in this thesis considers the impact of indoor play environments on PA; as such, focus was given to the preschool spaces that provided maximal opportunity for PA. The decision to evaluate PA in these specific spaces was also based on preschool programming as these were the respective spaces where designated free play time occurred at each preschool.

The indoor play space at the ARC Love to Play preschool recreational program was purposefully designed to offer a large variety of play experiences; the focus was on free play that was spontaneous and self-directed and that allowed children to interact with and shape their own environments (Nykiforuk & Hewes, 2014a). The Love to Play indoor play space was unique in that it offered opportunities to engage in all forms of play (sensory, motor (active), construction, make-believe, and arts and games). In accordance with the theoretical concept of loose parts (Nicholson, 1972), much of the play equipment was easily manipulated and moved allowing children the opportunity to literally redefine and rebuild their play environment as desired. Alternatively, the indoor play spaces or 'mini-gyms' at KLC and SOC offered more traditional preschool active play environments with stationary play structures. The following section provides a detailed description of each site.

3.3 Qualitative Characteristics of Preschool Sites

3.3.1 Ardrossan Recreation Complex (ARC), Love to Play space. The Love to Play indoor play space was located in a long and narrow room (1300 square feet). The roof and walls of the room were light grey/white, which allowed the brightly coloured play structures to be the focal point of attention. There were many fluorescent lights that gave the room a bright and dynamic look. There were two doors accessing the room (located on the west side of the front and back of the room). There were no windows in the room.

On entering the room there was a feeling that there was much to see and do; that there were many new and dynamic play activities to explore. This could be both stimulating and overwhelming to children. The room was full; there were natural walkways between structures and some small open areas at the front and back of the room. The room was roughly broken into two physical areas denoted primarily by floor colour: a large, brown-floored area at the front of the room that stepped down (one step) onto an equally large area with light grey vinyl tile flooring. Other than that physical division in the room, there was very little separation between play areas. There was a sense that children could move freely from one play area to another in continuous play episodes.

The area at the front of the room was dominated by three large play areas, including:

- The entire east wall of the room was a course of wide pneumatic tubes that children could feed chiffon scarves and small balls into. These objects travelled along the

tubes and shot out at various places. Levers and gates incorporated into the tubing allowed children to change the direction of air flow to change the point at which the scarves/balls shot out of the tubing. There was a single place to feed scarves/balls into the course and multiple points along the course where air flow could be changed and where scarves/balls could exit. The balls and scarves were multi-coloured and light; they were stored in a large green bin directly beside the structure.

- Beside the tube structure, on the front half of the north wall, was a large track for a ball drop. Children used a two-hand, yellow crank, in the shape of steering wheel, to lift a ball onto the top of the track; the ball then dropped onto a yellow wire track and children could watch as the ball travelled along, setting off levers and pin-wheels as it went. The balls exited the track system by dropping into a big green drum; children were able to catch the ball as it rolled around the drum. If it was not caught first, the ball came to a stop and could be picked up by the child and lifted back onto the track as desired. Multiple balls could travel along the track at one time.
- In the middle of the front play area was a large, round, wooden structure, approximately six feet tall. Staff referred to this play space as the 'treehouse', which was appropriate as it could be described as a hollowed out tree trunk. There were four stairs on one side of the structure that allowed children to climb up onto a playing platform (approximately three feet up from the bottom of the round 'trunk'); this area had big pillows, sheets, and clothes pins. The walls of this play structure were a mix of solid wood slats of varying colours and wire mesh to allow children to attach clothes pins and sheets for activities such as fort building. There is a short, inclined 'rock' wall with hand and foot holds of varying colours that provided access from the other side of the 'treehouse' structure.

Other objects found in the front play area included a green and orange storage box, two large black theater boxes with colourful curtain fronts that were big enough to allow two to three children to crawl inside, two stationary wooden sawhorses (painted and created to look like horses with yarn tails and manes), and standard chairs.

The front-play area stepped down to a sunken area, with white tile flooring, at the back half of the room. There were a number of primary play structures and areas in the back half of the room, including:

- On the north wall, immediately after the step down, was a very large blue container of Imagination Playgound™ big blue blocks of various shapes and sizes. These blocks were made of firm foam and had holes and shapes that fit together to facilitate construction. There was an open floor area in front of this container to provide space to build.
- The back quarter of the room contained a large imitation 'grocery store' area. There was a light wooden shelf that created two 'aisles' (wooden and wire shelves down both sides and curved along each end of the wooden structure). These shelves were stocked with plastic food items and empty food boxes. The grocery store also had a green check out station complete with a conveyor belt to unload groceries onto, a grocery till to ring in items, and a number above the till. At the back of the 'store' was an orange wall that created a small room to serve as a separate loading area (i.e., the back end of the store); this area was accessed through clear hanging panels of thick plastic. The loading area had a conveyer belt to move groceries to the front end of the store. There were a number of props that accompanied this area including child-sized metal grocery carts, plastic food items, empty boxes of grocery items, empty boxes for the loading area, and a cash register. Note, these two play structures dominated the back play area in terms of physical space and attraction; as a result, children were consistently playing in these areas.
- In addition, hanging on the back of the south wall was a large magnetic board (approximately eight to nine feet high); attached to this were black, white, and grey plumbing pipes of various sizes and joint shapes. Children can line these pipes together to create unique ball drops.
- Next to the magnetic board was a music area that allowed children to drum on the ends of black and white plumbing pipes, cut at various lengths to create various tones. They were lined along the inside of a wooden stand and were reminiscent of an organ.
- Finally, this area included a large plastic container of thin pieces of a tree trunk, cut into circular pieces of varying lengths. The teachers indicated that these were natural props that the children could use in innovative ways, including blocks to step on, tower building, etc.

The ARC playroom also had many play props. There were dolls, strollers, pillows, blankets, and a box of books. The diverse range of play opportunities was apparent in this room. See Appendix A for a room schematic of the Love to Play indoor play space. Figure 3.1 provides a visual of the ARC play space.

Figure 3.1: ARC, Love to Play Indoor Play Space (view from the front and the back of the room)

3.3.2 Kinsmen Leisure Center (KLC), 'Mini-gym' space. The KLC indoor preschool playground was described as a large space that contained "modern play equipment including a geo-jungle, wave climber, a pirate ship, unique slides and climbing structures" (Strathcona County, 2014c, para. 1). The play space at KLC was reminiscent of a gymnasium with a large space (2592 square feet) and very high ceilings. There were a number of large windows along the west side of the room that looked down onto the aquatic center. There was a large, heavy double door on the north side of the room that served as the primary entrance/exit to the play space. There was also a standard door in the corner that provided direct access to and from the preschool classrooms. The flooring divided the room into two areas; upon entering the room there was a smaller, open area of cream vinyl flooring (~25 feet); this area was open and clear of play structures. The flooring changed to a brown cushioned play surface over the remaining area where all play structures were located.

On entering the room, an aquatic theme was immediately apparent. The room was predominantly painted in shades of blue and green and there was a large tropical, aquatic-themed mural on all four walls. The wall looking down onto the aquatic centre (west wall) was painted with bamboo buildings and palm trees, the back wall of the room had crashing waves and coral,

and the east wall was adorned with aquatic animals including whales, sharks, turtles, and fish. The lower half of the east wall was also lined with standard blue gym mats. This aquatic mural was very eye-catching.

At the back of the room, there was a large, orange, brown, blue, and yellow pirate ship structure that coordinated with the aquatic theme. This was the largest play structure in the room. On one side of the ship, there were a number of stairs that children could climb up to the main level of the ship that could accommodate a number of children at once. The main level of the ship had a built in bench and wheel; there was also a small treasure chest with props related to the ship, including pirate costumes. There was a slide from the main level of the ship. The hull of this ship could be accessed by circle openings on each side of the ship; again, multiple children could be in this space at one time.

There were a number of other pieces of play equipment that were linked to the aquatic theme. These pieces were typically large and fixed. These include:

- A light blue and yellow structure that resembled a submarine partly submerged in water (i.e., just the top half of the submarine). Children could step into an open area at the front of the submarine or they could crawl through an opening in the middle of the submarine.
- A large plastic tortoise with a happy face. Children could sit on the back of the tortoise, hold onto its head, and rock back and forth. This piece of equipment could technically have been moved to another location in the room, although that was not the primary purpose and it would have likely taken some effort on the part of the child(ren).
- A large green eel that was approximately one foot high and five feet long. The eel had a ridged back and a smiling face. There were a number of ways that children might play with this structure including sitting on it, balancing while walking along the top, and crouching down to hide behind it.
- A sand castle structure that had four steps on one side and a small slide down the other side. There was also a tunnel through the bottom of the play structure.
- A blue dolphin that children could also sit on to rock back and forth. Again, this piece of equipment could have been moved in the play space, but that was not the primary purpose.

Mixed in with the aquatic-themed equipment were a number of other play structures. Most of these play structures were made of durable, primary-coloured plastic. The equipment was predominately stationary, including:

- A large, plastic cube shaped structure with four brightly coloured walls that had many shapes and sizes cut out to allow for various play. The front yellow wall had shapes that resemble a 'door' and a 'window' cut into it; children could walk into the middle of the cube structure where there was a flat surface that might serve as a bench, table, or bed. A green sidewall had horizontal cut outs that could have been used as a ladder and circles that allowed access to the center of the cube by crawling or climbing. The other sidewall was blue and had a series of circular cut outs. Finally the back orange wall had circle and square cut outs. This structure was known as the geo-jungle.
- A smaller plastic cube shaped structure with two small steps that led to a small landing and slide.
- A small multi-coloured plastic tunnel that children could have crawled through.
- A long balance beam structure approximately two feet high that provided a number of surfaces, such as level, rolling, and arched, for children to balance and walk across. It could be accessed by stairs on one end and a ramp on the other end. It was approximately twelve feet long, with a bend almost half way along its length.
- A dark green, small plastic teeter totter. Two to three children could have sat on it – one on each end and one in the middle.
- Soft play equipment, including a red and yellow ball pit. The pit was typically empty although teachers could fill it when wanted. Also included were a tall, circular yellow platform with four yellow wedges, two large red ramps, and two sets of blue stairs leading up to it from all sides. Some of this equipment was portable, particularly the small wedges, but it would have taken some effort on the part of the child(ren) to move it.

In addition to these play structures, a number of other pieces of play equipment were available in this play space, including a large container of Imagination Playground™ big blue blocks of various shapes and sizes with an area of open floor space in front of the container, two child-sized free-standing basketball hoops in each of the back corners of the space, and an approximately seven foot high wall climbing area on the east wall of the play space.

The play area seemed full of play structures and equipment; there were natural walkways between structures with some small open areas between equipment (the largest open area was directly in front of the pirate ship). There was a long closet along the north wall of the space that stored play equipment including a cart of balls of varying sizes and a basketball net. Children needed permission to access this equipment; teachers typically set out additional equipment prior to the start of play. See Appendix B for a room schematic of the KLC play space. Figure 3.2 provides a visual of the KLC play space.

***Figure 3.2*:** KLC Indoor Play Space

3.3.3 Strathcona Olympiette Centre (SOC), 'Mini-gym' space. The SOC indoor play space was once a community hall and, as such, it was a very large space (3896 square feet). There was a large double door leading into the space. Immediately to the right of the entrance were doors to male and female bathroom facilities. Further down this same wall was a door leading into a kitchen facility with two large open pass-through windows and counters between the kitchen and play space. There were a couple of long tables, with a few adult sized chairs, lined along these pass-through windows.

At the back of the room was a hallway that led to additional meeting rooms and a large storage closet that housed play equipment. There were no windows in this space. The lights were fluorescent. The walls were light lime green in colour. The floor was white vinyl tile. There were a number of support beams throughout the room that were mint green in colour. There was a standard door in the corner of the room that led directly back to the preschool classroom space; children would often enter and exit the play space through this door.

Upon initially entering this large multi-use space, it took a couple of seconds to orientate to the purpose of the room: it was just so big. The room seemed dimly lit in spite of many large

fluorescent lights and the light-coloured walls and floor. The room was divided into two primary play areas. The first area was a very large open area at the back of the room that was empty of any play structures. There was a large storage closet adjacent to this area that housed a variety of play equipment including three and four wheeled cycles, scooters, balls of various sizes, free-standing basketball nets, and bean bags. Teachers brought out select play equipment prior to play; children required permission to access the storage closet.

The second primary play space was a smaller area to the left of the main entrance. This area was demarcated by a raised, brown rubber play surface on the floor. This surface housed a number of play structures that were made of durable, primary-coloured plastic. Play structures include:

- A large climbing structure, the largest of the play structures, with stairs, ladders, tunnels, a small slide, and a longer slide, all combined together to provide an opportunity for diverse play activities. It was multi-coloured: green, purple, pink, yellow and orange. It was reminiscent of a jungle gym. It was big and inviting.
- There was a smaller version of this play structure at the other end of the play area. Again, this jungle gym structure had tunnels, ladders, a small slide, and stairs. It was green, blue, pink, and grey in colour. It was not as complex as its larger counterpart, but it provided many of the same opportunities for play.
- Soft play equipment including: a red and yellow ball pit that was empty; a tall, circular yellow platform with four yellow wedges; two large red ramps; and two sets of blue stairs leading up to it from all sides. Again, some of this equipment was portable, particularly the small wedges, but it would have taken some effort on the part of the child(ren) to move it. This soft play equipment was identical to the soft play equipment found in KLC.
- A geo-jungle identical to the one found at KLC. Namely, a large, plastic cube shaped structure with four brightly coloured walls that had many shapes and sizes cut out to allow for various play.

There were a number of additional play pieces including a large platform that could have served as a stage, a log cabin playhouse with a green roof, a small play kitchen complete with appliances, upper and lower cabinets, drawers, and a counter top with a sink, a magnetic table, and two child-sized, half-moon shaped tables that had been pushed together to form a complete circle. There were minimal play props accompanying these areas; they were limited to a couple of strollers and dolls. See Appendix C for a room schematic of the SOC play space. Figure 3.3 provides a visual of the SOC play space.

Figure 3.3: SOC Indoor Play Space

3.4 Participants

All preschool aged children (i.e., three to five years of age) registered at the three preschool sites between September 2014 and June 2015 were invited to participate in the overarching Love to Play study. Informed consent for all participating children was obtained in writing prior to the start of data collection. As part of this informed consent, information letters were provided to all parents/guardians of children enrolled and participating in the three preschool facilities. Adequate information was provided including objectives, risks and benefits associated with the research, that participation in the study had to be freely volunteered, and that the participant could withdraw at any point in the study. See Appendix D for the information letter to parents/guardians. This information was reviewed with the parent/guardian and consent was obtained by a trained research analyst during 'drop-off' and 'pick-up' to preschool. Informed consent was obtained from participating children's legal guardian(s). See Appendix E for the consent letters.

Informed consent from each of the preschool teachers was also required prior to video recording. Information letters were provided to all preschool teachers. Again, adequate information was provided including objectives, risks and benefits associated with the research, that participation in the study had to be freely volunteered, and that the participant could withdraw at any point in the study. See Appendix F for the information letter to preschool teachers and Appendix G for the consent letters.

Consent forms for video recordings were completed at the beginning of each of the preschool terms; including the fall term (September to December, 2014), the winter term (January to March, 2015), and the spring term (April to June, 2015). During video recordings, children without parental consent to participate were provided alternative activities in a different area of the preschool to ensure they were not captured on the recording. This occurred only on one occasion, with one child, throughout the duration of data collection.

3.5 Data Collection: Video Observation

Video cameras were used to continuously record play activity in the indoor play spaces of each of the participating preschools. Thirty minute video observations were recorded monthly over a nine-month period (September 2014 - June 2015; excluding December 2014 as preschool programming was not provided at any sites during that month). All video observations were recorded at the same time of day to minimize any effect time of day had on children's play. Multiple video recordings were collected to observe play over the course of time; this also provided the added benefit of minimizing any behaviour change within the children's play that may have occurred as a response to the presence of video recorders (Lomax & Casey, 1998).

The video observations completed in September and October (2014) were recorded using two video cameras. Unfortunately, the use of two cameras limited the observable areas of the play spaces; as a result, the research team opted to use three cameras in subsequent months to increase the video coverage of each play space in an attempt to capture all play activity. Cameras were wall mounted to allow for unobtrusive observations; the placement of the cameras were at a height and angle that most effectively avoided capturing images of children's faces (Nykiforuk & Hewes, 2014a). A member of the research team was present on site during each of the video recordings to place and manage the cameras, ensure that appropriate consent forms were completed, and to address staff or parent concerns as needed (Nykiforuk & Hewes, 2014a).

Over the duration of the study, approximately 810 minutes (13.5 hours) of video observation was recorded at each site, for a total of 2,430 minutes (40.5 hours) of video observation across sites.

With the exception of the video recordings completed in September and October 2014, each video observation was recorded using three separate cameras. Prior to coding, these separate camera perspectives were combined into a single file to allow for simultaneous viewing. For each separate video observation, Windows Movie Maker™ was first used to edit the three camera recordings to ensure a consistent starting point of all three perspectives. These edited files were then uploaded using Wondershare™ Video Editor (wondershare.com/videoeditor/) to create a split-screen video that provided simultaneous viewing of three unique perspectives of the play space.

Jewitt (2012) noted the benefits of video recordings include the ability to collect naturally occurring events in a "real-time sequential" (p. 4) fashion. Video observation allowed for a discrete way to observe children at play without interrupting the natural course of play. The video observations also allowed for repeated viewings to ensure accurate data collection and coding. Having the ability to review was critical for training the coders: it allowed the research team to review and discuss discrepancies in coding. The use of video recordings provided a permanent record of the observation, which ultimately increased the reliability of the observation tool used (Loprinzi & Cardinal, 2011). Additional benefits of video observation are that it can be manipulated (slowed, paused, etc.) and shared multiple times to allow the researchers to revisit the data as needed.

The use of video recordings is not without limitations. Cameras were wall mounted prior to each video recording. Prior to data collection, the research team assessed the preschool spaces to determine where cameras needed to be located in each space to ensure maximal coverage of each of the play spaces. To ensure consistent placement of the three cameras for all video observations, a room schematic and photograph instructions for camera location were provided; however, the camera could be mounted at varying heights, angles, and direction of focus. These placement decisions were at the discretion of the research team member and often determined what elements of the play space were and were not visible on the recording. There were also areas of play that could not be feasibly captured on the recording (i.e., inside play structures).

Technical problems encountered during recording included a camera falling off the wall and a camera that lost battery power during recording. There was also one occasion where the

time allocated for play in the play space was cut short by the preschool teachers to accommodate other program timelines; this resulted in a short observation period.

Camera recordings were started manually by a single research team member, resulting in slightly different start times from each camera in the space. Editing the three camera perspectives to ensure a consistent start time was a challenge; this was done manually and required significant time and careful observation. In some cases, this editing shortened the total video observation by a few minutes.

Challenges during observation and coding were also experienced. As it was not possible for the entirety of the play space to be captured using three cameras, there were periods during the video observation when the randomly selected focus child was hidden from view. Observation intervals when the focus child could not be seen were coded as *Can't Tell*. In a few instances, the focus child spent much of the video observation off screen or out of view (i.e., inside or under a play structure that hid the focus child from view) resulting in a large portion of the observation intervals being coded as *Can't Tell.*

Finally, the video observation did not capture the specific audio from the focus child. Given the placement of the cameras to capture the larger view of the room, the audio recorded included the noise generated from all of the children in the play space; this muted out much of the individual verbal activity. Without specific verbal cuing, the detailed nuance of play was often not captured, particularly when coding variables for play activity and social context. For example, children running would be coded as a *Gross Motor* play activity (i.e., the children were running only for the sole enjoyment of running); however, if the children had established rules prior to play that were guiding the purpose of the running (i.e., the children were playing tag) it should be coded as *Formal Game with Rules*. Without hearing the specific verbal interactions of the focus child, the coder was not able to determine if rules for play had been established, therefore, in absence of other visual cues, it was coded as *Gross Motor*. Non-verbal cues, when available, provided this detail; for example, when the children were running, was one child observed chasing the other children? Could that child be seen 'tagging' someone else? Did that 'tagging' change who was chasing and who was being chased?

3.6 Sampling

3.6.1. Video selection. In total, nine video observations were collected from each of the participating preschools. The video observations from the first month of each term (Fall - September 2014, Winter - January 2015, and Spring - April 2015) were all eliminated to ensure that newly enrolled children had ample time to adapt to the novel play environment. Video observations from October 2015 were also eliminated as they were recorded using only two cameras which made it challenging to follow a focus child through the play environment. The remaining five months of video observations (November 2014, February 2015, March 2015, May 2015, and June 2015) from the indoor play spaces of each of the participating preschools were coded. In total, fifteen unique video observations were coded (i.e., five months from each of three sites).

3.6.2 Selection of focus children. A group of randomly selected children from each site was used as a representative sample of the larger preschool population. In total, there were 120 children enrolled across the three sites for all three terms. Table 3.1 provides the total number of children enrolled in each term at each site.

Table 3.1

Total Number of Children Enrolled in Each Term at Each Site

TERM	ARC	KLC	SOC
Fall, 2014	17	10	10
Winter, 2015	15	16	11
Spring, 2015	15	13	13
TOTAL	47	39	34

The average age of children enrolled at each site was calculated, and is presented in Table 3.2.

Table 3.2

Age of Children Enrolled at Each Site, by Term (2014-2015 preschool year)

Child Age (years)	ARC			KLC			SOC		
	Fall 2014	Winter 2015	Spring 2015	Fall 2014	Winter 2015	Spring 2015	Fall 2014	Winter 2015	Spring 2015
Age 3	2	1	1	0	0	0	2	0	0
Age 4	15	12	11	10	14	10	7	9	7
Age 5	0	2	3	0	2	3	1	2	6
Average Age (per term)	**4.1**	**3.8**	**4.6**	**4.0**	**4.7**	**4.4**	**3.7**	**4.7**	**4.5**
Average Overall	**4.2**			**4.4**			**4.3**		

From each of the video observations, the number of focus children randomly selected for coding equaled sixty percent of the total enrollment for that site and term. For example, seventeen children were enrolled at the ARC site for the fall term. From the video observation recorded in that term (i.e., November) 10.2 focus children, or sixty percent of the total enrollment, would be randomly selected for coding. Note, when calculating sixty percent of the total enrollment, decimals were rounded up or down to the nearest whole number (i.e., 10.2 resulted in 10 focus children being randomly selected). Table 3.3 outlines the number of focus children that were selected from each video observation, by site.

Table 3.3

Number of Focus Children Selected from Each Video Observation at Each Site

		ARC	KLC	SOC	TOTAL
Video Observation	**November, 2014**	11	6	6	23
	February, 2015	9	10	7	26
	March, 2015	9	10	7	26
	May, 2015	9	8	8	25
	June, 2015	9	8	8	25
	TOTAL	47	42	36	**125**

Focus children were randomly selected using an online random numbers generator (http://andrew.hedges.name/experiments/random/). First, the random number generator selected a number between one and three to identify what camera perspective to use to identify the focus child. For example, if the random number was two, then the focus child would be identified in the second camera perspective. A second random number selected a number between one and fifteen was then generated; children visible on the selected camera perspective were counted from the top, left-hand side of the paused screen until the randomly generated number had been reached. If a camera perspective had no visible children, or all the visible children were already selected, the number of that camera perspective was removed from the random number generator.

Once a focus child was identified, individual characteristics, including gender and a brief description of clothing and hair colour/length, were noted to facilitate identification of the focus child for double coding and for re-observation if needed at a later date. There was a total of 125 focus children randomly selected: 47 children from ARC; 42 children from KLC; and 36 children from SOC.

3.7 Data Coding

3.7.1 Instrument. Young children's physical activity is characterized by short, intermittent bursts of intense activity that is multidirectional (Bailey et al., 1995; Oliver, Schofield, & Kolt, 2007); as a result, accurate assessment of their physical activity is challenging (Oliver et al., 2007). To effectively assess preschool children, PA measures must capture different activity intensities in a short time frame over multiple planes (Oliver et al., 2007).

While accelerometers are well suited to assess physical activity in preschool children, they are not able to provide contextual information about the PA, including the type of PA, the play activity associated with the PA, and the initiator of the PA (Oliver et al., 2007); as a result, accelerometers were not considered for this research. Several observation tools aimed at measuring PA and that also assess the environment in which PA occurs were explored: the SOPLAY (McKenzie, 2002), BEACHES (McKenzie et al., 1991), FATS (Klesges et al., 1984), and OSRAC-P (Brown et al., 2006) tools were considered, and are described below.

The System for Observing Play and Leisure Activity in Youth (SOPLAY) is an observational tool that collects data on students' PA during play and leisure time in specified target areas (McKenzie, 2002). Observations should occur before school, during lunch time, and after school. While this tool considers PA and the context in which it occurs, it is specific to school-aged students; its adaptability to preschool children was questioned and as a result this observational tool was not selected for data analysis.

The Behaviors of Eating and Activity for Children's Health Evaluation System (BEACHES) is an observational tool that assesses eating and physical activities and the social and environmental influences on these behaviours (McKenzie et al., 1991). It can be used in a variety of child-directed settings including home and school. Ten categories are used to assess eating and PA behaviours and associated factors in one integrated system. Given the comprehensive nature of this tool, the resulting coding system is complex. Given this, and because eating behaviours were not considered as part of this research, the BEACHES instrument was not selected for data analysis.

The Fargo Activity Timesampling Survey (FATS) is a direct observation tool that assesses PA (Klesges et al., 1984). It was developed for use with preschool children and considers both type and intensity of activity as well as parent–child interactions related to that PA. While the assessment of PA is appropriate for the current study, the FATS tool only considers the parental influence on activity, not the environmental context in which the PA occurs. Ultimately, the FATS instrument was not selected for data analysis.

Finally, the Observation System for Recording Physical Activity in Children – Preschool (OSRAC-P) is an observation tool that collects information about 1) the type and intensity of PA, 2) the physical environment and, 3) the social environment, including group composition, activity initiator, and prompts (Brown et al., 2006, Brown et al., 2009). This tool is a modified version of the Children's Activity Rating Scale (CARS), an observation tool used to assess PA in preschool children (Puhl, Greaves, Hoyt, & Baranowski, 1990). The OSRAC-P provides detailed information about context including activity type, location, and social environment (Oliver et al., 2007).

Ultimately, the OSRAC-P was selected as it allowed for observation of varying PA overtime, is specific to preschool activity, and provides an assessment of the context in which

play occurs (Brown et al., 2006). This tool supports research exploring the influence of environment on PA and play behaviours in preschool children.

The OSRAC-P is intended to be a direct observation tool employed by an in-person observer. There is some previous research that uses video observation to measure PA with the OSRAC-P (Fees et al., 2015; Hustyi, Normand, Larson, & Morley, 2012). Both of these studies recorded one randomly selected focus child at a time; their respective rationales for using video observation as opposed to direct observation were not provided (Fees et al., 2015; Hustyi et al., 2012).

3.7.2 OSRAC-P: variables and modifications. The OSRAC-P considers eight variables including: level of PA, type of PA, physical location, indoor play activity, outdoor play activity, group composition, activity initiator, and activity prompts (Brown et al., 2006). These variables are coded every thirty seconds throughout the entire observation.

A modified version of the OSRAC-P was developed and used for the Love to Play study. All modifications were determined by the research team as a result of training and were implemented prior to data coding. A modified codebook with code definitions (Appendix H) and a coding guide (Appendix I) were developed. Variable descriptions and the modifications made are described below.

***Level of physical activity*.**

Description. This variable describes the highest level of PA that the focus child achieves during the observation interval. The OSRAC-P notes that intensity considers speed of movement, assistance from others, repeated movement, and addition of weight to the movement (e.g., is the focus child holding or dragging an item?) (OSRAC-P, 2012, p. 9). The OSRAC-P classifies five levels of PA, which includes *Stationary/Motionless, Stationary with Limb or Trunk Movement, Slow-Easy Activity, Moderate Intensity,* and *Vigorous Activity* (Brown et al. 2006).

Modification. None. The OSRAC-P codes for level of PA were used without modification. Definitions for level of PA codes are available in the modified codebook (Appendix H).

Type of physical activity.

Description. This variable describes what physical activity the child was doing when the highest level of PA was achieved during the observation interval (OSRAC-P, 2012. p. 13). The OSRAC-P identifies nineteen types of physical activity, including *Climb, Crawl, Dance,*

Jump/Skip, Lie Down, Pull/Push, Rough and Tumble, Ride, Rock, Roll, Run, Sit/Squat, Stand, Swim, Throw, Walk, Other, and *Can't Tell* (Brown et al., 2006).

Modification. Original codes were modified to reflect unique characteristics of the participating play spaces; specifically, codes/definitions for *Hit/Pound* and *Lift/Carry* were added, while the code for *Swim* was removed. Definitions for type of PA codes are available in the modified codebook (Appendix H).

Physical location.

Description. This variable represents the physical location of the child during the observation interval (OSRAC-P, 2012). The OSRAC-P includes four codes for physical location including *Inside, Outside, Transition*, and *Can't Tell* (Brown et al., 2006).

Modification. The code for *Outside* was removed as outside spaces were not considered as part of this study. Definitions for physical location codes are available in the modified codebook (Appendix H).

Play activity (indoor and outdoor).

Description. This variable represents the play activity that the child was engaged in when the highest level of PA was achieved during the observation interval (OSRAC-P, 2012). The OSRAC-P includes eighteen codes for indoor play activity, including *Art, Books/Preacademic, Gross Motor, Group Time, Lg (Large) Blocks, Manipulative, Music, Nap, Self-Care, Snacks, Sociodramatic, Teacher Arranged, Time Out, Transition, Videos, Other, N/A*, and *Can't Tell*. (Brown, et al. 2006). The OSRAC-P also includes fifteen codes for outdoor play activity including *Ball, Fixed, Game, Open Space, Pool, Portable, Sandbox, Snacks, SocioProps, Teacher Arranged, Time Out, Wheel, Other, N/A,* and *Can't Tell* (Brown et al., 2006).

Modification. Given that the outdoor play settings were not considered as part of this research, the modified codebook combined the OSRAC-P codes/definitions for indoor and outdoor educational/play context. This combination of codes also better reflected the various play activities that occurred in the unique play spaces.

Other modifications included: (a) addition of codes/definitions for *Exploratory Play*, as defined by the Play Observation Scale (Rubin, 2001) and *Photovoice,* a specific activity conducted by participating children as part of the larger Love to Play study that was seen on multiple video observations; (b) changing the code *Video* to *Screen* to include computer use; and 3) removal of codes for *Nap, Open Space, Pool, Portable Equipment, Sandbox,* and *Time Out* to

reflect the activities of the specific play spaces being observed. Definitions for play activity codes used are available in the modified codebook (Appendix H).

Activity initiator.

Description. This variable describes who chose the area where the focal child is located or the activity that he/she is engaged in during the observation interval (OSRAC-P, 2012, p. 31). The OSRAC-P identifies three codes for Activity Initiator including *Adult, Child,* or *Can't Tell* (Brown et al., 2006).

Modification. None. Codes for activity initiator remained unchanged. Definitions for activity initiator codes are available in the modified codebook (Appendix H).

Group composition.

Description. Group composition considers the number of children and adults who are in the same area or who are engaged in the same activity as the focal child. Note that this variable includes interaction with the focal child or proximity (within five feet) to the focal child. In other words, group composition is not dependent on explicit social interaction or engagement with the same materials as the focal child (OSRAC-P, 2012, p. 32). The codes for this variable include *Solitary Activity, 1-1 Peer, 1-1 Adult, Group-Adult, Group Without Adult*, and *Can't Tell* (Brown et al., 2006).

Modification. None. Codes for group composition remained unchanged. Definitions for group composition codes are available in the modified code book (Appendix H).

Activity Prompts.

Description. Activity prompts are behaviours that have potential to change a child's response. These behaviours are "explicit and observable" (OSRAC-P, 2012, p. 35.) They can be "verbal, physical, or modeled prompts from other children or instructors". (OSRAC-P, 2012, p. 35). The codes for this variable include *No Prompt, Teacher Prompt Increase, Teacher Prompt Decrease, Peer Prompts Increase*, and *Peer Prompts Decrease* (Brown et al., 2006).

Modification. None. Codes for activity prompts remained unchanged. Definitions for activity prompt codes are available in the modified code book (Appendix H).

3.7.3 Additional variable: social play behaviours. An additional category was developed for social context in order to address the research questions of the overarching Love to Play study (see Appendix J). Codes for social play behaviours were adapted from social behaviours described in the Play Observation Scale (Parten, 1932; Rubin, 2001) and the Social

Play Continuum (Broadhead, 2003). Both of these tools allow for the observation of social behaviour in free play (Broadhead, 2003; Rubin, 2001). Codes used included *Active Conversation with Peer(s), Active Conversation with Teacher(s), Aggression, Associative Play, Cooperative Play, Imitation, Onlooker Behaviour, Parallel, Unoccupied Behaviour, Solitary, and Can't Tell*. These codes and definitions were added to the OSRAC-P variables in the code guide (see Appendix H).

3.7.4 Coder training. Training occurred from May through June 2015 and was guided by the OSRAC-P Training Manual (OSRAC-P, 2012). Two primary coders were trained by a third member of the research team. Training started with a detailed review of the training manual including codes and definitions. The research team then collaboratively coded a number of short excerpts from sample videos drawn from those that had been eliminated from the video selection. During sessions of team coding, discrepancies in coding were reviewed and discussed by the research team until clarified. Following this, the two primary coders then practiced independently using excerpts from the same sample videos from each of the participating sites. Again, discrepancies in coding were reviewed, discussed, and clarified by the research team. In accordance with the OSRAC-P training manual, inter-rater reliability was calculated using practice coding (OSRAC-P, 2012). Training continued until an inter-rater reliability of >90% was achieved on sample coding.

Review and refinement of the codes and definitions was completed by the research team as part of debriefing from all training sessions. A coding guide that provided codes, item definitions, original coding rules as provided by the OSRAC-P Training Manual (OSRAC-P, 2012), and key notes and exceptions was developed by the coders in collaboration with the research team (see Appendix I).

3.7.5 Coding the focus child. Prior to data coding, each randomly selected focus child was randomly assigned to one of two primary coders (named Coder 'B' and Coder 'G'). A random number generator was used to select a number between 1 and 125. The first number generated was assigned to Coder 'B', the second number generated was assigned to Coder 'G', the third number generated was assigned to Coder 'B' the fourth number generated was assigned Coder 'G', and so on until all focus children had been assigned to either of the primary coders. To allow for the calculation of inter-rater reliability, the OSRAC-P manual recommends that 10-

16% of observations should be observed and recorded by two observers concurrently and independently (OSRAC-P, 2012). To achieve this, thirteen focal children (>10% of total number of focus children) were randomly selected for coding by both primary coders.

During coding, each randomly selected focus child was observed throughout the play environment, and across all three camera perspectives, for the duration of the video observation (approximately 30 minutes). As instructed by the OSRAC-P Training Manual (OSRAC-P, 2012), the focus child was observed for a five-second observation interval, followed by a 25 second coding interval. The highest intensity of PA observed during the entire five-second interval was recorded. The types of physical and play activities that were being performed when the highest intensity of physical activity was observed were also coded (OSRAC-P, 2012). Given the limitations of video observation, there were spaces within the play environment that were not captured on the video recording. If the child was not visible on the video recording during the five-second observation interval, the highest intensity of physical activity was not known and subsequently coded as *Can't Tell*; the physical activity and play type were also coded *Can't Tell*. For each child, the five-second observation intervals were repeated every 25 seconds for the entire recorded observation (approximately 30 minute) creating up to sixty unique observation occurrences per focus child. This process was repeated for each randomly selected focus child.

Coding was collected and stored on a database created using Access 2013. Each primary coder had a separate copy of the database to collect and store data; these databases were merged once coding was completed. It should also be noted that measures were put in place to maintain confidentiality of all study participants during data analysis. Each child observed received an anonymized, randomly assigned numerical identifier during data analysis and results from the data analysis were calculated at an aggregate or group level.

3.8 Data Analysis

A total of 125 focus children were randomly selected for coding; this produced 6,229 unique data points. Data was stored in Access 2013 during coding and then exported to an Excel 2010 worksheet. Once in Excel, data points coded as *Can't Tell* for PA level and type and for play activity were removed; a total of 1,495 unique data points were removed. It was noted at this time that there were codes that had not been observed during coding. These included *Swing* and *Other* for Type of PA and *Group Time*, *Sensory Space*, *Snacks* and *Screen* for Play Activity.

Data was then imported to IBM SPSS Statistics 24 for analysis. It should be noted that data was collected and analyzed on password-protected desktops and raw data was only shared with members of the research team that had a direct responsibility for data analysis.

Kappa coefficients were calculated to compare coding scores for inter-rater reliability on each variable. Table 3.4 presents the inter-rater reliability that was achieved for each variable during coding.

Table 3.4

Inter-rater Reliability for Each Variable

Variable	**Kappa Score (Approximate Significance)**
Type of PA	0.919 (.000)
Level of PA	0.871 (.000)
Physical Location	0.990 (.000)
Play Activity	0.913 (.000)
Initiator of Activity	0.962 (.000)
Group Composition	0.847 (.000)
Play Activity Prompt	0.953 (.000)
Social Participation	0.849 (.000)

Agreement levels are considered almost perfect if they meet or exceed 81% (McHugh, 2012). The inter-rater reliability of this research exceeds 80%, and sometimes exceeds 90%, indicating very good agreement between the primary coders.

Descriptive statistics were then applied to the data collected. The primary analysis of this research includes data from the Level of PA, Type of PA, and Play Activity. These variables were discrete and the data collected was nominal. Given the nominal dataset, all three research questions were addressed using frequency distributions and Pearson Chi-square statistics. Frequency distributions were used to organize and illustrate the level of PA, type of PA, and play activity at each preschool site. Pearson Chi-square tests were calculated for each research question to determine if there was a relationship between variables of interest and preschool location. An alpha level of .05 was used for all Pearson Chi-square testing. For each research question, Chi-square statistics were completed comparing (a) all three sites together and (b) between each site.

Chi-square tests are limited as they do not provide information about the strength of a relationship. As a result, for all three research questions, associative measures, including Cramer's V and Phi coefficient, were used to report the effect size. Cramer's V was reported when the independent and/or the dependent variables had more than two categories. The calculations of Cramer's V completed as part of this research had one or two degrees of freedom. Effect measures were interpreted using Cohen's rules (1988); namely,

- Degree of Freedom = 1 then 0.10 = small effect; 0.30 = medium effect; and 0.50 = large effect
- Degree of Freedom = 2 then 0.07 = small effect; 0.21 = medium effect; and 0.35 = large effect.

The Phi coefficient was reported as the associative measure for binary variables (Gravetter & Wallnau, 2009). Effect sizes for Phi coefficient were reported as small (0.1), medium (0.3), or strong (0.5) (Cohen, 1988).

Following this data analysis, additional analysis was done to understand the initial results. The context specific variables coded as part of the modified OSRAC-P, including Initiator of the Activity; Group Composition; Play Activity Prompt; and Social Participation were analyzed. This analysis included the frequency distributions of each variable and a calculation of the Pearson Chi-square tests to determine if there was an association between context specific variables and PA. As with the initial analysis, an alpha level of 0.05 was used, Cramer's V or the Phi coefficient were reported as the associative measures when appropriate, and effect sizes were reported as noted above.

Chapter 4 – Results

4.1 Level of Physical Activity

4.1.1 Research Question. How physically active are preschool children during designated free play time in indoor play spaces at their preschool?

For data analysis, OSRAC-P codes for Intensity of PA, including *Stationary/Motionless*, *Stationary with Limb and/or Trunk Movement*, *Slow-Easy Activity*, *Moderate Intensity*, and *Vigorous Intensity*, were combined to reflect classification in the literature (ParticipACTION, 2016). Specifically, (a) codes for *Stationary* and *Limbs* were combined and relabeled as *Sedentary*, (b) *Slow and Easy* was relabeled as *Light PA*, and (c) *Moderate* and *Fast* were combined and relabeled as *MVPA*.

As per the literature, sedentary activities are those which require very little energy expenditure and typically incorporates activities that require stationary standing, sitting, or lying down; examples include watching TV or riding in a car (Norton, Norton, & Sadgrove, 2010). Light intensity PA is characterized as "…aerobic activity that does not cause a noticeable change in breathing rate…at an intensity that could be maintained for at least 60 minutes" (Norton et al., 2010, p. 496); examples include walking at a relaxed pace. Finally, MVPA is aerobic activity that "…makes you breath harder or puff and pant" (Norton et al., 2010, p. 500), at an intensity that may be sustained for 30-60 minutes or less; e.g., via swimming, jogging, cycling (Norton et al., 2010).

4.1.2 Frequency. Figure 4.1 provides the frequency of each level of PA observed at each preschool site. Frequency denotes the number of times the focus child(ren) were observed demonstrating the level of PA; i.e., counts observed.

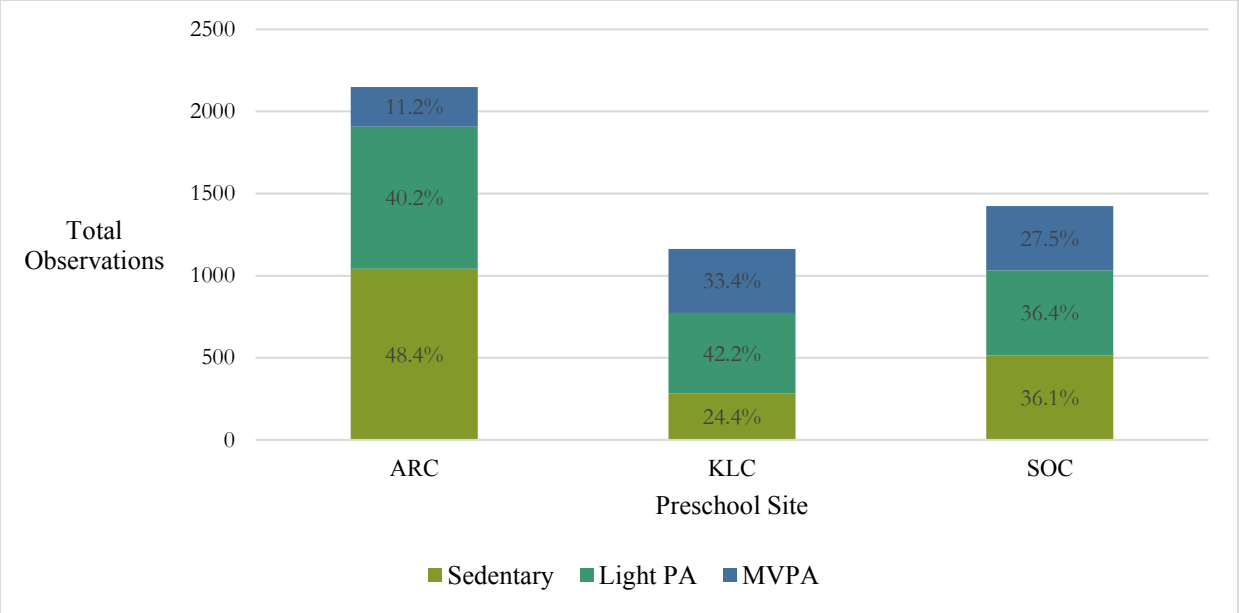

Figure 4.1: Frequency of Level of PA at each Site

When evaluating the combined data from all three preschool sites, children participating in this project (n = 125) were generally sedentary during indoor free play (1839 occurrences, 39% of the total observations from all sites combined). Alternatively MVPA was only observed during 22% of the total observations (1020 occurrences from all sites combined).

Considering data from each site, preschool children in ARC were the most sedentary (1042 occurrences, 49% of the total observations) with the fewest occurrences of MVPA (241 occurrences, 11% of the total observations). In comparison, children at SOC engaged in more MVPA (391 occurrences, 28% of the total observations), but sedentary activity was still observed at a higher frequency (514 occurrences, 36% of the total observations). Finally, children at KLC participated in the most MVPA (388 occurrences, 33% of total observations) and the least sedentary activity (283 occurrences, 24% of total observations). At KLC, MVPA occurred at a higher frequency than sedentary activities. While 33% is not a majority of observation intervals, this finding suggests that KLC's indoor play environment promotes MVPA over sedentary activities.

4.1.3 Pearson Chi-square. A Pearson Chi-square test was performed to test the null hypothesis of no association between preschool location and level of PA.

Comparison of all three sites. A significant relationship was found, χ^2 (8, N = 4734) = 328.327, p<0.000. The effect size for this finding, Cramer's V, was small, 0.186.

ARC compared to KLC. A significant relationship was found $\chi 2$ (2, N = 3331) = 305.71, p<0.000. The effect size for this finding, Cramer's V was medium, 0.304.

ARC compared to SOC. A significant relationship was found $\chi 2$ (2, N = 3572) = 161.38, p<0.000.The effect size for this finding, Cramer's V was small, 0.213.

KLC compared to SOC. A significant relationship was found, $\chi 2$ (4, N = 2585) = 41.760, p<0.000. The effect size for this finding, Cramer's V, was small, 0.127.

Null hypothesis rejected. A significant relationship was found in all calculations; suggesting that the null hypothesis is rejected. Preschool location influences the level of PA.

The most significant effect size was identified between ARC and KLC. A medium effect size suggests that the differences between sites are tangible and may be seen without careful study (Walker, 2007); in other words, an individual watching children play at both of these sites may be able to note differences in the PA among children without careful study.

4.2 Play Activity

4.2.1 Research Question. What types of play activities promote the highest and lowest levels of PA among preschool children during designated free play time in indoor play spaces at their preschool?

4.2.2 Frequency. Figure 4.2 illustrates the frequency of play activities at each site. A Pearson Chi-square test was calculated on this data to determine if there was an association between play activity and preschool site.

Following this, a cross tabulation of play activity and level of PA was analyzed for each site to determine the play activities that resulted in the highest and lowest levels of PA. This data is presented per site in Tables 4.1a (ARC), 4.1b (KLC), and 4.1c (SOC). Again, a Pearson Chi-square test was calculated to determine if there was an association between active play specifically and preschool location.

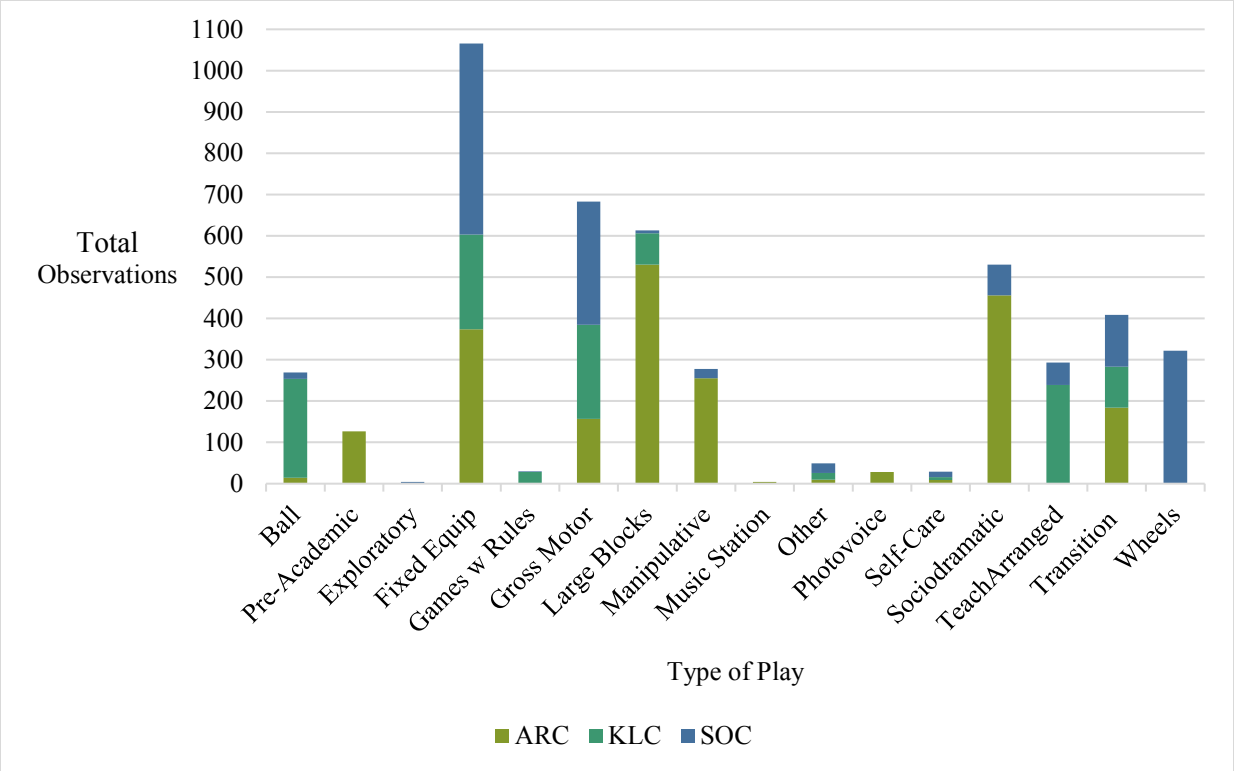

***Figure 4.2*:** Frequency of Play Types at Each Site

ARC had the most types of play activity observed (14/16 codes observed). The most frequent types of play at ARC included *Large Blocks* (530 occurrences, 25% of total observations), *Sociodramatic* (456 occurrences, 21% of total observations), and *Fixed Equipment* (374 occurrences, 16% of total observations). These three play activities account for 63% of total play activity recorded during observation at this site. Play activities that were not observed included *Games with Rules* and T*eacher Arranged*. *Wheels* was also not observed, however, it should be noted that riding toys with wheels were not available in the ARC indoor play space.

At KLC the most frequent types of play included *Ball* (240 occurrences, 21% of total observations), T*eacher Arranged* (239 occurrences, 21% of total observations), and *Fixed Equipment* (229 occurrences, 20% of total observations). These three activities account for 62% of the total play activity recorded during observation at this site. The play activities at KLC were the least diverse with a total of only nine play activities observed and coded. Play activities that were not observed included *Book/Pre-academic, Exploratory Play, Manipulative, Music, Photovoice, Sociodramatic*, and *Wheels*. It should be noted that, with the exception of

exploratory play, opportunities for the play activities not observed were not available in the KLC indoor play space.

Finally, the most frequent types of play at SOC included *Fixed Equipment* (463 occurrences, 33% of total observations), *Wheels* (322 occurrences, 23% of total observations), and *Gross Motor* (298 occurrences, 21% of total observations). Together these three activities account for 76% of the total play activity recorded during observation at this site. Play activities not observed at SOC included *Book/Pre-academic, Music*, and *Photovoice*. Again, opportunities for these play activities were not available in the SOC indoor play space.

It is interesting to note the lack of variety in play activity among the preschool children at all sites. There are sixteen possible codes for play activity, however, much of the observation is centered on three types of play. Even at ARC, which provided the greatest number of play types, 63% of the play focused on three types of play. This pattern was most evident at SOC where 76% of play was associated with three types of play activity.

4.2.3 Pearson Chi-square. The Pearson Chi-square test was performed to test the null hypothesis of no association between preschool location and type of play activity. Chi square calculations require that the expected frequency in each cell must be greater than five. In order to accommodate this rule of analysis, play activities were combined into two categories: Active Play and Other Play. Active Play included activities that were gross motor in nature, specifically including *Ball, Gross Motor,* and *Wheels*. All other play activities were categorized as *Other Play*. This was completed for all three sites.

Comparison of all three sites. A significant relationship was found, $\chi 2$ (2, N = 4734) = 725.00, $p<0.000$. The effect size of this finding, Cramer's V, was medium, 0.391.

ARC compared to KLC. A significant relationship was found, $\chi 2$ (1, N = 3311) = 505.78, $p<0.000$. The effect size of this finding, Phi coefficient, was medium, 0.391.

ARC compared to SOC. A significant relationship was found $\chi 2$ (1, N = 3572) = 658.74, $p<0.000$. The effect size of this finding, Phi coefficient, was medium, 0.429.

KLC compared to SOC. A significant relationship was not found, $\chi 2$ (1, N = 2858) = 4.945, $p<0.26$. The difference in play activity between KLC and SOC was not significantly different; in other words, differences between these two sites are negligible and can be explained by chance.

Rejection of the null hypothesis. Significant relationships were found for Chi-square calculations when comparing all three sites and when comparing ARC to both KLC and SOC. In these comparisons the null hypothesis was rejected. Preschool location, ARC verses both KLC and SOC, will impact active play. The medium effect size in both of these comparisons suggests that the difference in active play may be perceived without careful assessment; children are noticeably engaging in more active play opportunities at both KLC and SOC when compared to ARC. Note, the difference in active play between KLC and SOC was not significant; the null hypothesis is maintained. Differences between these locations is negligible and due to chance.

4.2.4 Play Types that Promoted Highest/Lowest Intensity of PA.

The intensity of PA that was achieved during specific play activities was considered at each site. This data is presented for each site: Table 4.1a provides data from ARC; Table 4.1b provides data from KLC; and Table 4.1c provides data from SOC.

Table 4.1a

Frequency of Types of Play at Each Level of PA Observed at ARC

		Level of Physical Activity		
		MVPA n (%) Observations	**Light PA** n (%) Observations	**Sedentary** n (%) Observations
Play Activity	Ball	4 (1.7)	10 (1.2)	-
	Pre-Academic	1 (0.4)	4 (0.5)	122 (11.7)
	Exploratory	- *	-	1 (0.1)
	Fixed Equip	65 (27.0)	155(17.9)	154 (14.8)
	Gross Motor	59 (24.5)	69 (8.0)	29 (2.8)
	Large Blocks	49 (20.3)	274 (31.6)	207 (19.9)
	Manipulative	6 (2.5)	50 (5.8)	199 (19.1)
	Music Station	2 (0.8)	2 (0.2)	-
	Other	-	2 (0.2)	8 (0.8)
	Photovoice	-	3 (0.3)	25 (2.4)
	Self-Care	-	-	9 (0.9)
	Sociodramatic	21 (8.7)	157 (18.1)	278 (26.7)
	Transition	34 (14.1)	140 (16.2)	10 (1.0)
	TOTAL	241 (11.2)	866 (40.3)	1042 (48.5)

* Note, - indicates that the play activity was not observed.

At ARC, *Fixed Equipment* (27%) and *Gross Motor* (25%) generated the highest frequency of MVPA. Alternatively, *Sociodramatic* (27%) and *Large Blocks* (20%) generated the highest frequency of sedentary activity.

Table 4.1b

Frequency of Types of Play at Each Level of PA Observed at KLC

		Level of Physical Activity		
		MVPA n (%) Observations	**Light PA** n (%) Observations	**Sedentary** n (%) Observations
Play Activity	Ball	82 (21.1)	109 (22.2)	49 (17.3)
	Fixed Equip	47 (12.1)	100 (20.4)	82 (29.0)
	Games w Rules	6 (1.5)	9 (1.8)	13 (4.6)
	Gross Motor	128 (33.0)	77 (15.7)	23 (8.1)
	Large Blocks	12 (3.1)	42 (8.6)	22 (7.8)
	Other	8 (2.1)	3 (0.6)	5 (1.8)
	Self-Care	-	1 (0.2)	6 (2.1)
	Teacher Arranged	79 (20.4)	80 (16.3)	80 (28.3)
	Transition	26 (6.7)	70 (14.3)	3 (1.1)
	TOTAL	388 (33.4)	491 (42.3)	283 (24.4)

At KLC, *Gross Motor* (33%) and B*all* (21%) generated the highest frequency of MVPA; *Teacher Arranged* was a close third at 20% of the total observation intervals. Conversely*, Fixed Equipment* (29%) and *Teacher Arranged* (28%) generated the highest frequency of sedentary activity during designated free play time at this site.

Teacher Arranged was observed with relatively high frequency for all levels of PA. This finding can be explained by having observed the nature of the specific activities that were arranged by the teacher. In one circumstance, the teacher initiated a game of tag with the entire preschool class. As part of the game, any child that was 'tagged' had to sit on the sidelines until all children were tagged and the round finished. While this *Teacher Arranged* activity generated bursts of high intensity MVPA, the only child that was maintaining consistent high levels of activity during this game was the child that was selected to be 'it' and, once tagged, children were sedentary as they waited for the round to conclude.

In another example, children were asked to sit with their eyes closed while the teachers hid balls throughout the room; children were then invited to run and find the balls. During this activity, children were sedentary (a) while the rules of the game were explained to them, (b)

while waiting for the balls to be hid, and (c) on the first couple of rounds of this game children were asked to sit once they found a ball in order to allow every child the opportunity to find a ball. Again, this activity generated bursts of high intensity activity, interspersed between prolonged periods of sedentary activity.

Table 4.1c

Frequency of Types of Play at Each Level of PA Observed at SOC

		Level of Physical Activity		
		MVPA n (%) Observations	**Light PA** n (%) Observations	**Sedentary** n (%) Observations
Play Activity	Ball	7 (1.8)	7 (1.4)	1 (0.2)
	Exploratory	-	1 (0.2)	2 (0.4)
	Fixed Equip	69 (17.6)	162 (31.3)	232 (45.1)
	Games w Rules	-	1 (0.2)	1 (0.2)
	Gross Motor	145 (37.1)	96 (18.5)	57 (11.1)
	Large Blocks	1 (0.2)	5 (1.0)	1 (0.2)
	Manipulative	-	3 (0.6)	20 (3.9)
	Other	3 (0.6)	8 (1.5)	12 (2.3)
	Self-Care	-	3 (0.6)	10 (1.9)
	Sociodramatic	2 (0.5)	17 (3.3)	55 (10.7)
	Teacher Arranged	14 (3.6)	14 (2.7)	26 (5.1)
	Transition	40 (10.2)	80 (15.4)	6 (1.2)
	Wheels	110 (28.1)	121 (23.4)	91 (17.7)
	TOTAL	391 (27.5)	518 (36.4)	514 (36.1)

Finally, at SOC *Gross Motor* (37%) and *Wheels* (28%) generated the highest frequency of MVPA. On the other hand, *Fixed Equipment* (45%) and *Wheels* (17%) were most frequently observed during sedentary activity.

Wheels was interestingly observed with high frequency during both MVPA and sedentary activity. Again, this can be explained by specifics provided through observation. Namely, the

code *Wheels* does not require the focus child to be pedaling the wheeled toy; the focus child could be sitting or being pulled on the riding toy. This result suggests that children at SOC were frequently using the riding toy in a sedentary manner. In other words, the availability of wheeled toys themselves do not promote increased PA.

Finally, considering the sites in combination, it is interesting to note that fixed equipment promoted the highest frequency of MVPA at ARC, but was associated with the highest frequency of sedentary activity at both KLC and SOC. Unfortunately, the code *Fixed Equipment* does not provide detail about the unique characteristics of the fixed equipment available and used by preschool children in the indoor play space. This makes it difficult to determine what specific features of the fixed equipment might promote or inhibit increased PA based on this coding alone.

Pearson Chi-square. The Pearson Chi-square test was calculated to determine if there was a connection between play type and level of activity. In order to meet the rule of expected frequency greater than five, the categories of Active and Other play (as described in Section 4.2.3) were used. This calculation was completed for all three sites combined and for each site independently.

Comparison of all three sites. A significant relationship was found, $\chi 2$ (2, N = 2858) = 176.707, $p<0.000$. The effect size of this association, Cramer's V was small, 0.261.

ARC. A significant relationship was found, $\chi 2$ (2, N = 2149) = 148.50, $p<0.000$. The effect size of this association, Cramer's V, was small, 0.263.

KLC. A significant relationship was found, $\chi 2$ (2, N = 1162) = 57.991, $p<0.000$. The effect size of this association, Cramer's V, was small, 0.223.

SOC. A significant relationship was found, $\chi 2$ (2, N = 1423) = 130.53, $p<0.000$. The effect size of this association, Cramer's V, was medium, 0.303.

Rejection of the null hypothesis. A significant relationship was found for all Chi-square calculations between level of PA and play type. In all cases, the null hypothesis was rejected and it was determined that the type of PA is impacted by the type of play activity selected by the preschool children; intensity or level of PA will depend on if the preschool children are engaging in active versus other play types.

4.3 Type of Physical Activity

4.3.1 Research question. What types of PA do preschool children engage in during designated free play time in indoor play spaces at their preschool?

4.3.2 Frequency. Figure 4.3 illustrates the frequency of PA type for each preschool location.

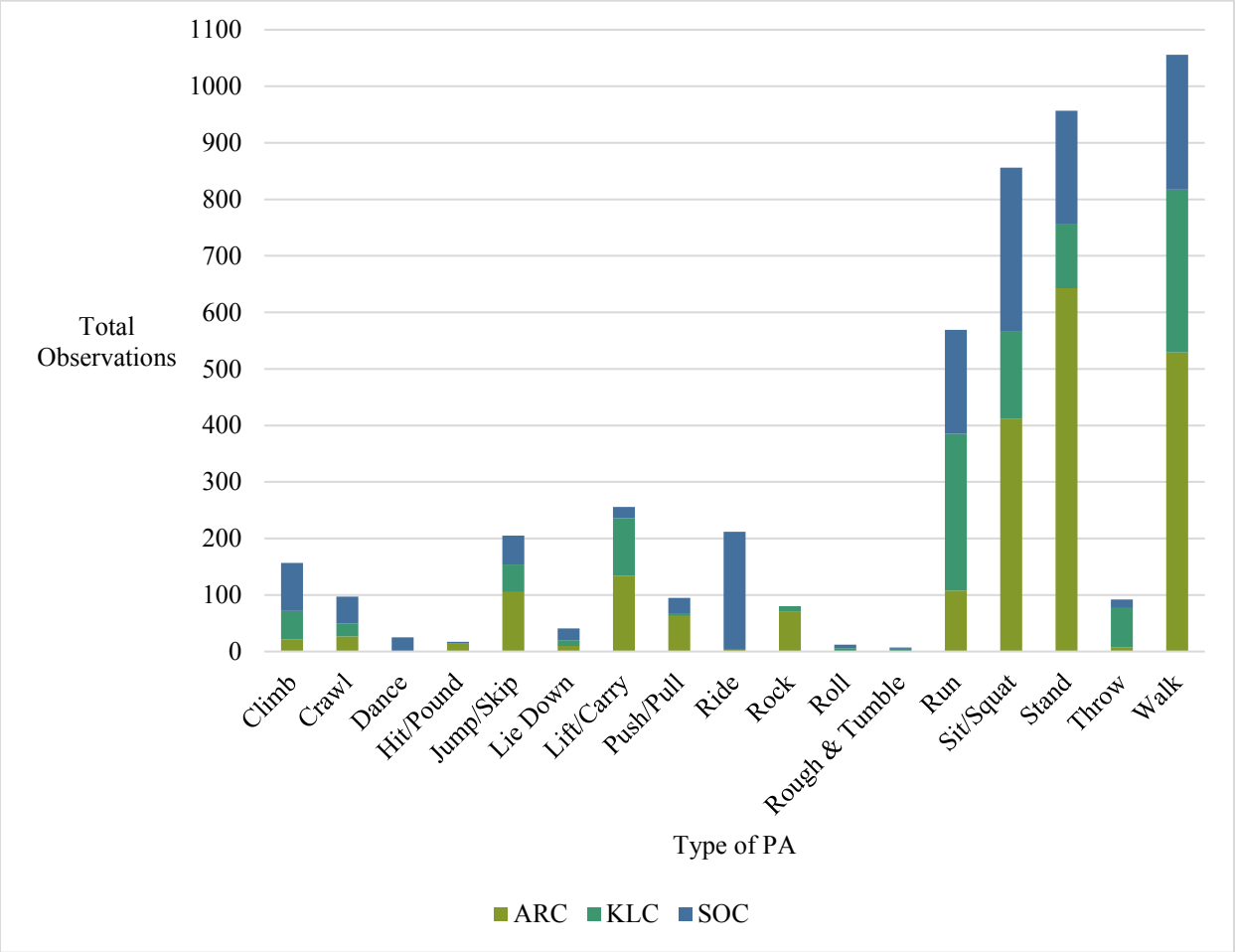

***Figure 4.3*:** Frequency of Types of PA at Each Site

The most frequent types of PA at ARC included *Stand* (643 occurrences, 30% of total observation intervals), *Walk* (529 occurrences, 25% of total observations), and *Sit/Squat* (412 occurrences, 19% of total observation intervals). These three activities account for 74% of total observation intervals. Types of PA that were not observed at ARC included *Dance* and *Rough & Tumble*.

At KLC, the most frequent types of PA included *Walk* (288 occurrences, 25% of total observations), *Run* (277 occurrences, 24% of total observations), and *Sit/Squat* (154 occurrences, 13% of total observations). These three activities account for 62% of the total observation intervals. Types of PA that were not observed at KLC included *Dance, Hit/Pound*, and *Ride*.

Finally, the most frequent types of PA at SOC included *Sit/Squat* (290 occurrences, 20% of total observations), *Walk* (239 occurrences, 17% of total observations), and *Ride* (209 occurrences, 15% of total observations). Together these three activities account for 52% of the total observation intervals. Types of PA that were not observed at SOC included *Rock*.

When considering the types of PA observed from all three sites, *Walk* and *Sit/Squat* were among the top three most common at all three sites (ARC: *Walk* = 529 occurrences, 25% of total observations and *Sit/Squat* = 412 occurrences, 19% of total observations; SOC: *Walk* = 239 occurrences, 17% of total observations and *Sit/Squat* = 290 occurrences, 20% of total observations; KLC: *Walk* = 288 occurrences, 25% of total observations and *Sit/Squat* = 154 occurrences, 13% of total observations). It is interesting to note that the percentage of total observations for these activities are not that different between sites; particularly between ARC and KLC where the variation between sedentary activity and MVPA is most discrepant. The other most commonly observed type of PA at ARC was *Stand* (643 occurrences, 30% of the total observations). Conversely, at the comparison sites, activities that were more gross motor in nature were included among the top three, including *Ride* (209 occurrences, 15% of total observations) at SOC and *Run* (277 occurrences, 24% of the total observations) at KLC.

It is also interesting to note, that in spite of a broad range of PA types (seventeen possible codes for type of PA), the majority of observation at each site is centered on a few PA types. At both ARC and KLC the majority of the total observations come from three types of PA (74% at ARC and 62% of KLC). At SOC, 51% of the total observations are associated with three types of PA; this increases to 64% when the fourth highest observed type of PA, *Stand*, is included. This lack of variety was also noted in the frequency of play activity (Section 4.2.2).

4.3.3 Pearson Chi-square. The Pearson Chi-square test was performed to test the null hypothesis of no association between preschool location and type of PA. Again, Chi-square calculations require that the expected frequency value for each cell must be greater than five. In order to accommodate this rule of analysis, the codes that had an expected frequency of less than

five, including *Hit/Pound, Roll* and *Rough & Tumble*, were combined to from an *Other* category; this combination of codes was done for each of the three sites.

Comparing all three sites. A significant relationship was found, $\chi 2$ (28, N = 4734) = 1383.71, p<0.000. This effect size for this finding, Cramer's V, was strong, 0.382.

ARC compared to KLC. A significant relationship was found, $\chi 2$ (13, N = 3311) = 580.92, p<0.000. This effect size for this finding, Cramer's V, was medium, 0.419.

ARC compared to SOC. A significant relationship was found, $\chi 2$ (14, N = 3572) = 731.86, p<0.000. This effect size for this finding, Cramer's V, was medium, 0.453.

KLC compared to SOC. A significant relationship was found, $\chi 2$ (14, N = 2585) = 436.123, p<0.000. The effect size of this finding, Cramer's V, medium, 0.411.

Null hypothesis rejected. A significant relationship was found for all Chi-square calculations between preschool location and type of PA. In all cases, the null hypothesis was rejected and it was determined that the specific preschool attended will impact the type of PA that children engage in. Again, the medium and strong effect sizes suggest that the types of PA selected by the preschool children may be noticeably different without careful observation.

4.4 Contextualization of Play

In order to better understand the findings from the primary analysis, the modified OSRAC-P variables considering context were analyzed. The analyses considered frequency distributions for the context specific variables, including: Initiator of the Activity; Group Composition; Play Activity Prompt; and Social Participation. In addition, Pearson Chi-square tests were calculated to determine if there was an association between each additional variable and the level of PA observed; i.e., did these measures of context affect the level of PA? The Chi-square calculations were completed for all sites combined and for each site individually.

4.4.1 Initiator of the activity.

Frequency. This variable provides information about who started the activity in which the focus child is engaged. The activity can be initiated by the teacher, who instructs or suggests engagement in a certain activity, or by a child, either the focus child or a peer (OSRAC-P, 2012, p. 31). Table 4.2 provides the frequency of activity initiator, by type, for each site.

Table 4.2

Frequency of Activity Initiator, by Type, Observed at Each Site

		ARC n (%) Observations	**KLC** n (%) Observations	**SOC** n (%) Observations
Initiator	Child	2082 (96.9)	840 (72.3)	1357 (95.4)
	Adult	66 (3.1)	320 (27.5)	66 (4.6)
	Can't Tell	1 (0.0)	2 (0.2)	- *
	TOTAL	2149 (100.0)	1162 (100.0)	1423 (100.00)

* Note, - indicates that Can't Tell was not observed/recorded

Children were the most predominant initiators of activity at all three sites (ARC = 96%, KLC = 72%, SOC = 95%), consistent with the child-led attribute of free play. At KLC, however, adult initiation of activity was observed more frequently, with teachers initiating activity 28% of the time (n = 320 occurrences) as opposed to ARC (3% of total observations, n = 66 occurrences) and SOC (5% of total observations, n = 66 occurrences).

Pearson Chi-square test. Pearson Chi-square tests were calculated to determine if there was an association between initiator of the activity and the level of PA. All cases coded as *Can't Tell* were removed (n=3). The Chi-square statistics were calculated for all three sites combined and for each site independently.

Including all three sites. A significant relationship was found, $\chi 2$ (2, N = 4731) = 12.296, p<0.002. The effect size of this association, Cramer's V, was negligible, 0.051.

ARC. No significant relationship was found, $\chi 2$ (2, N = 2148) = 1.202, p<0.548.

KLC. No significant relationship was found, $\chi 2$ (2, N = 1160) = 7.866, p<0.20.

SOC. No significant relationship was found, $\chi 2$ (2, N = 1423) = 1.19, p<0.552.

Reject the null hypothesis. A significant relationship was found for the Chi-square calculation when data from all three sites were included. In this case the null hypothesis is rejected, however the effect size is negligible suggesting that a significant relationship was detected only because of the large sample size included in this work. This position is supported by the site specific calculations which failed to demonstrate a significant association. In this case, the null would have to be accepted. There is no association between initiator of activity and PA at each of the individual sites.

4.4.2 Group composition.

Frequency. This variable defines the number of individuals, including adults and children that are in same area as the focus child. These individuals do not have to be engaged in the same activity as the focus child; they may just be in close proximity as the focus child. As a result, this variable is not a measure of social interaction (OSRAC-P, 2012, p. 32). Table 4.3 provides the frequency of group composition for each site.

Table 4.3

Frequency of Group Composition Observed at Each Site

		ARC n (%) Observations	**KLC** n (%) Observations	**SOC** n (%) Observations
Group Composition	Solitary	315 (14.7)	197 (17.0)	290 (20.4)
	1-1 Adult	26 (1.2)	28 (2.4)	22 (1.5)
	1-1 Peer	312 (14.5)	82 (7.1)	252 (17.7)
	Group Adult	463 (21.5)	369 (31.8)	187 (13.1)
	Group Child	1025 (47.7)	483 (41.6)	668 (46.9)
	Can't Tell	8 (0.4)	3 (0.3)	4 (0.3)
	TOTAL	2149 (100.0)	1162 (100.0)	1423 (100.0)

Group-Child, with no adult present, was the most common group composition observed at all three sites (ARC = 1025 occurrences, 48% of total observations, KLC = 483 occurrences, 42% of total observations, SOC = 668 occurrences, 47% of total observations). *Group-Adult* was the second most common group composition at both ARC and KLC (463 occurrences, 22% of total observations and 369 occurrences, 32% of total observations respectively). *Solitary* was the second most common group composition at SOC (290 occurrences, 20% of total observations). Conversely, 1-1 Adult, or focus child with one adult, was the least common for all three sites (ARC = 26 occurrences, 1% of total observations; KLC = 28 occurrences, 2% of total observations; SOC = 22 occurrences, 2% of total observations). This would be in line with the free play philosophy adopted by these preschool sites.

Pearson Chi-square test. Pearson Chi-square tests were calculated to determine if there was an association between group composition and the level of PA. Cases that were coded as *Can't Tell* were removed (n=15).

Comparing all three sites. A significant relationship between group composition and level of PA was found, $\chi 2$ (8, n = 4719) = 38.60, p<0.000. The effect size of this association, Cramer's V, was negligible, 0.064.

ARC. A significant relationship was found, $\chi 2$ (8, N = 2149) = 48.199, p<0.000. The effect size of this association, Cramer's V, was small, 0.106.

KLC. A significant relationship was found, $\chi 2$ (8, N = 1159) = 35.57, p<0.000. The effect size of this association, Cramer's V, was small, 0.119.

SOC. A significant relationship was found, $\chi 2$ (8, N = 1419) = 11.275, p<0.187. The effect size of this association, Cramer's V, was negligible, 0.063.

Rejection of the null hypothesis. A significant relationship was found for all Chi-square calculations between group composition and level of PA. This relationship suggests that group composition will impact level of PA. However, the small effect size at ARC and KLC suggests that the relationship between group composition and PA would only be observed through careful assessment. The negligible effect size between PA and group composition when comparing all three sites and at SOC suggests that the relationship detected may be the result of a large sample size.

4.4.3 Play activity prompt.

Frequency. This variable codes the observable behaviours aimed at increasing or decreasing the focus child's activity. This includes prompts from either teachers or peers to increase or decrease activity. Types of prompts could include verbal prompts (for example, teacher saying 'slow down'), modeled prompts (for example, a peer demonstrating how to kick the ball harder), or physical prompts (for example, a teacher placing their hands on the focus child's shoulders to discourage jumping). (OSRAC-P, 2012, p. 35). Table 4.4 provides the frequency of activity prompts at each site.

Table 4.4

Frequency of Activity Prompts, By Type, Observed at Each Site

		ARC n (%) Observations	**KLC** n (%) Observations	**SOC** n (%) Observations
Activity Prompt	None	1972 (91.8)	807 (69.4)	1309 (92.0)
	Peer Decrease	46 (2.1)	20 (1.7)	26 (1.8)
	Peer Increase	7 (0.3)	15 (1.3)	15 (1.1)
	Teacher Decrease	67 (3.1)	160 (13.8)	23 (1.6)
	Teacher Increase	49 (2.3)	157 (13.5)	46 (3.2)
	Can't Tell	8 (0.4)	3 (0.3)	4 (0.3)
	TOTAL	2149 (100.0)	1162 (100.0)	1423 (100.0)

No Prompt was predominantly observed at all three sites (ARC = 92%, KLC = 69%, SOC = 92%). When prompts were observed, they were most commonly provided from a teacher (ARC = 3% *Teacher Decrease*; KLC = 14% *Teacher Decrease*, 14% *Teacher Increase*; SOC = 3.2% *Teacher Decrease*). KLC had the most teacher prompts of observations across all three sites (217 occurrences for both *Teacher Increase* and *Teacher Decrease*).

KLC had the highest proportion of prompts (352 prompts, 30% of total observations) as compared to ARC (169 prompts, 8% of total observations) and SOC (110 prompts, 8% of total observations). Of the total prompts, the vast majority of KLC's prompts (90% or 317 of the total 352 prompts) came from teachers; in comparison, teachers were only responsible for 67% (116 of 169 total prompts) of the total prompts at ARC and 63% (69 of 110 total prompts) of the total prompts at SOC.

Pearson Chi-square test. Pearson Chi-square tests was calculated to determine if there was an association between activity prompts and the level of PA. Cases coded as *Can't Tell* were removed (n=15).

Comparing all three sites. A significant relationship was found, $\chi 2$ (8, N = 4719) = 65.717, p<0.000. The effect size of this association, Cramer's V, was small, 0.083.

ARC. A significant relationship was found, $\chi 2$ (8, N = 2141) = 36.830, p<0.000. The effect size of this association, Cramer's V, was small, 0.093.

KLC. A significant relationship was found, $\chi 2$ (8, N = 1159) = 47.483, p<0.000. The effect size of this association, Cramer's V, was small, 0.143.

SOC. A significant relationship was found, $\chi 2$ (8, N = 1419) = 22.454, p<0.004. The effect size of this association, Cramer's V, was small, 0.089.

Rejection of the null hypothesis. A significant relationship was found for all Chi-square calculations between activity prompts and level of PA. The null hypothesis is rejected in this case; activity prompts will impact the level of PA. The effect size, however, was small for all calculations, which suggests that this association would only be detected through careful observation.

4.4.4. Social participation.

***Frequency*.** This variable classifies the social interaction of the focus child. The codes and definitions were adapted from the Play Observation Scale (Rubin, 2001) and the Social Play Continuum (Broadhead, 2003). Table 4.5 provides the frequency of types of social participation at each site.

Table 4.5

Frequency of Types of Social Participation Observed at Each Site

		ARC n (%) Observations	**KLC** n (%) Observations	**SOC** n (%) Observations
Activity Initiator	Conversation Peer	22 (1.0)	18 (1.5)	41 (2.9)
	Conversation Teacher	32 (1.5)	69 (5.9)	36 (2.5)
	Aggression	12 (0.6)	11 (0.9)	6 (0.4)
	Associative	753 (35.0)	330 (28.4)	412 (29.0)
	Cooperative	3 (0.1)	201 (17.3)	7 (0.5)
	Imitation	8 (0.4)	1 (0.1)	6 (0.4)
	Onlooker	179 (8.3)	51 (4.4)	138 (9.7)
	Parallel	597 (27.8)	234 (20.1)	390 (27.4)
	Solitary	500 (23.3)	238 (20.5)	366 (25.7)
	Unoccupied	37 (1.7)	8 (0.7)	15 (1.1)
	Can't Tell	6 (0.3)	1 (0.1)	6 (0.4)
	TOTAL	2149 (100.0)	1162 (100.0)	1423 (100.0)

Associative Play was the most commonly observed social participation at all three locations (ARC = 753 occurrences, 35%, of total observations; KLC = 330 occurrences, 28% of total observations, SOC = 412 occurrences, 29% of total observations). *Parallel* and *Solitary* play were the next most commonly observed forms of social participation noted at all three sites (ARC: *Parallel* = 597 occurrences, 28% of total observations and *Solitary* = 500 occurrences, 23% of total observations; KLC = *Parallel* and *Solitary* had 234 and 238 occurrences respectively, 20% of total observations each; and SOC: *Parallel* = 390 occurrences, 27% of total observations, and *Solitary* = 366 occurrences, 26% of total observations). These three types of social participation accounted for 81% of total observations from all three sites combined.

Imitation, Onlooker, Parallel, *Solitary,* and *Unoccupied* could all be characterized as social participation that requires minimal to no social interaction. Interestingly, at ARC these four types of social interaction accounted for 61% of the total observations (1321 occurrences); in SOC, they accounted for 64% of the total observations (532 occurrences). In KLC, however, *Initiation, Onlooker, Parallel, Solitary* and *Unoccupied* were only coded for 46% of the total observations (532 occurrences). Conversely, *Cooperative* and *Associative* play could be characterized as social participation requiring a higher degree of social interaction. At KLC, these two types of social participation were coded for 45% of the total observations (531 occurrences, with 201 occurrences of *Cooperative* play). At ARC, *Associative* and *Cooperative* play combined accounted for 35% of the total observations (756 occurrences, with only 3 occurrences of *Cooperative* play), while at SOC they accounted for only 29% of the total observations (419 occurrences, with 7 occurrences of *Cooperativ*e play). These findings suggest that play at KLC was occurring at a higher level of social participation. It is also interesting to note that *Conversation with Teacher* was observed much more frequently at KLC (69 occurrences, 6% of total observations) as compared to either ARC (32 occurrences, 2% of total observations) or SOC (36 occurrences, 3% of total observations). This seems to be in line with other context related variables, including initiator of activity, group composition, and play activity prompts, which all demonstrate that teachers at KLC had a stronger presence during designated free play within the indoor play space as compared to either SOC or ARC.

Pearson Chi-square test. Pearson Chi-square tests were calculated to determine if there was an association between social participation and preschool location. Cases coded as *Can't Tell* were removed (n=13).

Comparing all three sites. A significant relationship was found, $\chi 2$ (18, N = 4721) = 718.30, $p<0.000$. The effect size of this association, Cramer's V, was medium, 0.276.

ARC compared to KLC. A significant relationship was found, $\chi 2$ (9, N = 3304) = 467.797, $p<0.000$. The effect size of this association, Cramer's V, was medium, 0.376.

ARC compared to SOC. A significant relationship was found, $\chi 2$ (9, N = 3560) = 42.118, $p<0.000$. The effect size of this association, Cramer's V, was small, 0.109.

KLC compared to SOC. A significant relationship was found, $\chi 2$ (9, N = 2578) = 300.227, $p<0.000$. The effect size of this association, Cramer's V, was medium, 0.341.

Null hypothesis rejected. A significant relationship was found for all Chi-square calculations suggesting that preschool location and social participation are associated; social participation will be influenced by the preschool attended. The medium effect size found when comparing all three sites, ARC to KLC, and KLC to SOC suggests that the differences may be noticeable through direct observation; while, the small effect size when comparing ARC to SOC suggests that these differences would only be detected through careful assessment.

4.4.5 Social participation at each level of PA. The frequencies of PA and social participation from each site were assessed to determine if specific types of social participation resulted in higher or lower levels of PA. Not surprisingly, given the high proportion of *Associative, Parallel,* and *Solitary* (81% of total observations from all three sites), these forms of social participation were the most frequently observed for all levels of PA; sedentary = A*ssociative* (35% of total observations), *Parallel* (21%), and *Solitary* (19%), light PA = *Parallel* (29%), *Associative* (28%), *Solitary* (25%), and MVPA = *Associative* (31%), *Parallel* (28%), *Solitary* (27%). Tables 4.6 provides the frequencies of social participation in each level of PA from each site.

Table 4.6

Frequency of Types of Social Participation at Each Level of PA Observed at Each Site

		Level of Physical Activity								
		Sedentary n (%) observations			**Light PA** n (%) observations			**MVPA** n (%) observations		
	SITE	**ARC**	**KLC**	**SOC**	**ARC**	**KLC**	**SOC**	**ARC**	**KLC**	**SOC**
Social Participation	Conversation with Peer(s)	19 (1.8)	9 (3.2)	28 (5.4)	3 (0.3)	8 (1.6)	9 (1.7)	-	1 (0.3)	4 (1.0)
	Conversation with Teacher(s)	24 (2.3)	57 (20.1)	24 (4.7)	7 (0.8)	8 (1.6)	10 (1.9)	1 (0.4)	4 (1.0)	2 (0.5)
	Aggression	3 (0.3)	1 (0.4)	4 (0.8)	5 (0.6)	7 (1.4)	-	4 (1.7)	3 (0.8)	2 (0.5)
	Associative Play	418 (40.1)	74 (26.1)	156 (30.4)	274 (31.6)	126 (25.7)	130 (25.1)	61 (25.3)	130 (33.5)	126 (32.2)
	Can't Tell	6 (0.6)	- *	6 (1.2)	-	-	-	-	1 (0.3)	-
	Cooperative Play	3 (0.3)	33 (11.7)	3 (0.6)	-	86 (17.5)	1 (0.2)	-	82 (21.1)	3 (0.7)
	Imitation	3 (0.3)	-	2 (0.4)	3 (0.3)	1 (0.2)	3 (0.6)	2 (0.8)	-	1 (0.2)
	Onlooker Behaviour	105 (10.1)	21 (7.4)	95 (18.5)	71 (8.2)	23 (4.7)	33 (6.4)	3 (1.2)	7 (1.8)	10 (2.6)
	Parallel	261 (25.0)	32 (11.3)	90 (17.5)	247 (28.5)	130 (26.5)	172 (33.2)	89 (36.9)	72 (18.6)	128 (32.7)
	Solitary	192 (18.4)	53 (18.7)	100 (19.5)	228 (26.3)	97 (19.8)	151 (29.2)	80 (33.2)	88 (22.7)	115 (29.4)
	Unoccupied	8 (0.8)	3 (1.1)	6 (1.2)	28 (3.2)	5 (1.0)	9 (1.7)	1 (0.4)	-	-
	TOTAL	1042 (100.0)	283 (100.0)	514 (100.0)	866 (100.0)	491 (100.0)	518 (100.0)	241 (100.0)	388 (100.0)	391 (100.0)

* Note, - indicates that social participation at that level of PA, at that site, was not observed; i.e., frequency = 0

Pearson Chi-square test. Pearson Chi-square tests were calculated to determine if there was an association between social participation and the level of PA. Cases coded as *Can't Tell* were removed (n=13). To meet the Chi-square requirement of expected frequency greater than five in each cell, the codes for social participation were combined into two groups; lower social interaction and higher social interaction. The low interaction group were the types of social participation that require minimal interaction with peers including *Imitation, Onlooker, Parallel, Solitary,* and *Unoccupied*. Alternatively the high interaction group included types of social participation that required greater interaction including *Conversation with Peer(s), Conversation with Teacher(s), Aggression, Associative Play,* and *Cooperative Play*. This combination of codes was completed for each site. Table 4.7 provides the frequency of the low and high interaction groups for each level of PA at each site.

Table 4.7

Frequency of 'High' and 'Low' Social Interaction at Each Level of PA at Each Site

		ARC n (%) observations		**KLC** n (%) observations		**SOC** n (%) observations	
Social Interaction		High	Low	High	Low	High	Low
Activity	Sedentary	467 (56.8)	569 (43.1)	174 (27.7)	256 (48.1)	215 (42.8)	293 (32.0)
	Light PA	289 (35.2)	577 (43.7)	235 (37.4)	167 (31.4)	137 (27.3)	368 (40.2)
	MVPA	66 (8.0)	175 (13.2)	220 (35.0)	109 (20.5)	150 (29.9)	254 (27.8)
	TOTAL	822 (100.0)	1321 (100.0)	629 (100.0)	532 (100.0)	502 (100.0)	915 (100.0)

<u>*Including all three sites*</u>. A significant relationship was found, $\chi 2$ (2, N = 4721) = 45.389, p<0.000. The effect size of this association, Cramer's V, was small, 0.098.

<u>*ARC*</u>. A significant relationship was found, $\chi 2$ (2, N = 2143) = 41.158, p<0.000. The effect size of this association, Cramer's V, was small, 0.139.

KLC. A significant relationship was found, $\chi 2$ (2, N = 1161) = 15.087, p<0.001. The effect size of this association, Cramer's V, was small, 0.114.

SOC. A significant relationship was found, $\chi 2$ (2, N = 1417) = 20.063, p<0.000. The effect size of this association, Cramer's V, was small, 0.119.

Null hypothesis rejected. A significant relationship was found for all Chi-square calculations suggesting that the level of social interaction is related to PA level. The effect measure was small for all calculations suggesting that these associations are subtle and would only be detected with precise observation.

4.5 Summary of Results

Preschool children observed in this study were largely sedentary during designated free play within indoor play spaces. KLC, however, provides evidence that indoor play spaces can promote increased PA.

When considering the play activity that promoted different levels of PA, there were some key examples of play that resulted in both high and low levels of PA. For example, *Wheels* at SOC and *Teacher Arranged* at KLC stimulated high frequencies of both MVPA and sedentary activity, while *Fixed equipment* stimulated a high frequency of MVPA at ARC, but sedentary activity at both KLC and SOC. Findings like this highlight the need to consider the specific characteristics of the play activity and the context in which play occurs, and to acknowledge that making various play activities available within an indoor play space does not inherently promote or inhibit PA.

It was also interesting to note the limited diversity in play and PA types. The majority of play observed focused on three types of play activity at each site, including *Large Blocks*, *Sociodramatic*, and *Fixed Equipment* at ARC; *Ball*, *Teacher Arranged*, and *Fixed Equipment* at KLC; and *Fixed Equipment*, *Wheels*, and *Gross Motor* at SOC. At the same time, the majority of observed play also focused on three types of PA at each site, including *Stand*, *Walk*, and *Sit/Squat* at ARC; *Walk*, *Run*, and *Sit/Squat* at KLC; and *Sit/Squat*, *Walk*, and *Ride* at SOC. The reason for this limited diversity in play activity and PA types is not known.

Finally, an evaluation of the context variables, including initiator of activity, group composition, and play activity prompts, suggests that the teachers at KLC played a more

significant role in designated free play within the indoor play space as compared to ARC and SOC. Chapter 5 will use Bronfenbrenner's social ecological model to consider how PA might be impacted by various influences within the indoor play setting, including the potential role for teachers in this environment.

Chapter 5 - Discussion & Conclusion

5.1 Social Ecology of Preschool Play Environments

The results of this research align with broader findings that young children are largely sedentary during indoor free play (Fees et al., 2015; Van Cauwenberghe et al., 2011). The results from KLC, however, provide evidence that indoor play environments can promote MVPA over sedentary activity. The specific influences within KLC's indoor play space may provide insights into creating indoor play environments that promote increased PA.

The analysis of data from the three participating preschool sites demonstrates the complexity of the correlates of PA within indoor play settings. Interestingly, the results of this thesis align with Bronfenbrenner's Social Ecological Theory specific to the social ecology of children. Within this model, the indoor preschool play environment serves as the immediate setting (Bronfenbrenner, 1974). As noted in Section 1.5.3 (p. 7), there are three dimensions of influence within this setting, including: (a) design of the physical space and materials; (b) people with differing roles and interactions with the child; and (c) the social meaning of the activities being performed by these people, both with each other and with the child (Bronfenbrenner, 1974). The results of this thesis suggest possible influences on PA within all three of these dimensions.

5.1.1 Design of the physical space and materials. Children in free play environment(s) are self-motivated to participate, which provides an opportunity to select sedentary activity (Burdette, Whitaker, & Daniels, 2004). The highest observed frequency of sedentary activity was at ARC, which also provided access to the greatest variety of play types. Conversely, KLC, which had the highest observed frequency of MVPA, also had the smallest selection of play types available; play types not provided at KLC were those that might inherently foster more sedentary movement, including pre-academic/book, exploratory, manipulative, and music. This aligns with the intuitive notion that indoor play settings focused specifically on active play opportunities may facilitate increased PA.

This finding is also supported by evidence demonstrating that increased access to active play opportunities will increase the amount and intensity of children's PA (Barkley, Roemmich, Ryan, Bellar, & Bliss, 2011; Feda, Lambiase, McCarthy, Barkley, & Roemmich, 2012; Sanders et al., 2016). In one study, twenty children, aged four to eight years, each participated in two free-choice activity conditions, including a 'high choice' and 'low choice' (Sanders et al., 2016). The high choice condition had access to eight different PA options including three obstacle courses made up of gymnastic/soft-play equipment, one jump rope, three athletic balls, and a set of cones. The low choice condition had access to two PA options including one obstacle course made up of gymnastic/soft-play equipment and one athletic ball. In addition to the PA options, children in both conditions had unrestricted access to sedentary activities including puzzles, board games, action figures and dolls, and colouring books and crayons. For both activity conditions, each child was given 30 minutes of solitary play in an indoor gymnasium setting during which PA was measured using accelerometers and direct observation. This study found that the high choice group demonstrated higher PA and that expanding access to active play options increased young children's PA by 20.5%.

The relationship between active play options and PA ultimately speaks to the need for intentional design to meet the objective of the play environment. ARC's Love to Play indoor play space was designed specifically to target childhood development through play-based learning (Nykiforuk & Hewes, 2014a). To achieve this objective, it is fitting that multiple play opportunities would be provided. Play spaces attempting to meet an objective of promoting increased PA, however, may need to emphasize opportunities for active play and gross motor movement to achieve this goal. Research is needed to investigate the specific active play options that will best promote PA within indoor play spaces that are intentionally providing diverse play opportunities.

Additional research is also needed to test the value of active play opportunities in promoting PA. Specifically, is this finding generalizable to other indoor play environments? Do play environments that focus on active play opportunities actually result in increased PA? What are the specific active play opportunities that will best promote and inhibit PA in indoor play spaces? Can preschool children have too many active play opportunities in a single play space?

The majority of play observed within this study was focused on a small amount of play activity and PA types at each site. It is understood that this finding may be unique to this study.

This study observed play during a very limited period, during 30 minutes of designated free play time on a single day each month, which may limit its generalizability. Additional research will be needed to assess and understand the facilitators and barriers to diversity of play; i.e., does play in indoor play spaces typically focus on a small number of play activities and PA types?

Investigation is needed to understand the relationship between the availability of play options and the preferences of preschool children. Specifically, research is needed to understand how physical environments influence children's preferences during free play and how this ultimately impacts PA. For example, what types of play activities do children prefer in indoor play settings? How does the physical environment influence these preferences? Does the quantity and variety of play opportunities within indoor play spaces change these preferences? How do these preferences impact PA? Research is needed to understand if there are generalizable patterns between preferences within indoor play spaces and PA. This research also needs to extend beyond the physical environment to consider how social features of the indoor play space may also impact child preferences, the overall diversity of children's play activity, and the impact of this on PA.

The results of this project provide insight into one possible influence within the physical space, i.e., opportunities for active play. The impact of the physical space and materials on PA needs further investigation. There are many broad questions that can direct this research. What characteristics of the physical indoor play environment influence PA? What play activities and equipment within the indoor play setting promote high levels of PA? What activities and equipment inhibit PA? How does social context (including interactions and social meaning of activity) influence these physical characteristics?

5.1.2 People with differing roles and interactions with the child. KLC, which had the highest observed frequency of MVPA, also had the most teacher involvement during play. Teachers were observed both initiating and prompting activity. This supports existing evidence that links teacher facilitation to increased PA during play (Gubbels, 2014; Larson, Normand, Morley, & Miller, 2013; Van Zandvoort et al., 2010).

This facilitation can be defined as guided play, where children engage in spontaneous activities under the subtle direction of adults (Hirsh-Pasek & Golinkoff, 2008). The benefits of guided play have been evaluated in a number of development domains including self-regulation

and meta-cognition (Robson, 2016), language development (Weisberg, Zosh, Hirsh-Pasek, & Golinkoff, 2013), attention (Gardner-Neblett et al., 2016) and motor skill development (Palma, Pereira, & Valentini, 2014). It is thought that guided play helps children develop proactive control, or neural mechanisms that allow the brain to use clues from the environment to determine what might happen next (Weisberg, Hirsh-Pasek, Golinkoff, & McCandliss, 2014). This readiness to anticipate events provides the child with freedom to explore at will (Weisberg et al., 2014).

Guided play can be seen as a middle ground between structured activity and free play (Weisberg, Zosh et al., 2013); it allows for both a specific goal, for example increased PA, while allowing children to maintain a large degree of autonomy (Weisberg, Hirsh-Pasek, Golinkoff, 2013). Ultimately, guided play is intended to retain the child-directed elements of free play, but adds focus on a specific goal through light adult scaffolding (Weisberg, Hirsh-Pasek, Golinkoff, Kittredge, & Klahr, 2016), which is characterized as adequate support at the right time to allow children to develop new or refined skills (Wood, Bruner, & Ross, 1976). It is thought that "(guided play) offers an opportunity for exploration in a context specifically designed to foster a…goal. As such, it features two crucial elements: child agency…and gentle adult guidance to ensure that the child progresses toward the…goal" (Hassinger-Das, Hirsh-Pasek, & Golinkoff, 2017, p. 47).

In line with the Social Ecological Model, Hirsh-Pasek et al. (2015) suggests that guided play creates an active, meaningful, and socially interactive learning context. In this environment, it is theorized that the teacher is providing feedback in response to child-directed play; the child incorporates this feedback while continuing to experience the play environment, which in turn has the potential to evolve the play activity and subsequent teacher feedback. It is posited that this provides an opportunity for immediate and meaningful adult feedback that may enable children to participate in extended playful experimentation (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011; Hassinger-Das et al., 2017).

The results presented in this thesis suggest that teacher facilitation through guided play may increase PA during free play within indoor play environments. As a result, the creation of indoor play environments aimed specifically at promoting PA should consider the role of adult involvement, whether of teachers or parents. These environments will need to provide opportunity for guided play. This research would suggest that activity prompts, including verbal

prompts to increase activity, modelling activity, and physical prompts, are important components of guided play. Teacher initiation of activity may also be an important component of guided play provided that the initiated activity promotes sustained levels of PA.

Further research, however, is needed to understand the precise role of the adult and the nature of the guided play. For example, does the adult need to participate directly in the play? Is the role of the adult to interact for the purposes of initiating the play activity or providing encouragement and prompts from the sidelines? Perhaps guided play requires a combination of these roles? Does this role change depending on the design of the indoor play space and the materials available during play? How does guided play change depending on the social context of play? Is there an adult to child ratio that is most beneficial for increasing PA while still allowing for child-directed play? Does the nature of guided play change when the adult role varies (e.g., parent versus a teacher)? In addition, research needs to consider how the eight characteristics of play (see Section 2.8) are impacted by guided play. For example, are children still able to self-direct play through guided play? Is guided play still spontaneous, all-engrossing and non-literal? Research is needed to assess how much autonomy children ultimately retain when adults guide play in order to increase PA.

Finally, research investigating the roles and interactions within the play environment needs to broadly identify and understand other roles and interactions present in indoor play spaces. Who are the players present within indoor play spaces? How do these players work independently and collaboratively to support or inhibit PA? How do these roles/interactions change in response to influences from other domains including physical characteristics of the play space and social meaning of activities?

5.1.3 The social meaning of the activities being performed by the people, both with each other and with the child. Associative play was the most frequently observed form of social play (combined sites, n=1495, 32%). Associative play is defined as a group of children participating in similar or identical activities without formal organization, group interaction, or a definite goal (Broadhead, 2003; Frost, Wortham, & Reifel, 2008; Medical Dictionary, 2009). During associative play, children may borrow or lend toys, and they may imitate others in the group, but each child acts independently. The children's individual interests take precedence over the interests of the group (Broadhead, 2003; Frost et al., 2008; Medical Dictionary, 2009).

This observation is aligned with early theory that suggests preschool children, aged 3.5-4.5 will prefer to engage in associative play (Parten, 1932; Rubin, 2001). This research also demonstrates that associative play was observed at a high frequency for all levels of PA, suggesting that associative play can be performed at any level of physical activity. Note, this finding does not suggest that associative play promotes one level of PA over another. Parallel and solitary play types were also frequently observed for all intensities of PA. Unfortunately, research considering the effect of specific types of social participation on PA among preschool children could not be found.

Results of this research demonstrates that play at KLC had more social participation, with a higher frequency of associative and cooperative play when compared to both ARC and SOC. There is evidence that demonstrates linkage, in general, between increased PA and social participation (Barkley et al., 2014; Eaton & Keats, 1982; Lehto, Reunamo, & Ruismäki, 2012). Barkley et al. (2014) demonstrated that children, aged three to six years old, had a 54% increase in PA intensity when playing with a friend during indoor free play, as opposed to children who were playing alone. As part of that research, children at play were given the option of extending their play time by ten minutes; 100% of children with a friend opted to extend play, while only 45% of children playing alone extended their play time. When additional play time was selected, the PA intensity was maintained for both conditions (solo and with-friend play). This research concluded that the "…presence of a friend has a strong positive influence on physical activity behavior in young children" (p. 408).

A systematic review analyzing the relationship between PA and peers among preschool children speaks to the importance of social participation for promoting PA (Ward, Bélanger, Donovan, & Carrier, 2016). This review concluded that there is evidence suggesting that preschoolers are more physically active when in the presence of peers. This relationship, however, seems to be dependent on a number of variables including size of the play group and characteristics of the peer(s) including age, gender, familiarity, and personality traits such as extroverted/introverted.

The importance of individual characteristics within the relationship between PA and social participation is echoed by a study that observed the PA of 892 children, average age of 4.7 years, engaged in indoor free play at Finnish daycares (Lehto et al., 2012). This research found that children interacting with peers were more physically active. It also provided additional

insights into the relationship between social participation and PA. First, children who were withdrawn from their peers with less social contact tended to be less physically active. Second, children were less physically active when in the presence of an independent and self-directive peer. While the immediate setting in this study was daycare facilities (rather than preschool programs as in the current studies), it provides evidence that "… (young) children's (individual) social strategies and the personal qualities of their peers will impact PA" (Lehto et al., 2012, p. 281). This suggests that providing the opportunity for peer and group interaction alone may not be sufficient to increase PA. More research into this relationship is needed. The generalizability of the importance of peer groups for increasing PA within indoor play spaces needs to be tested. The individual and peer characteristics that both promote and inhibit PA in indoor play spaces must be identified. For example, how does gender impact PA? Is PA impacted when children are playing with same-sex peers as opposed to peers of the opposite gender? In addition, the potential impact of specific types of social participation, for example parallel play, associative play, and cooperative play, on PA need to be tested and understood.

Broadly, within the domain of social meaning, further research is required to identify the possible social meanings of various play and non-play activities occurring in indoor play spaces. For example, how do social rules such as appropriateness of choices, safety, and sharing impact PA? Research is also needed to determine how the social meaning is influenced by physical characteristics and individual roles/interactions within the play space; for example, how does group interaction change when the physical space is smaller or larger? How does social meaning change when there are significant age differences between children playing?

5.2 Focusing on Health Outcomes

Ultimately, the objective of creating indoor play spaces that promote PA is to improve the health of young children. This intent needs to guide research in this area. For example, evidence demonstrates that outdoor urban green spaces promote PA and, ultimately, improve health and well-being (WHO, 2016). Health benefits associated with outdoor urban green spaces include improved mental health and cognitive function, reduced cardiovascular disease, reduced prevalence of type 2 diabetes, and reduced overall mortality (WHO, 2016). "The mechanisms underlying links between green space access and health are likely to be complex and interacting.

Access to green space may produce health benefits through various pathways (mechanisms leading to health effects), some of which may have a synergistic effect" (WHO, 2016, p. 3).

Published literature identifying an association between indoor spaces, increased PA, and health outcomes could not be identified. Research, therefore, is needed to assess the potential for this association. In line with the research presented in this study, specific inquiry needs to consider the factors that influence active play and PA within indoor spaces, how these factors can be applied to create play spaces that intuitively encourage physical activity, and the impact of these indoor built environments on health outcomes. The driving question should be, can indoor play spaces be built to increase PA and subsequently improve health and well-being of young children?

The Life Course Health Development Model, presented in Section 1.5.1, should factor into future research. Longitudinal studies are needed to understand the physical and social exposures present in indoor preschool play spaces and how these exposures might impact future health. Longitudinal studies are also needed to determine the patterns of health that can be learned in indoor preschool settings and how these track through life and impact health over time. Consideration should also be given to how play impacts health over time and what characteristics of play are most advantageous for future health; for example, how is health impacted by specific types of play, i.e., free play, guided play, or structured play; the location of play, i.e., indoor or outdoor play spaces; and adult participation, i.e., no adult involvement, adult guided play, or adult directed play.

5.3 Limitations

It is understood that play contributes to child development in many areas including physical, psychosocial, and cognition domains. By choosing to examine active play, this research focuses predominantly on physical development rather than the overall development of the preschool child and excludes investigation of alternative benefits associated with play. It is not the intent of this work to suggest that the value of play is only reflected by its ability to promote PA or to minimize the importance of play for other forms of development.

One strength of this study was the relatively large sample size and the use of a reliable observation system that was developed specifically for preschool children's sporadic activity.

There were, however, limitations associated with data analysis. Although the OSRAC-P has been validated (Pate, O'Neill, & Mitchell, 2010) the modified version used in this research has not. Additionally, the application of the OSRAC-P to video observation data should be evaluated using a combination of observation and objective monitoring (Oliver, Schofield, & Kolt, 2007). It is acknowledged that understanding children's play is accomplished through both observing their actions and listening to their comments/conversation (Forman & Hall, 2005). The use of video observation through wall mounting did not allow for audio cues from the specific focus child. Some of the detail and nuance of play, specifically relating to context specific variables, may have been lost as a result.

Finally it should be noted that the observation of PA was limited to the preschool spaces and times (i.e., designated as free play time in preschool programming) where PA was potentially at its highest. No conclusions can be drawn regarding the overall PA levels of the preschool children attending these programs because the overall programs were not observed. It should also be noted that, other than age, individual characteristics and demographics of the preschool children were not considered as part of this study; as a result the possible impact of these factors of play and PA were not considered. Finally, the generalizability of these results to a larger population may be limited as all three preschool settings were located in the Municipality of Strathcona County.

5.4 Summary of Further Research Directions

This project has provided a snapshot of the influences on PA during free play time within the immediate setting of indoor preschool play spaces. The application of the Social Ecological Model provides insight into the complexity of these influences within and between dimensions of the model.

As noted throughout Section 5.1, more research is needed to investigate how the physical characteristics of the facility, the various roles and interactions, and the social meaning of activities within the indoor play space impact PA. These factors need to be investigated both independently and collectively; understanding the importance of reciprocal interaction between them and acknowledging that they do not influence PA in isolation. For example, imagine that a specific physical characteristic of the indoor play space is found to successfully increase PA.

Now imagine how the effectiveness of this physical characteristic to influence PA might change when the social context changes; e.g., when the age of the children playing increases/decreases, when the number of children playing gets significantly smaller/larger, when there are more/less teachers guiding play, or when children have circumstances or disabilities that change the context of play.

Research is needed to address specific questions about the domains within the immediate setting of Bronfenbrenner's Social Ecological Model for children; assessing how these domains independently influence PA, how they collectively to support/inhibit PA and how changes within one domain impact others. Ultimately, future research will lend itself meaningfully to practice with respect to the intentional design of built environments and indoor preschool play environments that promote increased PA. Naturally, it will be necessary to conduct similar studies in multiple, diverse indoor play settings to determine generalizable principles of design of indoor play settings for preschool children.

Finally, this project has focused exclusively on the immediate setting of Bronfenbrenner's Social Ecological Model for children. Research is still needed that considers the 'supporting layer' that shapes the context of the immediate setting (Bronfenbrenner, 1974). Consideration of the influences within the supporting layer, need to include organizational characteristics, including rules and regulations guiding practice; community factors, consisting of the relationships among organizations, institutions, and informal networks within the community; and public policy, incorporating local, provincial and national laws and policies (McLeroy et al., 1988). Again, these factors need to be investigated independently and collectively; and in multiple and diverse indoor play settings to ensure generalizability to other indoor built environments as findings emerge. Finally, there is also an opportunity for longitudinal research to consider what health outcomes and behaviours associated active play impact health over time; i.e., how does active play impact health in childhood? What patterns of health behaviour associated with active play persist as an individual ages? How do these patterns impact health in adulthood?

5.5 Implications for Practice

5.5.1 Practice implications. This project provided insights into the physical and social dynamics that influence PA within preschool indoor play spaces, during a particular part of the programming day. There are a number of strategies that teachers and managers of preschool programs can implement in order to promote PA within indoor play spaces.

Teachers need to acknowledge that they have a role in facilitating play to promote increased PA. This facilitation should be through guided play, or guidance provided with the goal of increased PA in mind. Guided play can take two forms. First, guided play can be provided by preparing a play space that emphasizes active play. This includes providing children with access to multiple and diverse active play opportunities. Activities should focus on gross motor activities such as running, jumping, and climbing; equipment may include jump ropes, balls, wheeled toys for riding, and soft play equipment and climbers.

Second, guided play can also be provided by providing comments and activity prompts in line with child selected play activities. This would include verbal, modeled, and physical prompts. For example, verbal cues might include encouraging a child to "run fast" when chasing a peer or complimenting a child for kicking a ball "so far", while modelled activity might include demonstrating how to throw a ball over-hand when a child is playing catch or to use a jump rope when the child is attempting to skip. Note, that according to the principles of guided play, children should still be permitted to spontaneously self-select play activities, allowing for a high degree of child autonomy throughout play; guided play is in response to child-directed activities. Weisberg et al. (2016) writes that "the adult's role is to prepare the environment and use open-ended prompting to encourage the child toward (a)…goal, but children must navigate their own path through the…context (p. 5).

Finally, teachers and program directors need to recognize that free play does not ensure adequate levels of PA among preschool children. When the intention is to promote PA, there is a need to intentionally prepare for active play within indoor play spaces; there needs to be a readiness to offer multiple opportunities for active play and to facilitate or guide play in order to achieve increased levels of PA among preschool children.

At the same time, preschool programs need to appreciate that guided play to increase PA is not a replacement for free play. There are benefits of free play that are essential to childhood

development, including learning to regulate emotional responses, promotion of a positive affect, development of stress response systems, and development of creativity, a sense of motivation, and social attachment (Lester & Russel, 2008). Ultimately, preschool programs need to provide opportunities to play that deliver a mix of both free and guided active play.

It should be noted that the teachers participating in this study are preschool teachers working within municipal recreation preschool programs. This context is unique from school-based preschool programs. While teachers from both of these preschool settings will have common education and training, the organizational priorities and mandates will differ. Recreational preschool programming can primarily focus on recreation and child care, while school-based preschool programs may choose to focus on school readiness which could include a specialized preschool curriculum to achieve this goal; for example, the HighScope Preschool Curriculum focuses on active participatory learning and planned academic experiences with an emphasis on consistent daily routines and well-organized classrooms (Zachry, 2013). Given these differing objectives, the implications discussed above require a strong commitment on the part of the organization to prioritize PA and to incorporate this priority into specific organizational objectives.

5.5.2 Policy implications. Ultimately, it is not enough to create indoor play environments that promote PA; supportive policy is needed to ensure success within these settings.

Policy within preschool settings must support guided play among young children within the indoor play spaces in order to increase PA. Teachers need to be supported by being given adequate time and resources to ensure active play can be provided during play opportunities. For example, there needs to be adequate time built in to preschool programming to allow for play, teachers will require time to plan and prepare indoor play spaces that will encourage active play, there needs to be adequate physical resources and equipment to allow for multiple opportunities for active play, and teachers have to be trained to guide play without restricting child autonomy during play.

When appropriate, preschool programs should take advantage of opportunities to incorporate guided play into the existing curriculum. For example, Strathcona County's Recreation, Parks, and Culture department developed the Love to Play program with a philosophy of free play; current policy could be revised to recognize the importance of providing

a mix of free and guided play. To support this policy, regular and ongoing training regarding the teacher's roles and responsibilities for delivering both free and guided play could be provided. The integration of both free and guided play into early learning is known as Playful Learning (Hassinger-Das et al., 2017). There are a number of online tools that could guide the development of program specific learning modules regarding Playful Learning. For example, The Centre for Education Innovations (http://www.earlylearningtoolkit.org/playful-learning) provides a number of resources, directed at teachers and program managers, regarding implementing and providing Playful Learning.

There is also an opportunity for community and public policy to support increased PA within indoor play settings. First, this should include incorporating and adhering to national guidelines on PA and sedentary behaviour for young children (CSEP, 2012) through community programming and public policy. There are also lessons and opportunities that can be implemented from Canadian statements on play based learning (Council of Ministers of Education, Canada (CMEC), 2010) and outdoor active play (Tremblay et al., 2015). Community programming needs consider and plan for the intentional implementation of, (a) strategies to increase PA and limit sedentary activity, (b) "…challenging, dynamic, play-based learning opportunities" (CMEC, 2010, para. 6), and (c) plenty of opportunities for outdoor active play with teachers facilitating through guided play.

Public policy can also support these efforts by ensuring adequate availability, access to, and maintenance of parks and green spaces within the community; by promoting provincial and national programs, campaigns, and funding opportunities that promote PA, play based learning, and/or outdoor active play; and by developing coalitions at the organizational level with a shared mandate to promote PA.

Finally, in the pursuit of health through built environments, "public health needs to rediscover the importance of place. From nature contact to buildings, from (indoor and outdoor) public places to cities, there are research needs and unmet opportunities to design and build healthy places" (Frumkin, 2003, p. 1454). As research emerges that provides insight into designing indoor play spaces that increase PA, there needs to be collaborative development of supportive policy within communities, provincially, and federally to ensure success. This requires a commitment to invest and support the ongoing assessment and creation of indoor play settings.

5.6 Summary and Conclusion

The purpose of this research was to consider how indoor free play settings influence PA among participating preschool children during designated free play time. This multiple case analysis used video recordings to observe the play of a total of 125 preschool children (three to five years of age) from three preschool programs offered by Strathcona County Recreation, Parks and Culture, including ARC, KLC, and SOC. Play was recorded during designated free play time in the programming of the respective indoor preschool play spaces. Variables observed and coded included intensity and type of physical activity, types of play activities, and the context for play.

This research supports the observation that preschool children are largely sedentary during free play within indoor play spaces. It also provides evidence that increased PA can be achieved in indoor preschool play spaces. The results also showed that increased opportunities for active play, adult participation through guided play, and higher social interaction contributed to an increase of PA among the participating preschool children.

This research supports the need for future research into the factors that influence PA among preschool children within indoor play settings. This ongoing research needs to consider both the immediate setting and the broader facility, community, and public policy influences; and how they work independently and collectively to impact PA of preschool children within indoor play spaces.

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Appendices

Appendix A: Schematic of the LovetoPlay Play Space

Appendix B: Schematic of the Kinsmen Leisure Center (KLC) Play Space

Appendix C: Schematic of the Strathcona Olympiette Centre (SOC) Play Space

Appendix D: Parent/Guardian Information Letter for "Play Video Observation" (Part 3)

Appendix E: Parent/Guardian Consent Letter for "Play Video Observation" (Part 3)

Appendix F: Instructor Information Letter for "Play Video Observation (Part 3)

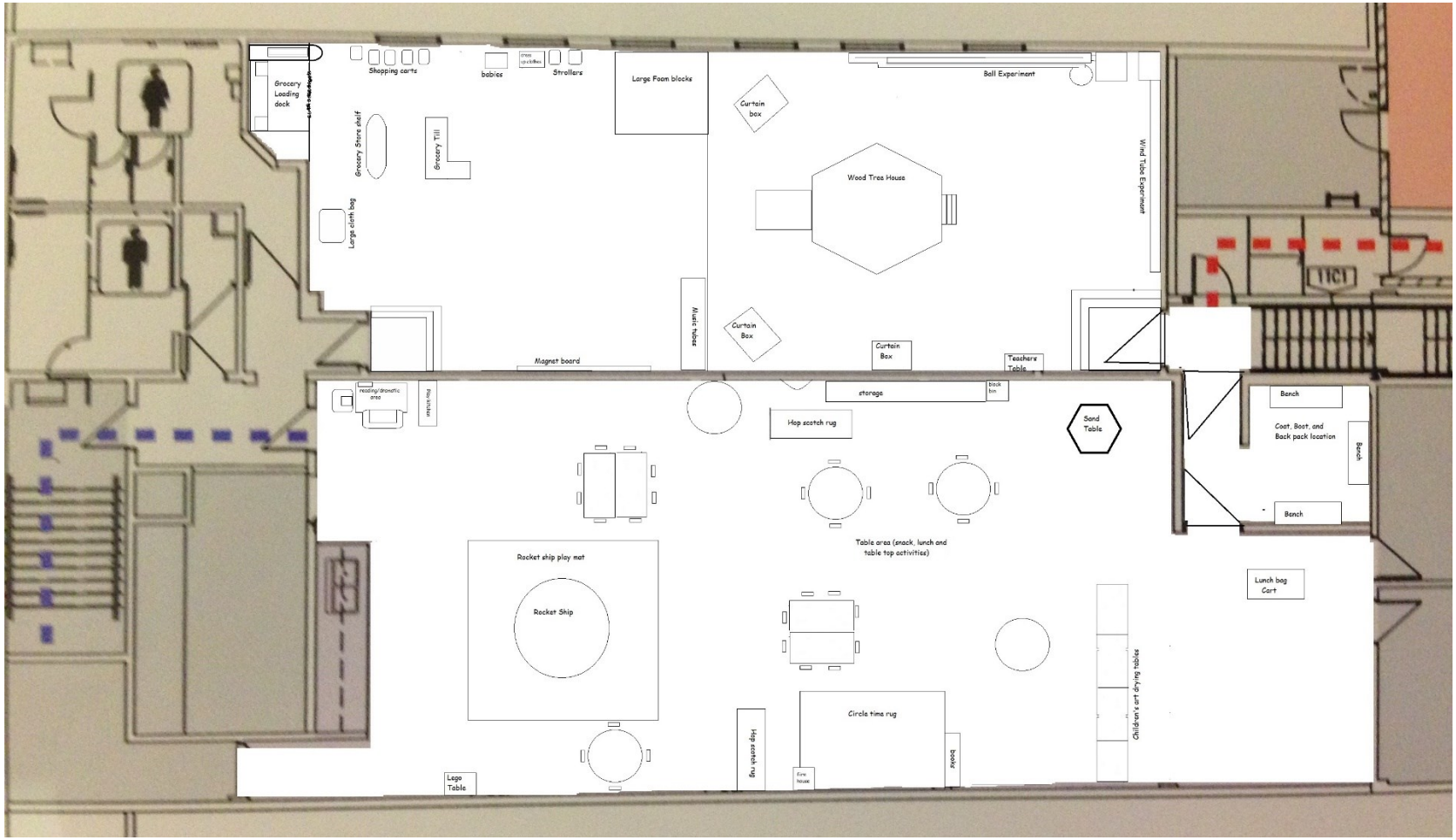
Appendix G: Instructor Consent Letter for "Play Video Observation (Part 3)

Appendix H: Modified Codebook

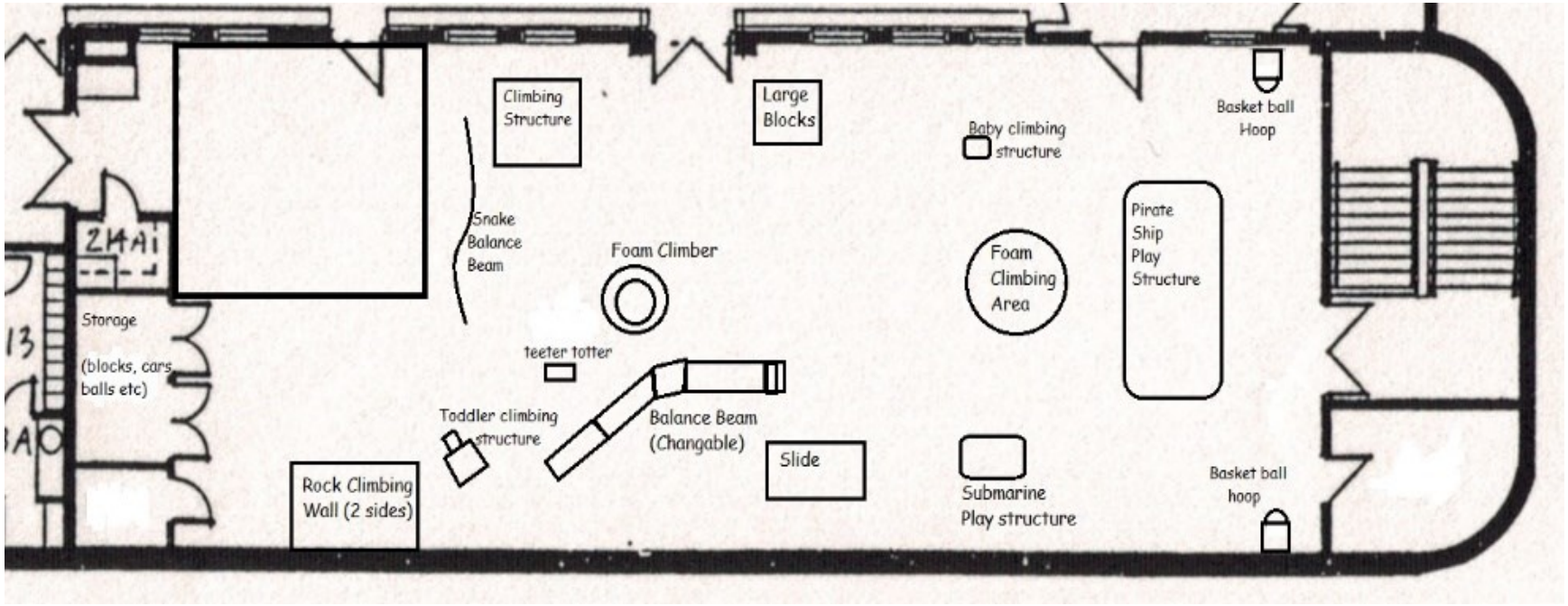
Appendix I: Coding Guide

Appendix J: "Evaluation of a Play-Based Preschool Recreation Program: Exploring the Impact of Community Investment in Play-Based Learning on Health and Health Equity" – Research Question

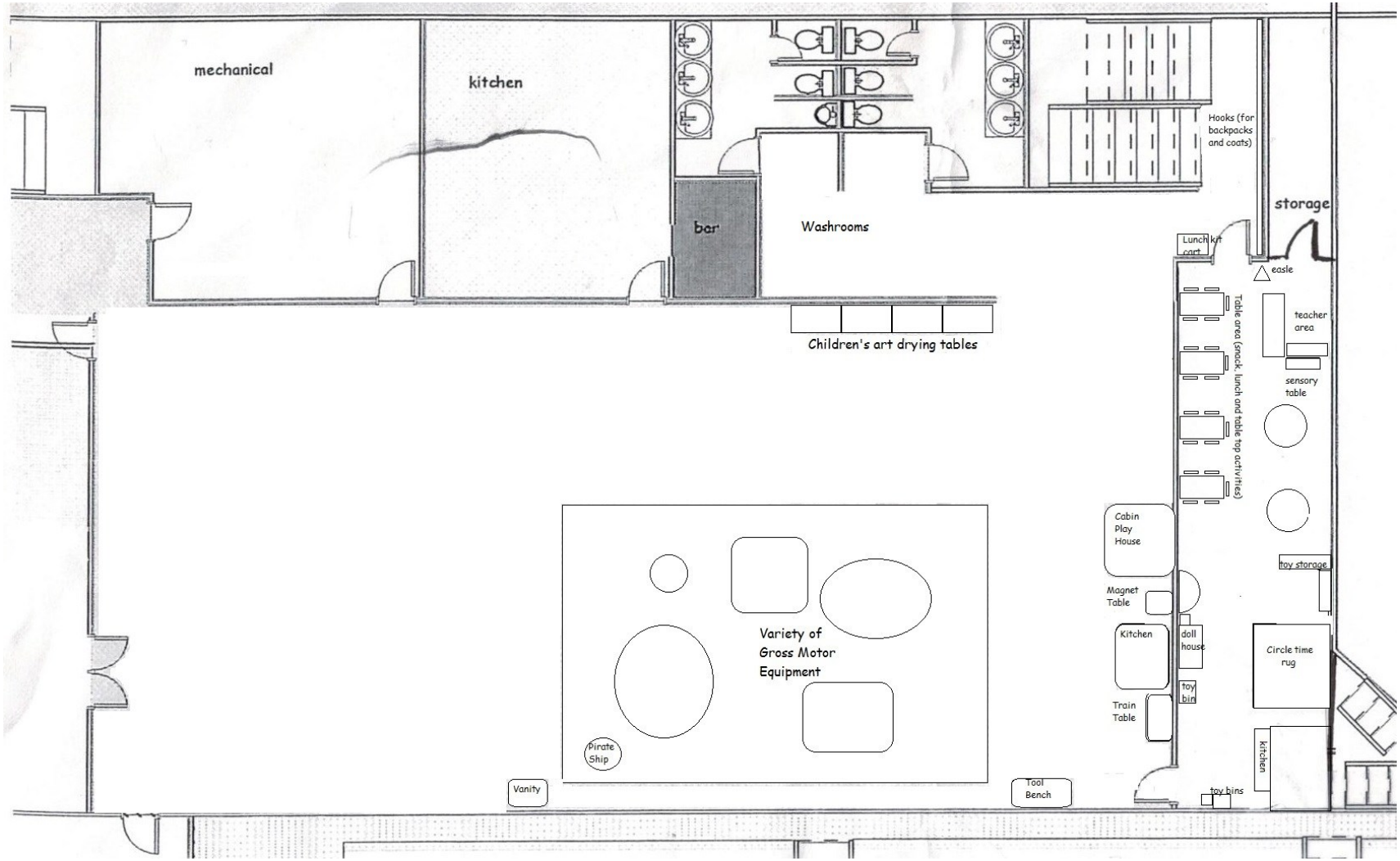
Appendix A: Schematic of the Ardrossan Recreation Complex (ARC) LovetoPlay Indoor Play Space



Appendix B: Schematic of the Kinsmen Leisure Centre (KLC) Indoor Play Space



Appendix C: Schematic of the Strathcona Olympiette Centre (SOC) Indoor Play Space



Appendix D: Parent/Guardian Information Letter for "Play Video Observation" (Part 3)

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Evaluation of a Play-Based Preschool Recreation Program: Exploring the Impact of Community Investment in Play-Based Learning on Health and Health Equity

Principal Investigators:
Candace Nykiforuk, PhD - University of Alberta, School of Public Health, Centre of Health Promotion Studies
Jane Hewes, PhD - Grant MacEwan University, Early Learning and Child Care

Background and Purpose

Three preschool programs, one each at the Ardrossan Recreation Complex, Strathcona Olympiette Centre, and Kinsmen Leisure Centre are involved in a research project to better understand childhood play in preschool settings. The research team would like to understand how children play with the different structures, toys/objects, and other features in their preschool.

To do this, part 3 of the Love to Play project will use video to observe play behaviours and activities during preschool; including children's social interactions, choice of activities, how they move toys and equipment, and their use of play structures. Video observations of children in their preschool setting will take place once per month from January to June 2015. The monthly observations will consist of two 30-minute recordings on the same day: one in the morning while the children are in the preschool room and one in the afternoon while the children are in the play room. Video recording will occur at a height and angle to allow a "bird's eye" view only so that children's faces will not normally be recorded. A member of the research team will be present on the day of the "play observations" and will be available to parents/guardians for questions.

Participation

At the beginning of the Winter (January) and Spring (April) sessions, you will be asked to sign one consent form for all of the video recording observations in that session. Your consent for your child's participation and your child's agreement to participate in this research is completely voluntary. If you feel uncomfortable having your child participate in this observation, he/she will not be involved in activities where video recordings are taking place. Alternative activities for children not participating in this part of the research will be arranged in a different area of the preschool, where they will not be videoed.

Confidentiality

Due to the nature of the video observations, your child's activities captured on video cannot be removed from the recordings. Additionally:

- You and your child may ask questions and clarify their rights at any time throughout the research project.
- You may withdrawal your consent of your child's participation in the study at any time.
- Your child may refuse to participate at any stage of the project without fear of ill or unfair treatment.
- In order to protect your child's anonymity, the video recordings will be taken from wall-mounted cameras at a height and angle that limits facial recognition. Further precautious will be taken to protect the confidentially of participant information collected:
- Any direct identifying factors from the videos will not be used in the analysis of the recordings.
- The use of indirect identification information (i.e. gender) will only be used in data analysis.
- All recordings will be stored on password protected computers at the Centre of Health Promotion Studies, University of Alberta.
- The data will only be accessible for data analysis to the Principal Investigators (Dr. Candace Nykiforuk and Dr. Jane Hewes), their supervised staff, students, and associated research team.
- In the unlikely event of a breach of information, you will be contacted and informed of what information was compromised.

Use of Data

Data accumulated through video recordings will be analyzed using reputable analytic tools that assess play behaviours and participant use of space. Data will only be analyzed at the group level to identify patterns of play relative to the features in each preschool. Data will not be analyzed for each child specifically. Data will be presented in grouped format for the results.

Results from the study will be gathered to create a summary to be shared with parents/guardians and instructors about the preschoolers' experiences in the program. General results may also be shared with program staff and facility managers who may be interested in using the information to help alter or enhance their preschool environments. Results of this part of the research may also be shared in academic presentations, reports, publications, and possibly combined with earlier results in the study to fully understand childhood play. **Your son's/daughter's name (or other identifying information) will never be associated with the presentation of the results.**

Possible Risks and Benefits

As this study uses unobstructed video observation, we do not anticipate any risk for your child's behaviour during recording process. We hope that future programs, and therefore users, may positively benefit from the study results as programs are improved to enhance childcare experiences.

Funding Agencies

This part of the Love to Play project is funded by the Canadian Institutes of Health Research (CIHR) and Alberta Centre for Child, Family, and Community (ACCFCR).

Contact Information

If you have any questions regarding this study, please contact:

- Ana Paula Belon, Project Coordinator (780-492-0280; ana.belon@ualberta.ca)
- Candace Nykiforuk, Principal Investigator (780-492-4109; candace.nykiforuk@ualberta.ca)

- Jane Hewes, Principal Investigator (780-497-5193; hewesj@macewan.ca)

The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.
This project has been approved on ethical grounds by the MacEwan University Research Ethics Board on September 08th, 2014. Any questions regarding your rights as a participant may be addressed to the Board at (780) 633-3274 or REB@macewan.ca).

Appendix E: Parent/Guardian Consent Letter for "Play Video Observation" (Part 3)

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Evaluation of a Play-Based Preschool Recreation Program: Exploring the Impact of Community Investment in
Play-Based Learning on Health and Health Equity

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Do you understand that your child has been asked to be in a research study?	**Y**	**N**
Have you read and received a copy of the attached Information Letter?	**Y**	**N**
Do you understand the benefits and risks involved for your child in taking part in this project?	**Y**	**N**
Have you had an opportunity to ask questions and discuss the study?	**Y**	**N**
Do you understand that alternative activities will be arranged in a video-free area of the preschool if you do not agree your child to participate in the video recording?	**Y**	**N**
Do you understand that your child is free to choose to participate or not and discontinue participationat any time during the video recording, without having to give a reason?	**Y**	**N**
Do you understand that, if you agree for your child to be video recorded in this observation session, you will be unable to remove the images of your child captured on video?	**Y**	**N**
Has the issue of confidentiality been explained to you?	**Y**	**N**
I agree for my child to be video recorded as part of the project	**Y**	**N**

1

Who explained the study to you? _____

Signature of Participant

_____

Printed Name

_____

Date _____

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Participation

At the beginning of the Winter (January) and Spring (April) sessions, you will be asked to sign one consent form for all of the video recording observations in that session. Your consent to participate in this research is completely voluntary. Due to the nature of the video observations, your activities captured on video cannot be removed from the recordings. Additionally:

- You may ask questions and clarify your rights at any time throughout the research project.

- You may withdrawal your consent for your participation in the study at any time.
- You may refuse to participate at any stage of the project without fear of ill or unfair treatment.

Confidentiality

In order to protect participant's anonymity, the video recordings will be taken from wall-mounted cameras at a height and angle that limits facial recognition. Further precautious will be taken to protect the confidentially of participant information collected:

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Results from the study will be gathered to create a summary to be shared with parents/guardians and instructors about the preschoolers' experiences in the program. General results may also be shared with program staff and facility managers who may be interested in using the information to help alter or enhance their preschool environments. Results of this part of the research may also be shared in academic presentations, reports, publications, and possibly combined with earlier results in the study to fully understand childhood play. **Your name and the children's names (or other identifying information) will never be associated with the presentation of the results.**

Possible Risks and Benefits

As this study uses unobstructed video observation, we do not anticipate any risk for your behaviour or children's behaviours during recording process. We hope that future programs, and therefore users, may positively benefit from the study results as programs are improved to enhance childcare experiences.

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If you have any questions regarding this study, please contact:

- Ana Paula Belon, Project Coordinator (780-492-0280; ana.belon@ualberta.ca)
- Candace Nykiforuk, Principal Investigator (780-492-4109; candace.nykiforuk@ualberta.ca)
- Jane Hewes, Principal Investigator (780-497-5193; hewesj@macewan.ca)

The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.
This project has been approved on ethical grounds by the MacEwan University Research Ethics Board on September 08th, 2014. Any questions regarding your rights as a participant may be addressed to the Board at (780) 633-3274 or REB@macewan.ca).

Appendix G: Instructor Consent Letter for "Play Video Observation" (Part 3)

SCHOOL OF PUBLIC HEALTH

3-300 Edmonton Clinic Health Academy
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Instructor Informed Consent for "Play Video Obarvation" (Part 3)

Evaluation of a Play-Based Preschool Recreation Program: Exploring the Impact of Community Investment in
Play-Based Learning on Health and Health Equity

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Do you understand that you have been asked to be in a research study?	**Y**	**N**
Have you read and received a copy of the attached Information Letter?	**Y**	**N**
Do you understand the benefits and risks involved in taking part in this project?	**Y**	**N**
Have you had an opportunity to ask questions and discuss the study?	**Y**	**N**
Do you understand that you are free to choose to participate or not and discontinue participation at any time during the video recording, without having to give a reason?	**Y**	**N**
Do you understand that, if you agree to be video recorded in this observation session, you will be unable to remove your images captured on video?	**Y**	**N**
Has the issue of confidentiality been explained to you?	**Y**	**N**
Do you understand who will have access to your images?	**Y**	**N**
I agree to be video recorded as part of the project	**Y**	**N**

Who explained the study to you? _____

Signature of Participant/Printed Name _____

Date _____

The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

This project has been approved on ethical grounds by the MacEwan University Research Ethics Board on September 08th, 2014. Any questions regarding your rights as a participant may be addressed to the Board at 780-633-3274 or REB@macewan.ca.

Appendix H: Modified Codebook

MODIFIED CODES AND DEFINITIONS

We have made some modifications to the OSRAC-P to include codes we feel will better reflect the nature of our observation spaces, and to provide more detail on play types according to desired research outcomes. The majority of the following codes are taken from OSRAC-P, with exceptions marked in red.

*Category order has also been modified for what we feel will be a more logical and expedient flow for coding.

A: PHYSICAL ACTIVITY

I) TYPE OF PHYSICAL ACTIVITY (OSRAC-P Category B: Physical Activity Type)

Climb:	Alternating weight distribution between limbs to move against gravity, or hanging from one or more limbs
Crawl:	Propulsion using four points of contact
Dance:	Dancing or expressive movement
Hit/Pound:	Repeatedly connecting two objects together in a forceful motion
Jump/Skip:	Jumping, skipping, hopping, galloping
Lie Down:	Lying down, no body movement
Lift/Carry:	Displacing an object using arms/hands
Push/Pull:	Pushing or pulling an object or child, may include pushing a swing
R&T:	Tumbling, wrestling
Ride:	When the wheels of the riding object are in motion, or the child is attempting with effort to move the riding object, for example, cycling, skateboarding, roller skating, scooter
Rock:	Rocking on a teeter totter, rocking horse, or other object
Roll:	The child's body is rolling
Run:	Running
Sit/Squat:	Sitting, squatting, or kneeling
Stand:	Standing, or upright with one leg up and arms holding onto an object\

("Swim" has been removed to reflect the spaces we are coding)

Swing:	Demonstrated effort to swing, does not apply to residual swinging of an object
Throw:	Throwing, kicking, or catching. Also to be used for dribbling a ball
Walk:	Walking, marching
Other:	_____
Can't Tell	Unable to observe

II) LEVEL OF PHYSICAL ACTIVITY (OSRAC-P Category A: Physical Activity Level)

Stationary:	Stationary/motionless, no major limb movement ie. Sleeping, lying, standing, sitting, squatting, kneeling, or riding passively in a wagon
Limbs:	Stationary with movement of limbs or trunk (arm or leg movements without moving the entire body from one place to another)
Slow-Easy:	Walking or riding slowly
Moderate:	Walking at a rapid pace, up a hill, skipping, hopping, jumping, kicking, or galloping, climbing, tumbling, swinging with legs kicking
Fast:	Running, walking up an incline quickly, 3+ repetitions of skipping, hoping, jumping, or kicking, riding quickly, climbing quickly, vigorous fighting
Can't Tell	Unable to observe

B: <u>PHYSICAL CONTEXT</u>

I) PHYSICAL LOCATION (OSRAC-P Category C: Location)

Inside:	Inside of one of the preschool rooms
Transition:	Moving between two settings in the preschool facility, for example, lining up and waiting to move to another room, moving between two rooms, or moving between the inside and outside of the preschool building.
Can't Tell	Unable to observe

("Outside" has been removed to reflect the spaces we are coding)

II) PLAY ACTIVITY (A combination of OSRAC-P Category D: Indoor Educational/Play context and Category E: Outdoor/Gym Educational/Play Context. These categories were combined to accommodate activities in the Mini Gym and Love to Play spaces, and to be able to compare these spaces using the same codes.)

Art area:	The child is within an area designed for arts and crafts
Ball:	The child is playing within an area where there are many balls available
Books/Pre Ac.:	The child is located in an area containing books, writing, listening, science, or math materials
Exploratory:	The child is engaged in a focused examination of an object for the purpose of obtaining visual information about its specific physical properties. The child may be examining an object in his/her hand or may be looking at something across the room. Also, if a child is listening to a noise or listening for something, his/her behavior is coded as exploratory activity (Also described in the Play Observation Scale)
Fixed Equipment:	The child is playing on a jungle gym, play house, swing set, or waiting in line to use fixed equipment
Game:	When the child is engaged in a physical game such as tag, red rover, duck-duck goose, etc. These games should be formal, meaning they have rules that the children are following. (Look for verbal and behavioural rules as to the formality of the games)

Gross motor: The child engages in large motor physical activities such as dancing or jumping, outside of group activities

Group Time: The child is engaged in an activity that involves participating in a group of at least 50% of the children and where a teacher is discussing (ie. Asking questions of the children) or presenting information.

Large Blocks: When the child is participating in activities with large building or construction materials. Large block areas are typically on the floor and not on a table

Manipulative: Manipulative, fine motor, and sensory center activities requiring small motor movements of the hand, fingers, wrists, and hand-eye coordination, for example: playing with play dough, putting together puzzles, stacking rings, stringing beads, placing pegs in a pegboard, putting small blocks together. May also include sensory tables with rice, beans, sand, or water, and using accompanying props such as glasses, scoops, water wheels, and buckets

Music Station: The child is in an area designed for musical pursuits, including sound-making instruments or speakers

Open Space: The child is in a non-designated area

Photovoice: Children are photographing the play environment around them. This is an activity conducted as part of the larger evaluation.

Sensory: The child is interacting with an object purely to discover the sensory properties of that object

Self Care: The child is at a sink, coat room, washroom, etc.

Snacks: The child is in a location used for food prep/serving food

Sociodramatic: When the child is engaged in sociodramatic and pretend play, using props such as dress up clothes, kitchen utensils, doctors kits, cash registers, telephones, dollhouses, puppets, and stuffed animals

Screen: The child is in an area with a screen for watching videos/TV, or using a computer (Code "Video" in OSRAC-P, renamed for computer possibility)

Teacher Arranged: Teacher arranged and led gross motor activity, when the teacher arranges or transforms space, materials, or an acrtivity for the purpose of gross motor activities. Formal gross motor activity with the focal child has to be led or supervised by an adult (eg. Obstacle course, bean bag race) or without equipment) (eg. Exercising, gymnastics)

Transition between activities : The focal child is moving from one activity to another

Wheels: When the child is playing with a wheeled object such as a bicycle, tricycle, scooter, wagon, Hotwheels, etc. If the focal child is pushing, rising, or sitting on any piece of wheeled equipment that is not fixed, it should be coded as Wheels.

Can't Tell: Unable to observe

Other: _____

"N/A" has been removed as it is used for when a child is outdoors or in transition. Our study does not capture children outdoors, and transition is captured by the Transition code.

"Nap" has been eliminated as the children do not have nap time during our observations
"Pool" has been removed as there are no swimming pools in our study
"Portable equipment" has been removed as it is designed to capture sand/water tables, which is captured in sensory/manipulative.
"Sandbox" has been removed as it is captured by the sensory station, and there are no in-ground sandboxes in our study.
"Time out" eliminated as the children are not given time outs in these spaces

C: <u>SOCIAL CONTEXT</u>

I) INITIATOR OF ACTIVITY (OSRAC-P Category F: Initiator of Activity)

Adult Initiated:	An adult instructs or suggests a child to engage in a certain activity
Child Initiated:	The child or a peer initiates the activity
Can't tell:	Unable to observe

II) GROUP COMPOSITION (OSRAC-P Category G: Group Composition)

Solitary :	The child is engaged in an activity alone, without other peers or adults
1-1 Peer:	The child is interacting one-on-one with another peer
1-1 Adult:	The child is interacting one-on-one with an adult
Group-Adult:	Several children are interacting with one adult
Group-Child:	Several children are interacting without the presence of an adult
Can't Tell:	Unable to observe

III) PROMPT FOR PLAY ACTIVITY (OSRAC-P Category H: Prompt for Physical Activity)

Teacher prompts increase:	There is an explicit prompt by the teacher to increase or maintain activity levels
Teacher prompts decrease:	There is an explicit prompt by the teacher to decrease activity levels
Peer prompts increase:	There is an explicit prompt by a peer to increase or maintain activity levels
Peer prompts decrease:	There is an explicit prompt by a peer to decrease activity levels
None:	No explicit prompt
Can't tell	Unable to observe

IV) Social Participation (New category)

Active Conversation with a Peer(s):	Verbal transfer of information to another person (peer).
Active Conversation with Teacher(s):	Verbal transfer of information to another person (teacher).
Aggression:	Non-playful agonistic interaction with another child. The child is demonstrating aggressive or violent behavior either towards an object (i.e. kicking an object out of frustration) or another person.

Associative play:	A group of children participate in similar or identical activities without formal organization. When the child is interested in the people playing but not in coordinating their activities with those people, or when there is no organized activity at all. There is a substantial amount of interaction involved, but the activities are not in sync.
Cooperative play:	When the child is interested both in the people playing and in the activity they are doing. The activity is organized, and participants have assigned roles. There is also increased self-identification with a group, and a group identity may emerge. Examples would be dramatic play activities with roles, like playing school, or a game with rules, such as freeze tag.
Imitation:	A child is observing and replicating another's behavior.
Onlooker Behaviour:	Child watches but does not participate in an activity. S/he may also offer comments, or laugh with the other children, but does not become involved in the actual activity.
Parallel:	The child plays beside, or in the company of, other children but does not play with his/her companions. The child plays independently; however, the activity often, though not necessarily, brings him/her within three feet of other children. If the child is very attentive to others while playing independently, parallel play is coded regardless of the distance between the focal child and the other children. S/he is often playing with toys that are similar to those that the children around him/her are using. The child usually seems to be somewhat aware of, and attentive to, his/her playmates.
Unoccupied Behaviour:	The child does not demonstrate focus or intent. Examples include observations of the child staring blankly into space, wandering with no specific purpose, or only slightly interested, if at all, in ongoing activities. If the child is engaging in a functional activity (e.g., twisting hair or fiddling with an object) but is not attending to the activity, then the child is coded as being unoccupied
Solitary:	Playing alone at a distance from other children. The child plays apart from other children at a distance greater than three feet (one meter). S/he is usually playing with toys that are different from those other children are using. The child is centered on his/her own activity and pays little or no attention to any children in the area.
Can’t Tell	Unable to observe.

Appendix H: Code Guide

PHYSICAL ACTIVITY LEVEL/INTENSITY			
Taken from OSRAC-P Category A			
CODE	**Quick Definition**	**DEFINITION**	**KEY NOTES/EXCEPTIONS**
Stationary	Stationary/Motionless (Level 1)	Stationary/motionless, no major limb movement	• Resting state; extremely confined or limited movement • No major limb movement or 2 major joint movements • Includes sleeping, lying, standing, sitting, squatting, kneeling, or riding passively in a wagon Writing or drawing motions only (with fingers and hand) is stationary
Limbs	Stationary with movement of limbs or trunk (Level 2)	Stationary with easy movement of limbs or trunk (arm or leg movements without moving the entire body from one place to another)	• Non-vigorous arm, leg, and trunk movement • No translocation from one place to another; 1 to 2 steps without translocation is considered limbs • The focal child needs to visibly bend a major joint or perform a movement in 2 joints (NOT including wrist, ankle, fingers, and toes); the joint must be at or above 90 degrees for it to be considered limb movement (i.e. scratching a nose without lifting the elbow = 1) • Code 'Limbs" if the child is being supported by another object or limb • Code "Limbs" if smaller movement is repetitive (2+ times) or if the child is stabilizing themselves This would include standing motionless while holding a moderately heavy object
Slow-Easy	Slow-easy movement (Level 3)	Walking or riding slowly	• Moving the body from one location to another at a slow and easy pace Walking – child must move with BOTH feet (3 continuous steps)
Moderate	Moderate movement (Level 4)	Moving body from one location to another at a moderate pace	• Includes walking at a rapid pace; walking up 2+ stairs or up a hill • 2 repetitions of skipping, hopping, jumping, kicking, galloping, rolling, or cycling Climbing and swinging with legs kicking
Fast	Fast movement (Level 5)	Moving body from one location to another at a fast or very fast pace	• Running, walking up 3+ stairs or an incline quickly or with vigorous arm movement • 3+ repetitions of skipping, hopping, jumping, galloping, kicking, fast cycling Vigorous fighting
Can' Tell	Cannot tell	Unable to observe	Coded only if you cannot see the focal child

Coding Rules for Physical Activity Level (OSRAC-P, pages 9 and 12):

- First record the highest level of physical activity noted within the 5 second observational interval – all subsequent codes for the other categories in that interval are coded based on the highest level of physical activity observed and recorded
- Intensity may depend on a) the speed or vigorousness of the child from slow and easy to moderate and fast movements b) whether the movement is assisted by others c) whether the child movement is repeated in the interval and d) if there is a weight being moved, held, or translocated
- Multiple body parts moving typically means higher intensity
- Movement that is performed more vigorously or requires more effort (carrying a heavy object) can be 'upgraded' to the next intensity code
- If physical activity is coded as 'Can't Tell' (unable to observe focal child) then all variables should be coded as 'Can't Tell'
- Slow and Easy = 1 repetition, Moderate = 2 repetitions, Fast = 3+ repetitions

PHYSICAL ACTIVITY TYPE			
Taken from OSRAC-P Category B			
CODE	**Quick Definition**	**DEFINITION**	**KEY NOTES/EXCEPTIONS**
Climb	Climbing or hanging	Alternating weight distribution between limbs to move against gravity, or hanging from one or more limbs	• Includes hanging or swinging from a bar • Child must bear weight through hanging limbs; if child is only leaning on the bar/rail (i.e. weight is still through their leg, code as a 'stand' • A partial climb (one leg up and arms holding an object) is coded as 'limbs' for PA level and 'stand' for physical activity type • Must include arms
Crawl	Crawling	Propulsion using four points of contact	
Dance	Dancing, expressive movement	Dancing or expressive movement	
Hit/Pound	Hitting 2 objects together	Repeatedly connecting two objects together in a forceful motion	Could be a child hitting another child with an object
Jump/Skip		Jumping, skipping, hopping, galloping	
Lie Down	Lying down	Lying down, no body movement	
Lift/Carry	Lifting and carrying an object	Displacing an object using arms/hands	Trumps walking/running when 2 hands are needed or the child is carrying a large object(s)
Push/Pull	Pulling or pushing an object/child	Pushing or pulling an object or child, may include pushing a swing	
R&T	Rough and tumble play, wrestling	Tumbling, wrestling	Think of true 'wrestling'
Ride	Cycling, skateboarding, roller skating, scooter	When the wheels of the riding object are in motion, or the child is attempting with effort to move the riding object,	• Code only if the child is making an effort to pedal/ move the riding object; If the child is only sitting (no effort to ride) code as 'sit/squat' • Examples are cycling, skateboarding, roller skating, scooter
Rock	Rocking on an object	Rocking on a teeter totter, rocking horse, etc.	
Roll	Rolling	The child's body is rolling	
Run	Running	Running (arms pumping)	Fast run= all out; mod run = could go faster; slow run and fast walk are similar Includes stairs
Sit/Squat	Sitting, squatting, kneeling	Sitting, squatting, or kneeling	• Child's knees must be bent past 90 degrees; bending knees or leaning over is coded as 'stand' with 'limbs' as PA level since the child has to stabilize themselves • Includes walking while in kneeling (walking on knees without arm involvement) – code according to repetitions i.e. 'slow-easy, sit/squat' • Also includes moving into 'sit/squat'
Stand	Standing/Standing up	Standing, or upright with one leg up and arms holding onto an object	Includes 'standing up' from sitting/squatting
Swing	Swinging on an actual swing	Demonstrated effort to swing	•Only coded if the child makes an effort to pedal/move •If the child is only sitting (no effort to ride) code as 'sit/squat'

		Does not apply to residual swinging of an object	
Throw	Throwing, kicking, catching that is associated with a ball	Throwing, kicking, or catching. Also to be used for dribbling a ball	• TRUMPS ALL OTHER MOVEMENT • Throwing heavier objects increases the activity level ; i.e. throwing a ball while standing stationary is 'Slow and Easy' • Use this code for dribbling only if the child is stationary – if the child is moving code as a 'walk' or 'run'
Walk	Walking, marching	Walking, marching	"2 Step Rule" both feet must move to another spot to code 'Walking' Includes stairs Slow walk = min 2 steps, translocate, no arm involvement Mod walk = 3+ steps at minimum, quicker pace, arms swing
Other	Other	----------	
Can't Tell	Cannot tell	Unable to observe	Coded only if you cannot see the focal child

Coding Rules for Physical Activity Type (OSRAC-P pages 13-14)

- Represents the type of activity the focal child was performing at the highest physical activity level/intensity recorded during the 5 second observation interval
- If the focal child performs multiple activity types at the same intensity, code the last physical activity type performed during the observation interval
- Ensure not to confuse Level/Intensity and Type – code the highest activity level/intensity

PHYSICAL LOCATION			
Taken from OSRAC-P Category C "Outside" has been removed to reflect the spaces we are coding			
CODE	**Quick Definition**	**DEFINITION**	**KEY NOTES/EXCEPTIONS**
Inside	Inside the centre/building	Inside of one of the preschool rooms	
Transition	Transition between 2 settings in the preschool	Moving between two settings/room in the preschool facility	For example, lining up and waiting to move to another room, moving between two rooms, or moving between the inside and outside of the preschool building When the 'transition' code is used (i.e. children are leaving the room) the play activity should be coded as 'N/A'
Can't Tell	Cannot Tell	Unable to Observe	Coded only if you cannot see the focal child

Coding Rules for Location (OSRAC-P page 15):

- **Transition must be initiated by the teacher**
- Leaving the room to pee = child initiated, inside, transition between activities (exception = if the teacher asks/prompts the child to leave the room to use the bathroom = adult initiated, transition, N/A play activity)

PLAY ACTIVITY – what was the child doing when they achieved their highest level of intensity			
A combination of OSRAC-P Category D (Indoor Education/Play Context) and Category E (Outdoor/Gym Educational/Play Context) – combined to allow for comparison of the activity in the traditional mini-gym spaces with the LovetoPlay spaces using the same codes Codes for "Nap", "Pool", "Portable equipment", "Sandbox", "Time Out", and "Open Space" have been eliminated			
CODE	**Quick Definition**	**DEFINITION**	**KEY NOTES/EXCEPTIONS**
Art	Art centre and activity	The child is within an area designed for arts and crafts	Engaging in activities that focus on art such as drawing painting, cutting, sculpting, etc; being in art activity areas
Ball	Ball or object play used for gross motor activities	The child is playing within an area where there are many balls available OR Play activity with balls or other portable equipment for gross motor activities	I.e. ball pit, hula hoops, jump ropes, Frisbees, etc. If the child is carrying a ball/or playing with a ball in any location, 'Ball' should be coded
Books/ Preacademic		The child is located in an area containing books, writing, listening, science, or math materials	• Note this should be occurring outside of a large group (at which time it would be coded as 'group time') Engaging in activities related to books, writing, listening, science, math, and board games (when the child is playing the game as intended); being in a books, writing, science, or math area
Exploratory	Visual examination of an object	The child is engaged in a focused examination of an object for the purpose of obtaining visual information about its specific physical properties. The child may be examining an object in his/her hand or may be looking at something across the room. Also, if a child is listening to a noise or listening for something, his/her behavior is coded as exploratory activity (Also described in the Play Observation Scale)	Staring with no manipulation
Fixed Equipment	Fixed Equipment	The child is playing on a jungle gym, play house, swing set, or waiting in line to use fixed equipment	Also coded when a child is waiting for their turn on equipment Fixed equipment should NOT be coded when the focal child is engaged in some other activity while on the fixed equipment (i.e. sociodramatic, ball, etc.) This can be coded when gross motor occurs on a fixed play structure (note fixed is defined as a play structure that cannot be moved by the children) Fixed equipment should NOT be coded when the focal child is engaged in some other activity while on the fixed equipment, i.e. socioprop or ball/object play while sitting in the play house. *Any interaction with or near the air tubes in the ARC LTP room is considered "fixed equipment". For the ARC air tubes, coding it as fixed equipment if the

			child is catching balls/scarves coming out of the tubes, and balls if they are playing with the balls in the area but not interacting with the tubes
Game	Formal game with rules	When the child is engaged in a physical game such as tag, red rover, duck-duck goose, etc.	These games should be formal, meaning they have rules that the children are following. (Look for verbal and behavioural rules as to the formality of the games)
Gross motor	GM activities	The child engages in large motor physical activities such as dancing or jumping, outside of group activities	Gross motor when no fixed play equipment is involved Engaging in a large motor activity; being in an indoor area with gross motor equipment (i.e. obstacle course, mat area for tumbling)
Group Time	Group or circle time	The child is engaged in an activity that involves participating in a group of at least 50% of the children AND a teacher is discussing or presenting information (i.e. Asking questions of the children or providing instruction). Teacher planned or initiated the activity An example would be traditional circle time (group time is likely to be coded more often in the preschool rooms rather than the gym spaces)	• 'Group Time' preempts other context codes (when they children are in a large group) except for 'Screen Time' in a group setting which is coded as 'Screen' AND 'Teacher Arranged' in which a GM activity is arranged and led by the teacher • Continue coding 'Group Time' when group time ends if the focal child is engaged in the group activity as other children got to other activities • When the 'Group Time' code is used , the Initiator of Activity should be coded as 'Adult'
Large Blocks	Large block centres and activities	When the child is participating in activities with large building or construction materials. Large block areas are typically on the floor and not on a table	Must be differentiated from manipulative play in that the large blocks are typically larger and most often, but not exclusively used on the floor rather than on a table
Manipulative	Manipulative, fine motor, and sensory centres and activities	Manipulative, fine motor, and sensory center activities requiring small motor movements of the hand, fingers, wrists, and hand-eye coordination	I.e. playing with play dough, putting together puzzles, stacking rings, stringing beads, placing pegs in a pegboard, putting small blocks together, playing with cars and trains. May also include sensory tables with rice, beans, sand, or water, and using accompanying props such as glasses, scoops, water wheels, and buckets Also includes board games that are NOT being played as intended
Music Station	Music centres and activities	The child is in an area designed for musical pursuits, including sound-making instruments or speakers	Should also be coded when the focal child is engaged in listening to, dancing to, or involved in musical activities outside a large group
Photovoice	Participating in the photovoice project	The child is actively taking photographs, or holding the camera with the intention of taking a photo or viewing past photos	Do not code as photovoice if the camera is hanging from the child's neck but they are not using the camera and do not appear to have an intention of using it.
Self-Care	Self-care areas	The child is at a sink, coat room, washroom, etc.	I.e. washing hands, changing clothes, tying shoes, in bathroom
Snacks	Snacks, meals, and food	The child is in a location used for food prep/serving food	Participating in an activity that involves the prep and eating of real food (i.e. setting the table, passing out food, cooking, eating) If teachers are using a cooking activity during large group time (approx. 50% of children present) code as 'Group Time'
Sociodramatic	Sociodramatic play and pretend	When the child is engaged in sociodramatic and pretend play	Props could include dress up clothes, kitchen utensils, doctors kits, cash registers, telephones, dollhouses, puppets, and stuffed animals

			'Sociodramatic' should be coded if the focal child is not in a clearly defined centre and not engaged in a specific activity, but is wearing sociodramatic clothing
Screen	Computer, TV, and videotapes	The child is in an area with a screen for watching videos/TV, or using a computer (Code "Video" in OSRAC-P, renamed for computer possibility)	Even if the child is in group time, code as 'Screen'
Teacher Arranged	Teacher arranged and led GM activity	Teacher arranged and led gross motor (GM) activity, when the teacher arranges or transforms space, materials, or an activity for GM activities. (Does NOT include a GM activity already underway when the teacher joins the play – this is coded as the activity context in which the focal child is engaged) This can include only the focal child OR a group of children	Teacher arranged and led GM activities trumps any other codes. Formal gross motor activity with the focal child has to be arranged, led and/or supervised by an adult (e.g. Obstacle course, bean bag race or without equipment including exercising or gymnastics) Teacher must remain as an active participant in the activity – if the teacher leaves the activity it is coded accordingly When the "Teacher Arranged" code is used, the Initiator of Activity should be coded as "Adult".
Transition between activities	Between centres and scheduled activities	The focal child is moving from one activity to another	Focal child is not located in or involved in a clearly designated centre/activity (i.e. Wandering around or passing through an activity/area without engaging with the materials) or waiting for an activity change (transition to group time, snack, going outside)
Wheels	Riding a toy with wheels	When the child is playing with a wheeled object such as a bicycle, tricycle, scooter	If the focal child is pushing, rising, or sitting on any piece of wheeled equipment that is not fixed, it should be coded as Wheels.
Other	Record activity		Focal child is engage with/located in an educational play activity/area not otherwise designated above – record what child is doing
Can't Tell	Cannot Tell	Unable to observe	Child is engaged in activities you can't see

Coding Rules for Play Context (OSRAC-P, pages 15-30)

- Play context should be coded first by physical activity type/behavior and then by location
- Think "**Behavior, behavior, behavior**" – match the focal child's behavior and then location if there is no behavior context to code
- If the focal child is in a defined centre and interaction with an activity matches that centre, then the code should match the activity and the centre (i.e. pretend cooking in the sociodramatic centre)
- If the focal child is in a defined centre and interaction with an activity that does not match that centre, then the code should match the behavior and not the centre (i.e. putting together a puzzle in the large block centre)
- If the focal child remains in a defined area, not interacting with the centre materials, then the code should match the location (i.e. sitting and watching the other kids in the large block centre)
- The Play Context coded should be directly related to when the highest level of physical activity takes place
- Preparation and clean up periods should be coded by activity in relation to indoor context (i.e. if the child is told to clean up the sociodramatic play area then the indoor context should be coded as 'Sociodramatic'
- Note a bench/ table that exists in the space is not considered fixed equipment as it's intended use is not for play– this should be coded as 'Other' with an explanation
- When the focal child is cleaning code for the activity space that they are cleaning in; and parallel social participation if other children are cleaning the same area
- Playing with a play house, play kitchen, etc., depends on the activity, and could either be fixed equipment (climbing on it or using the structure for gross motor) or sociodramatic (actually playing house)

INITIATOR OF THE PLAY ACTIVITY – who selected the play activity or area			
Taken from the OSRAC-P Category F			
CODE	**Quick Definition**	**DEFINITION**	**KEY NOTES/EXCEPTIONS**
Adult	Adult initiated	An adult instructs or suggests a child to engage in a certain activity	Activity area or activity was clearly selected and started by an adult Teacher explicitly asks or gestures the child to an activity
Child	Child Initiated	Child or peer initiated activity	Focal child selects activity area and/or activity I.e. child moves away from adult initiated activity, child chooses activity without teacher present, child chooses activity prior to teacher participation The default is 'Child Initiated' unless otherwise indicated
Can't Tell	Cannot tell who initiated	Unable to observe	Coding begins after the activity was initiated, or if you cannot see the focal child

Coding Rules for Initiator of the Activity (OSRAC-P, page 31)

- Information about who started an activity might be obtained from behavior before the specific 5 second interval; the initiator of an activity can be determined outside of the 5 second observation interval (i.e. if an adult initiated an activity at the 25 second recording time period before a 5 second interval, if the child is involved in that painting activity during the 5 second observation interval it would be coded as 'adult initiated'
- The initiator will be coded the same as long as the activity lasts – as long as the child continues to engage in the activity without becoming involved in another activity
- If you cannot determine who initiated the activity for a specific observational interval, try by the next observational interval to determine the activity initiator with contextual information
- 'Group Time' and 'Teacher arranged' (Play Activity) are adult initiated

GROUP COMPOSITION			
Taken from OSRAC-P Category P			
CODE	**Quick Definition**	**DEFINITION**	**KEY NOTES/EXCEPTIONS**
Solitary	Solitary/Alone	The child is engaged in an activity alone, without other peers or adults	Not interacting with or in close proximity to adults/peers Child is typically involved in an activity by themselves Child is moving to a new activity/centre without passing through other children Children can be playing in different areas, but if they are interacting to each other, that should NOT be coded as Solitary. Children can be playing in the same area, but not interacting with peers or adult, that should NOT be coded as Solitary.
1-1 Peer:	Interaction with 1 peer	The child is interacting one-on-one with another peer even when they are playing in different defined areas Two children are playing in the same defined area, but not interacting with each other	Engaged in an activity or in proximity with (5 feet) one other child Includes passing by a peer during transition
1-1 Adult:	Interaction with 1 adult	The child is interacting one-on-one with an adult	Engaged in an activity or in proximity (5 feet) with one or more adults in the absence of a group (focal child is the only child)
Group-Adult:	Group with an adult	Several children are interacting with one adult	Engaged in an activity with or is in proximity (5 feet) to 1 or more peers AND an adult(s) If the adult moves away from the group but is still in verbal contact the adult is still considered WITH the group
Group-Child	Group without an adult	Several children are interacting without the presence of an adult	Engaged in an activity or in proximity (5 feet) with 2 or more peers and no adult – note this includes in the same proximity (i.e. focal child walk/runs past 2 or more children on the playground)
Can't Tell	Cannot Tell	Unable to observe	Coded if you cannot see the focal child

Coding Rules for Group Composition (OSRAC-P, page 32-34)

- Defined by the number of children and adults in the same activity area or engaged in the same activity as the focal child OR are in proximity to the focal child
- Group composition is first defined by interaction with another child, group of children, or adult and then by proximity (within 5 feet of another child, group of children, or adult)
- Group composition is NOT depended on explicit social interaction or engagement with the same materials
- Solitary is only coded if the focal child is alone for the full 5 seconds and does not interact with, or come in proximity of another child, group of children, or adult
- Group adult is coded when the focal child is engaged with an adult who is part of a group of children
- 1-1 adult should be coded when the focal child is engaged with an adult who is in proximity but not interacting with a group of children
- Proximity is first determined by defined activity areas and then by proximity (5 feet); if non-clearly defined areas, use the proximity rule.

PROMPT FOR PHYSICAL ACTIVITY			
Taken from OSRAC-P Category H			
CODE	**Quick Definition**	**DEFINITION**	**KEY NOTES/EXCEPTIONS**
Teacher prompts increase		There is an explicit prompt by the teacher to increase or maintain activity levels	Teacher prompts the focal child to engage in or maintain PA • I.e. teacher holds the child's hand while running, teacher is leading a group of children (with focal child) in exercises and says "March around the circle like me"
Teacher prompts decrease		There is an explicit prompt by the teacher to decrease activity levels	Teacher prompts the focal child to stop or decrease PA • I.e. teacher physically stops focal child from riding a tricycle
Peer prompts increase		There is an explicit prompt by a peer to increase or maintain activity levels	Peer prompts the focal child to engage in or maintain PA • I.e. peer takes focal child's hand and starts running across playground
Peer prompts decrease		There is an explicit prompt by a peer to decrease activity levels	Peer prompts the focal child to stop or decrease PA • Examples given are verbal
None	No prompt	No explicit prompt	Child was not explicitly prompted to -/+ physical activity (PA) or the teacher's prompt is instructional in nature and unrelated to PA • If the PA is part of a formal preschool game, imitation of physical activity should not be recorded as a prompt • If the teacher merely moves the child a short distance or instructs the child to move should not be recorded as a prompt This is the default if no physical prompt is observed (or if the physical prompt observed is not clear in meaning or intent)
Can't Tell	Cannot Tell	Unable to observe	Only code this if the focal child cannot be seen – i.e. focal child is not on the camera frame

Coding Rules for Prompt (OSRAC-P, pages 35-36)

- Prompts are explicit and observable teacher behaviours presented for the purpose of increasing or decreasing the likelihood of children's responding
- Types include a) verbal prompts b) modeled prompts c) physical prompts
- Simultaneous prompts should be coded as the higher priority person prompting
- Code prompts for the highest level of physical activity observed

SOCIAL PARTICIPATION			
New category; adapted from the Play Observation Scale (POS)			
Active Conversation with a Peer(s) **Active Conversation with Teacher(s)**	Conversation involves the verbal transfer of information to another person (either peer or teacher).	Conversation involves the verbal transfer of information to another person. Parallel and private-speech do not fall under this category as neither represents attempts at communication. Conversation is coded when a child is being spoken to by another child and is actively listening in order to respond or follow directions, and is also coded when more than one child shares laughter (eye contact must be made).	• A child who is listening to someone else's conversation but is not specifically being spoken to is coded as engaging in onlooker behavior instead of conversation. • Code only if this occurs outside of ongoing play behavior/activity (i.e. conversation has to seem 'out of the blue') • Conversation with teachers trumps conversation with children
Aggression	Non-playful agonistic interaction with another child	The child is demonstrating aggressive or violent behavior either towards an object (i.e. kicking an object out of frustration) or another person	• Indicated by previous events and facial expression, as well as context of the action. • AGRESSION TRUMPS OTHER FORMS OF SOCIAL PARTICIPATION • Includes taking toys from another child
Associative play	A group of children participate in similar or identical activities without formal organization	When the **child is interested in the people playing but not in coordinating their activities with those people**, or when there is no organized activity at all. There is a **substantial amount of interaction involved, but the activities are not in sync**	• A form of play in which a **group of children participate in similar or identical activities without formal organization**, group direction, group interaction, or a definite goal. **The children may borrow or lend toys or pieces of play equipment, and they may imitate others in the group, but each child acts independently**, as on a playground or among a group riding tricycles or bicycles (from http://medical-dictionary.thefreedictionary.com/associative+play) • The **child plays with other children**. The communication **concerns the common activity**; there is borrowing and loaning of play materials; following one another with trains or wagons; mild attempts to control which children may or may not play in the group. **All the members engage in similar activity, there is no division of labor, and no organization of the activity around materials, goal, or product**. The children do not subordinate their individual interests to that of the group(from http://www.education.com/reference/article/characteristics-social-play/) • Includes children being read to
Cooperative play		When **the child is interested both in the people playing and in the activity they are doing.** In cooperative play, the activity is **organized**, and participants have **assigned roles**. There is also increased self-identification with a group, and a group identity may emerge. Examples would be dramatic play activities with roles, like playing school, or a game with rules, such as freeze tag.	• Any **organized** recreation among a group of children in which activities are planned for the **purpose of achieving some goal**. It usually occurs among older children(from http://medical-dictionary.thefreedictionary.com/cooperative+play) • The child plays in **a group that is organized for the purpose of making some material product, striving to attain some competitive goal, dramatizing situations of adult and group life, or playing formal games**

			(from http://www.education.com/reference/article/characteristics-social-play/)
Imitation		A child is observing and replicating another's behavior	
Onlooker Behaviour	Child watches but does not participate in an activity	The child watches the activities of others but does not enter into an activity. S/he may also offer comments, or laugh with the other children, but does not become involved in the actual activity	Code 'photo-voice' play activity as 'onlooker' behaviour
Parallel	The child plays beside, or in the company of, other children but does not play with his/her companions	The **child plays independently**; however, the activity often, though not necessarily, brings him/her within three feet of other children. If **the child is very attentive to others while playing independently**, parallel play is coded regardless of the distance between the focal child and the other children. S/he is **often playing with toys that are similar to those that the children around him/her are using**. The child seems to be **somewhat aware of, and attentive to, his/her playmates**.	Frequently engages in "parallel speech" (i.e., verbalizing his/her own thoughts for the benefit of the other children).
Unoccupied Behaviour	The child does not demonstrate focus or intent.	**The child does not demonstrate focus or intent**. Examples include observations of the child is staring blankly into space, wandering with no specific purpose, or only slightly interested, if at all, in ongoing activities. If the child is engaging in a functional activity (e.g., twisting hair or fiddling with an object) but is not attending to the activity, then the child is coded as being unoccupied	Generally, there are two types of unoccupied behaviors: (1) the child is staring blankly into space; or (2) the child is wandering with no specific purpose, only slightly interested, if at all, in ongoing activities.
Solitary	Playing alone at a distance from other children	The child **plays apart** from other children at a **distance greater than three feet (one meter)**. S/he is usually **playing with toys that are different from those other children are using**. The child is centered on his/her own activity **and pays little or no attention to any children** in the area.	If the child is playing in a small area the three-foot rule is often not applicable. In such cases the observer must rely upon the relative attentiveness of the child to others in his/her social milieu Solitary vs. Parallel Play: As previously mentioned, a distance of three feet (one meter) is considered to distinguish between solitary and parallel play. However, the three-foot proximity rule is not absolute. In some situations, the observer must consider other factors when deciding whether to code a behavior as solitary or parallel Note that a child can be engaged in solitary play even when in a group
Can't Tell			Only coded when the child cannot be seen on camera

Coding Rules:

- Low social participation to High Social Participation:
- Unoccupied → Solitary → Onlooker → Imitation (solely observation) → Parallel (observation with some interest) → Associative (interest and engagement with no rules) → Cooperative (interest and engagement with rules) → Conversation with peer → Conversation with Adult → Aggression
- If the play behavior is not clear in the context default to the lower level of social participation
- If the same children are interacting for a period of time, the social participation remains the same until: 1) Children physically part from each other, 2) Group dynamics change (addition/deletion of other individuals), 3) Other visible change to group or context.

Appendix J: "Evaluation of Play-Based Preschool Recreation Program: Exploring the Impact of Community Investment in Play-Based Learning on Health and Health Equity" – Research Questions

The research questions guiding the broader Love2Play Study included (Nykiforuk & Hewes, 2014a, p. 2):

1. What are the similarities and differences between children's play behaviours and perceptions about 'play and health' in the Love to Play space in comparison to two traditional preschools in the Strathcona County?
2. How do children play in their Love to Play or traditional preschool setting? How are their play activities and behaviours influenced by the design of their play environment? What is the relationship between characteristics of the play environment and: (a) opportunities to actively engage in different kinds of play; (b) nature of social interactions in play; (c) challenge and risk of taking; (d) how and when children exercise choice and control; (e) creative manipulation of space and loose parts; (f) the nature and duration of play episodes?
3. How do children describe and represent their health and their play experiences in their preschool?
4. What are staff perceptions and experiences of children's play and health in their preschool?
5. What are parent's perceptions and experiences of children's play and health in their preschool?
6. Do the conditions of the Love to Play space support sustained episodes of child-directed free play, relative to the traditional preschool play environments?