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The Influence of the Childcare Environment on Physical Activity among Preschool-Aged Children: A Feasibility Study

Leigh M. Vanderloo
The University of Western Ontario

Supervisor
Dr. Patricia Tucker
The University of Western Ontario

Graduate Program in Health and Rehabilitation Sciences
A thesis submitted in partial fulfillment of the requirements for the degree in Master of Science

THE INFLUENCE OF THE CHILDCARE ENVIRONMENT ON PHYSICAL ACTIVITY AMONG PRESCHOOL-AGED CHILDREN: A FEASIBILITY STUDY

(Spine title: Childcare Environment and Preschoolers' Physical Activity)

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by

Leigh Mary Vanderloo

Graduate Program in Health and Rehabilitation Sciences

A thesis submitted in partial fulfillment of the
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THE UNIVERSITY OF WESTERN ONTARIO
The School of Graduate and Postdoctoral Studies

Certificate of Examination

Supervisor

_____
Dr. Patricia Tucker

Supervisory Committee

_____
Dr. Jennifer Irwin

_____
Dr. Andrew Johnson

_____
Dr. Jamie Melling

Examiners

_____
Dr. Jamie Melling

_____
Dr. Jeffrey Holmes

_____
Dr. Aniko Varpalotai

The thesis by

Leigh Mary Vanderloo

entitled:

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Chair of the Thesis Examination Board

Abstract

This study sought to: (1) measure moderate-vigorous physical activity (PA) levels of a sample of preschoolers; (2) assess which attributes (e.g., space, equipment, policies) within centre-based childcare environments influence PA; and, (3) pilot the methodology to ensure the feasibility of undertaking a full-scale study. Thirty-one preschoolers from five childcare centres across London, Canada participated. Actical® accelerometers were worn by participants for one day during childcare hours to assess activity levels using a 15-second epoch length. The Environment and Policy Assessment and Observation instrument was used to conduct a full-day evaluation of the childcare environment. On average, participants engaged in 11.45 minutes of moderate-vigorous PA. Sedentary opportunities, portable and fixed play equipment, and staff behaviour accounted for 49.3% of the variability in moderate-vigorous PA, with sedentary opportunities, fixed play equipment, and staff behaviours displaying an inverse relationship. Results indicate the critical role the childcare environment plays in promoting PA among preschoolers.

Keywords: preschooler, physical activity, accelerometer, childcare environment, health promotion, feasibility study

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Chapter 1: Introduction and Literature Review

The pervasiveness of childhood overweight (i.e., BMI greater than 85th percentile) and obesity (i.e., BMI greater than 95th percentile) is distressing (Center for Disease Control and Prevention/National Center for Health Statistics, 2000). With obesity rates reaching epidemic proportions worldwide (World Health Organization [WHO], 2011), it is evident that this issue remains a major public health concern. Researchers suggest that not only is the prevalence of obesity increasing rapidly across the globe, but that these escalations are beginning in early childhood, especially among those living in developed and most developing countries (Lobstein, Baur, & Uauy, 2004; Wang & Lobstein, 2006). Within Canada, the incidence of childhood obesity has tripled over the past three decades (Shields, 2005), with close to one-third of children now being classified as overweight or obese (Tremblay, Katzmarzyk, & Willms, 2002). Younger children are not immune to this epidemic. In 2010, the World Health Organization reported that approximately 43 million children under the age of 5 were overweight or obese, suggesting that even preschool-aged children (i.e., those aged 2.5-5 years) are affected by this problem. Similar to this international trend, national data reveal that 15.2% and 6.3% of Canadian children aged 2 to 5 years are overweight and obese, respectively (Olstad & McCargar, 2009; Shields, 2006). In Ontario, statistics reflect a similar status, with the prevalence of overweight and obesity among this age group falling between 8 and 19% (Canning, Courage, & Frizzell, 2004; Canning, Courage, Frizzell, & Seifert, 2007; Gabel, 2011; He & Sutton, 2004). These statistics indicate that children are becoming overweight at very young ages, and consequently, early intervention is a key step in addressing the development of healthy children and the prevention of this health condition.

Health Consequences of Obesity

Childhood obesity has been linked to a plethora of co-morbidities, including type 2 diabetes (Daniels, 2006), glucose intolerance (Nassis et al., 2005), hyperlipidemia and hypertension (Daniels, 2006; Freedman, Serdula, Scinivasan, & Berenson, 1999), asthma (Leung & Robinson, 1990), and sleep apnea (Daniels, 2006; Leung & Robinson, 1990). As well, overweight and obese children tend to physically mature earlier than their non-overweight counterparts (Canning & Mayer, 1966; Lee, 2007), augmenting the possibility of both increased corpulence in adulthood (Garm LaValle, Rosenberg, & Hawthorne, 1986; Van Length, Kemper, & van Mecehelen, 1996a), and higher levels of abdominal fat in females (Van Lenthe et al., 1996b). Studies also show that childhood overweight and obesity may have devastating impacts on the musculoskeletal system (Wearing, Hennig, Bryne, Steele, & Hills, 2006). Persistent and excess weight-bearing associated with childhood obesity may hinder normal movement patterns, subjecting children to increased pain and injury (Dowling, Steele, & Bauer, 2004; Hills & Wahlqvist, 1994).

Of particular importance is the well-documented relationship between childhood obesity and coronary heart disease (Celermajer & Ayer, 2006; Freedman, Khan, Dietz, Srinivasan, & Berenson, 2001; Timmons, Naylor, & Pfeiffer, 2007). According to Timmons and colleagues (2007), signs of atherosclerosis may be present in children as young as 2.5 years of age. With the prevalence of childhood obesity on the rise, heart disease becomes even more problematic as cardiac risk factors present in childhood have the tendency to continue into adulthood (Celermajer & Ayer, 2006; Freedman et al., 2001). The correlation between childhood obesity and heart disease are particularly disturbing given that Whincup and Deanfield (2005) found that the heart-related

consequences of obesity are cumulative; the longer one is obese, the more detrimental the health outcomes.

In addition to the adverse physiological health consequences, childhood obesity has also been associated with psychological problems, including low self-esteem (French, Story, & Perry, 1995; Friedman & Brownell, 1995; Wang, Wild, Kuhle, & Kip, 2009), psychosocial stress (Dietz, 1996; Puhl & Latner, 2007), and poor body image (Friedman & Brownell, 1995). Moreover, childhood obesity has been linked to social problems such as social stigmatization and discrimination (Janssen, Craig, Boyce, & Pickett, 2004; Sjöberg, Nilsson, & Leppert, 2005). For instance, bullying was highlighted as a social consequence of obesity, where the extent of bullying was positively correlated with weight (Janssen et al., 2004). The far-reaching consequences of childhood obesity are distressing. Individuals who suffer from overweight and obesity in early years are less likely to marry as adults (Janssen et al., 2004), and may also face inequities in wages and promotions in comparison to their peers who fall within a normal weight range (Loh, 1993).

It is well understood that childhood obesity is related to many physical and psychosocial health problems (Williams et al., 2002). However, what is particularly alarming is that obesity and obesity-related illnesses present in childhood tend to persist into adulthood (Celermajer, 2006; Serdula, Ivey, Coates, Freedman, & Williamson, 1993). According to the Bogalusa Heart Study (Freedman et al., 2001), participants who were overweight as a child were more obese than those who became overweight later in life. In fact, further research by Freedman et al. (2005) estimated that, in comparison to their healthy weight peers, overweight children between the ages of 2 and 5 years were 4 times more likely to be overweight in adulthood. Given that the preschool period has been

identified as a critical time for growth and development (Dietz, 2000; Whitaker, Pepe, Wright, Seidel, & Dietz, 1998), it is imperative that children develop healthy habits early. These behaviours will not only set the foundation for a healthy childhood free of the aforementioned obesity-related health problems, but will also serve as the basis for a healthy lifestyle in later life (Simons-Morten, Parcel, O'Hara, & Steven, 1998).

Physical Activity: Overall Benefits and Current Levels of Participation Among Children

Physical activity, defined as any bodily movement that results in energy expenditure above resting levels (Caspersen, Powell, & Christenson, 1985), is central to the health and well-being of children, as it sets the foundation for an active adult life (Cragg & Cameron, 2006). Marcus and colleagues (2000) found that children, even as young as 2 years of age, can benefit from engaging in daily physical activity. Not surprisingly, physical activity plays a crucial role in combating childhood overweight and obesity (Marcus et al., 2000; Warburton, Nicol, & Bredin, 2006), and is associated with many positive health benefits. Notably, regular physical activity has been linked to improving motor skill development (Barnett, Beurden, Morgan, Brooks, & Beard, 2009), lowering triglyceride values, decreasing levels of low-density lipoprotein (LDL) cholesterol and increasing levels of high-density lipoprotein (HDL) cholesterol (Sääkslahti et al., 2004), as well as slowing the development of cardiovascular disease while improving various cognitive and psychosocial factors (Timmons et al., 2007).

Despite the aforementioned health benefits, only 7% of children and youth are sufficiently active to meet the recently revised Canadian physical activity guidelines (Colley, Garriguet, Janssen, Craig, Clarke, & Tremblay, 2011). These guidelines recommend that children and adolescents (aged 5-17 years) should work towards

accumulating 60 minutes per day of moderate-vigorous physical activity (MVPA) in order to reap positive health benefits (Canadian Society of Exercise Physiology [CSEP], 2011a, 2011b; Warburton et al., 2011). Not surprisingly, the *2012 Active Healthy Kids Canada Report Card on Physical Activity for Children and Youth*, a synthesis of Canadian research on physical activity behaviours of children and youth, gave Canadian children a failing grade ("F") for the sixth straight year due to their poor levels of physical activity (Active Healthy Kids Canada, 2012). With such dismal activity levels, it is clear that children are not expending the energy required to develop healthy hearts, lungs, and muscles, or to maintain a healthy weight (Active Healthy Kids Canada, 2008). Consequently, should the activity levels of children and youth not increase; children will continue to remain at risk for adult obesity and its related co-morbidities (Nader, Bardley, Houts, McRitchie, & O'Brian, 2008).

The Significance of Physical Activity for Preschool-Aged Children

The preschool population has been identified as a particularly important cohort on which to focus, as obesity can be seen among children as young as 2 years of age (Canning et al., 2004; He & Sutton, 2004). The importance of intervening during the preschool years is further supported by the fact that obesity and its associated health complications (Guo, Ruchoe, Chumlea, Gardner, & Siervogel, 1994), as well as physical activity behaviours established in early childhood (Malina, 2001), tend to continue through one's lifetime. Despite the association between increased preschool physical activity and decreased risk of obesity (Moore et al., 2000; Trost, Sirard, Dowda, Pfeiffer, & Pate, 2003), preschool-aged children engage in high levels of sedentary behaviour, with increased inactivity rates among female preschoolers (Oliver, Schofield, & Kolt, 2007; Tucker & Irwin, 2008). In fact, as few as 36% of Canadian 2-3 year olds, and only

44% of 4-5 year olds engage in regular physical activity (Human Resources Development Canada & Statistics Canada, 2007). When considering actual minutes spent participating in physical activity, Tucker (2008) conducted a systematic review of 39 international studies and found that only 54% of studies reported that preschool-aged children participated in a minimum of 60 minutes of physical activity per day. Reilly and colleagues (2004) and Vasquez and colleagues (2006) found that preschool-aged children engage in MVPA for approximately 20 to 25 minutes per weekday, and only 32 minutes per weekend day. Perhaps even more alarming is the work by Temple, Naylor, Rhodes, and Wharf Higgins (2009) which reported minutes of physical activity being as minimal as 12.7 minutes per day among their preschool-aged sample. Given the negative relationship between physical activity levels and age, this lack of physical activity participation among preschoolers is disconcerting (Salmon, Timperio, Cleland, & Venn, 2005; Taylor et al., 2009; Trost et al., 2003). Furthermore, in addition to affecting future weight status, the findings of Brown and colleagues' (2009) study suggest that weight problems in early life greatly restrict physical activity levels. These results are echoed by Trost et al. (2003), who suggested overweight preschoolers will continue to make gains in adiposity, should their current levels of physical activity not improve. Given that the majority of behaviours of obese school-aged children were developed early in life (Reilly, 2008), increased activity levels among preschool-aged children should be viewed as a priority. In turn, physically active preschoolers will serve as the forerunners to healthy school-aged children, adolescents, and adults. Ignoring the significance of preschool physical activity will prove detrimental in terms of overall health, well-being, and development.

Types of physical activity. The activity behaviours of preschool-aged children are characterized by sporadic bursts of omnidirectional movement with random periods of rest (Bailey et al., 1995; Oliver et al., 2007). Contrary to adult-directed activities (Gimitrova & Gmitrov, 2003), physical activity among preschoolers is more typically described as free and unstructured child-directed play (Burdette, Whitaker, & Daniels, 2004). Although correlated with many developmental benefits, child-directed play may also increase the number of opportunities available for preschool-aged children to engage in sedentary activities (such as screen viewing, passive games, and various sitting activities; Burdette et al., 2004), and therefore, stresses the importance of incorporating some adult led activities into the daily activity patterns of young children. Moreover, given that the highest levels of preschooler physical activity occur outdoors (Baranowski, Thompson, DuRant, Baranowski, & Puhl, 1993; Cosco, Moore, & Islam, 2010; Hinkley, Crawford, Salmon, Okely, & Hesketh, 2008), outdoor play should also be included in their daily activity patterns as a means of maximizing their activity output.

Physical Activity Guidelines for Preschool-Aged Children

As previously noted, the physical activity levels of preschoolers appear quite low (Human Resources Development Canada & Statistics Canada, 2007; Reilly et al., 2004; Temple et al., 2009; Tucker, 2008; Vasquez et al., 2006). When we consider these activity levels in the context of recent physical activity prescriptions for the preschool population, the findings are even more deterring. Specifically, new physical activity guidelines in Canada, the United Kingdom, and Australia all purport that preschoolers should engage in 180 minutes of physical activity per day at any intensity (Australian Government, 2010; CSEP, 2012a; Start Active, Stay Active, 2011; Tremblay, LeBlanc, Carson, Choquette, Connor Gorber, Dillman, Duggan, Gordon, Hicks, Janssen, Kho, Latimer-Cheung,

LeBlanc, Murumets, Okely, Reilly, Spence et al., 2012), and the National Association for Sport and Physical Education (NASPE), in the United States, encourages 120 minutes of daily activity (NASPE, 2002). Evidently, activity behaviours of preschoolers are well below the suggested international guidelines. It is hoped that the recent development and application of such guidelines will provide much needed physical activity support and guidance for health practitioners, childcare providers, and parents/guardians (CSEP, 2012a; Tremblay, LeBlanc, Carson, Choquette, Connor Gorber, Dillman, Duggan, Gordon, Hicks, Janssen, Kho, Latimer-Cheung, LeBlanc, Murumets, Okely, Reilly, Spence et al., 2012).

The Childcare Environment

National data indicate that approximately 80% of preschool-aged children with studying or employed mothers attend some form of childcare or early childhood education program regularly (Cleveland, Forer, Hyatt, Japel, & Krashinsky, 2008). Based on the National Longitudinal Survey of Children and Youth (Human Resources Development Canada & Statistics Canada, 2007), researchers found that in 2002-2003, 54% of children between the ages of 6 months and 5 years were enrolled in childcare outside of the home; a significant increase from the 42% of children in childcare in 1994-1995 (Bushnik, 2006). Moreover, these children are spending on average, approximately 29 hours per week in non-parental care (Bushnik, 2006; Canadian Fitness and Lifestyle Research Institute, 2008). The large proportion of children who attend childcare regularly, coupled with the number of hours preschoolers spend in this environment, suggest that this venue would serve as an ideal site to promote improved physical activity behaviours among this unique population. The appropriateness of this venue is further supported by Benjamin et al.'s (2008) research which contends that preschool-aged children learn

many lessons while in care, including those associated with screen-viewing, physical activity, and nutrition behaviours.

Unfortunately, the childcare environment has received limited attention in academia. In fact, the 2010 Active Healthy Kids Canada report card draws attention to this existing knowledge gap. To date, limited national and international scholarly work has investigated the correlations between healthy development and physical activity in early childhood (Active Healthy Kids Canada, 2010). Preliminary international research suggests that the childcare environment has a strong influence on the physical activity patterns and levels of preschool-aged children (Cosco et al., 2010; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004), accounting for close to 50% of the variation in physical activity (Pate et al., 2004). In fact, research suggests that in comparison to demographic factors such as age, gender, and ethnicity, the childcare centre has proven to be a stronger predictor of physical activity (Pate, McIver, Dowda, Brown, & Addy, 2008). Similarly, the findings of a recent meta-analysis suggest that early learning centres (e.g., childcare facilities, nursery schools, etc.) are an effective venue to support MVPA among preschoolers (Gordon, Tucker, Burke, & Carron, under review).

Of the few studies exploring this relationship, specific characteristics within the childcare environment have been identified as contributing to the appropriateness of this setting for encouraging physical activity. Such attributes include gross motor equipment (e.g., balls, tricycles, climbers), sufficient indoor and outdoor play space, and the childcare providers' level of training (Cardon, Van Cauwenberghe, Labarque, Haerens, & De Bourdeaudhuij, 2008; Dowda, Pate, Trost, Almeida, & Sirard, 2004; Hannon & Brown, 2008; Pate et al., 2008). A recent study by van Zandvoort, Tucker, Irwin, and Burke (2010), which looked at childcare providers' perspectives of engaging children in

physical activity identified music, resources, and the childcare providers themselves as facilitators to improving preschoolers' participation in physical activity. In addition, some studies also reference the importance parents place on the childcare's ability to provide their children with sufficient involvement in physical activity (Irwin, He, Sangster Bouck, Tucker, & Pollett, 2005; Tucker, Irwin, Sangster Bouck, He, & Pollett, 2006). Despite this particular setting being acknowledged as influential with regards to the activity behaviours of preschoolers, Canadian data assessing this relationship are lacking. Moreover, contrary to popular belief that preschoolers are highly active (Pate et al., 2008), physical activity levels within the childcare setting are low (Pate et al., 2004, 2008), with one study reporting that an alarming 89% of the preschoolers' day is spent in inactivity (Brown et al., 2009). Similarly, Temple and colleagues (2009) found that children enrolled in home-based childcare facilities spent only a mere 1.76 minutes per hour engaged in MVPA, suggesting that sedentary behaviours in childcare centres are high. Given that long periods of inactivity are common among this age group (Alpert, Field, Goldstein, & Perry, 1990; He, Irwin, Sangster Bouck, Tucker, & Pollett, 2005; Pate et al., 2004; 2008), coupled with the fact that childcare policies and regulations vary dramatically among Canadian provinces (Vanderloo, Tucker, Ismail, & van Zandvoort, 2012), greater attention is required to address the low levels of physical activity among Canadian preschoolers in childcare. Understanding the current physical activity levels of preschool-aged children as well as the environment in which these behaviours occur will greatly assist public health professionals, childcare providers, and early learning specialists in encouraging and supporting appropriate amounts of physical activity among this unique cohort.

Positioning within a Theoretical Health Promotion Model

The present study aligns well with the Precede-Proceed model of health promotion program planning (Green & Kreuter, 2005). Composed of eight phases, the Precede-Proceed model is premised by an initial identification of the desired outcome, an assessment of possible causes responsible for the health concern, followed by the development and evaluation of an intervention program intended to achieve the desired outcome (Green & Kreuter).

Phases 1 through 4 comprise the 'precede' portion of the model (Green & Kreuter, 2005). Phase 1, *social assessment and situational analysis*, seeks to elicit an understanding of the quality of life from the population of interest. Phase 2, *epidemiological assessment*, involves program planners drawing on literature which looks to behavioural, environmental, and genetic factors in an attempt to identify and rank possible health goals and problems that may further explain the issues collected in Phase 1, in addition to providing prevalence data. Phase 3, *educational and ecological assessment*, identifies and categorizes which behaviour-influencing items are considered predisposing, reinforcing, and enabling factors. Finally, Phase 4, *administrative & policy assessment and intervention alignment*, looks to match interventions with the desired outcomes described in the previous phases, in addition to determining the feasibility of creating and implementing the proposed program (Green & Kreuter).

The final four phases make up the 'proceed' portion of the model (Green & Kreuter, 2005). Phase 5 speaks to the *implementation* phase of the model, where appropriate intervention methods and strategies are selected. Lastly, Phases 6 (*process*), 7 (*impact*), and 8 (*outcome*) speak to the various levels of program evaluation (Green & Kreuter).

The current study aligns within the ecological assessment (Phase 3) of this model. Green and Kreuter (2005) contend that the presence of all three types of factors (i.e., predisposing, enabling, and reinforcing) is necessary to encourage, facilitate, and sustain behaviour change. Once identified, these factors will provide valuable feedback for future health promotion initiatives by serving as program objectives and/or targets for change (Green & Kreuter). Specific to this study, the ecological approach of objectively assessing the childcare environment will not only prove beneficial in identifying which areas require improvement, but also which attributes serve best to improve the physical activity levels of preschoolers. The undertaking of an ecological assessment to understand which childcare environmental factors impact preschoolers' physical activity behaviours may result in modifications to the childcare setting in service of supporting active behaviours.

Study Rationale

Given that activity levels tend to decrease with age, the importance of developing strong physical activity habits early in life is vital (Salmon, Timperio, Cleland, & Venn, 2005; Taylor et al., 2009; Trost et al., 2003). Currently, there is a lack of Canadian research involving the use of objective tools to assess physical activity levels among preschool-aged children (Timmons et al., 2007; Tucker & Irwin, 2008). Only three Canadian studies to date have examined the physical activity behaviours of this age group (Gabel, Obeid, Nguyen, Proudfoot, & Timmons, 2011; Temple et al., 2009; Tucker & Irwin, 2008), and one relied on parental and childcare provider reports of activity, which have the tendency to overestimate preschoolers' physical activity levels and have demonstrated limited validity (Bates, 2006; Pfeiffer, McIver, Dowda, Almeida, & Pate, 2006; Tucker & Irwin, 2008).

Moreover, the 2010 Active Healthy Kids Canada report card highlights the need for objectively-measured data on Canadian preschoolers' physical activity behaviours and recommends the childcare facility as a reasonable site to support physical activity among these young Canadian citizens (Active Healthy Kids Canada, 2010). This recommendation, coupled with the fact that low levels of physical activity in childhood are predictive of future obesity and overweight (Twisk, Kemper, & van Mecehelen, 2002), in addition to the large percentage of Canadian preschoolers attending childcare, suggest that research efforts should focus on the childcare environment as a point of intervention.

Purpose of Study

The purpose of this feasibility study was to assess the influence of the childcare environment on preschoolers' objectively-measured physical activity levels while in care. Specifically, this study sought to: (1) objectively measure the moderate-vigorous physical activity levels of a sample of preschool-aged children during childcare hours; (2) objectively assess which attributes (e.g., indoor/outdoor space, equipment, physical activity policies) within the centre-based childcare environment influence physical activity; and (3) pilot the proposed methodology, recruitment strategy, and measurement tools to ensure the feasibility of undertaking a full-scale, city-wide study with a larger sample of preschool-aged children attending a variety of early learning environments.

For the purpose of this study, *childcare* refers to centre-based facilities where the care of children occurs in a school-like setting with typically no more than 16 children per classroom. Because centre-based childcare facilities (as compared with home-based childcare) are regulated by the Ontario Day Nurseries Act, these facilities may have greater potential for physical activity infrastructure (Cradock, O'Donnell, Benjamin,

Walker, & Slining, 2010; Day Nurseries Act, 1990; Lawlis, Mikhailovich, & Morrison, 2006).

Chapter 2: Methods

Study Design and Procedures

To examine the activity levels of preschoolers while attending childcare, a cross-sectional feasibility study was undertaken. This design was deemed appropriate to assess preschoolers' physical activity levels and the childcare environment attributes in a minimally invasive manner. Moreover, this design allowed for researchers to assess the practicability of conducting this study with a larger sample of preschool-aged children attending a variety of childcare facilities.

Recruitment strategies and study sample. Recruitment took place between August and October 2010. Thirteen publicly-funded childcare centres from one of the largest childcare organizations in London, Ontario were invited to partake in this study, and five agreed to participate. Only one classroom per centre was recruited for participation given that local childcare facilities vary in size and because researchers could only accommodate one classroom per data collection day.

Through previous studies and interactions, the research team developed a research affiliation and maintained support from the organization providing the centres within the sampling frame of the present study. The Vice-President of childcare services was approached to invite the Directors of all the childcare centres to an informal information session about the study in June 2010. The purpose of this meeting was to discuss the study design and procedures, as well as to provide the Directors with an opportunity to ask questions and voice concerns. Following the information session, all Directors demonstrating an interest in participating in the study were contacted (initially through email, with follow-up phone contact) to invite one of their preschool classrooms to

participate in the study. Although numerous centres showed an initial interest in participating, five centres confirmed a date for data collection with the researchers.

The Directors served as gatekeepers to accessing the childcare staff as well as the parents/guardians of the preschool children. The active involvement of childcare providers in the recruitment process and data collection was particularly important in facilitating parental/guardian buy-in and reducing attrition. Once approval from each participating facility had been achieved, childcare providers were asked to assist with participant recruitment.

Parents/guardians were provided a Letter of Information (Appendix A) outlining the purpose of the study, the study procedure, as well as possible benefits and risks of participating. Given the young age of the study participants, parental/guardian consent (Appendix B) was obtained prior to study involvement. Parents/guardians not wishing their children to participate in the study were asked to sign a separate portion of the consent form which allowed their children to be indirectly observed in the classroom. For the parents/guardians who did not consent to their children participating in the study or being observed in the classroom, their children were separated from the rest of the group and their behaviours were not observed by the researchers. Parents/guardians of participants were given a small token of appreciation, a $10 gift certificate to a local grocery store, as well as a letter of thanks at the conclusion of data collection (Appendix C). The Directors of the participating childcare centres also received a letter of thanks (Appendix D) and a $50 gift certificate to a child's education store as a token of appreciation at the conclusion of data collection. All study procedures and related documents were approved by the Office of the Research Ethics Board at The University of Western Ontario (Appendix E).

Using a convenience sampling strategy, 31 preschoolers received parent/guardian consent and were present on the day of data collection from the five publicly-funded centre-based childcare facilities. This sample size was sufficient to test the methodology, to derive general effect sizes, and to result in a large enough sample of preschool-aged children to draw conclusions from the study's findings.

Inclusion criteria. For the purposes of this study, children were included if they were: (a) between the ages of 2.5 and 5 years; (b) enrolled in a participating centre-based childcare facility; and (c) enrolled in the preschool classroom selected to participate in the study. In centres with more than one eligible preschool classroom, a single classroom was selected by the Directors. Individuals who met all the criteria of the proposed study, in addition to having parent/guardian consent, were eligible to participate.

Instruments and Tools

The following instruments were used to carry out the current study:

Actical® (MiniMitter, Oregon) accelerometers. Having demonstrated acceptable reliability and validity in measuring preschoolers' physical activity (Cliff, Reilly, & Okely, 2009; Pate, O'Neill, & Mitchell, 2010; Pfeiffer et al., 2006), Actical® accelerometers were used to collect objective physical activity data. Once formatted to the child's height, weight, and age, the Actical® accelerometer provided detailed information on movement counts and physical activity intensities, as well as the dates and times during which these activities occurred. These small (28mm x 27mm x 10mm), lightweight (17.5g), and waterproof omnidirectional motion sensors proved useful in measuring physical activity patterns and intensities among children (Colley, Connor Gorber, & Tremblay, 2010; Pate et al., 2010; Pfeiffer et al., 2006). As suggested in the literature (Obeid, Nguyen, Gabel, & Timmons, 2011; Temple et al., 2009), a time

sampling interval (i.e., epoch length) of 15-seconds was used as a means of capturing the short, sporadic bursts of preschoolers' physical activity. Furthermore, a 15-second epoch length was chosen given that longer epoch lengths tend to mask short bursts of activity (Nilsson, Ekelund, Yngve, & Sjöstörm, 2002; Trost, McIver, & Pate, 2005), and may also result in the misclassification of activity intensity, as bouts of high- and low-intensity activities within the same epoch length may be combined when averaged over a 1-minute period (Cliff et al., 2009).

Based on the omnidirectional movement patterns that typically characterize physical activity among this unique population, the use of Actical® accelerometers (and their ability to measure activity in more than one plane) was appropriate for this study (Oliver et al., 2007). Using accelerometry data, the proportion of the day that individuals spend in sedentary, light, moderate, and vigorous physical activities was identified.

Environment and Policy Assessment and Observation instrument (Appendix F). Developed by Ward and colleagues (2008), the validated Environment and Policy Assessment and Observation (EPAO) instrument was used to objectively assess childcare policies as well as the nutrition and physical activity environment within the childcare facility (Ball, Benjamin, Hales, Marks, McWilliams, & Ward, 2005; Benjamin et al., 2007; Ward et al., 2008). The physical activity portion of this one-day tool was used to measure the following eight physical activity subscales: Staff Behaviours, Sedentary Environment, Sedentary Opportunities, Portable Play Environment, Fixed Play Environment, Physical Activity Policies, Active Opportunities, and Physical Activity Training & Education (Ball et al., 2005; Ward et al., 2008; see Table 1 for a description of the physical activity subscales). In addition to the day-long observation of the childcare environment, a document review was also carried out. The following documents were

Table 1

Description of Physical Activity Subscales from Environment and Policy Assessment and Observation (EPAO) Instrument

Subscale	Description
Staff Behaviours	Interactions between staff and children that may promote or discourage physical activity behavior; includes restricting active play, joining in activity, positive statements about physical activity (all Y/N)
Sedentary Environment	Items in the physical environment that may promote or discourage physical activity behavior; includes TV in room, computer in room, physical activity displays, posters, and books (all Y/N)
Sedentary Opportunities	Daily opportunities that may result in little or no MVPA; includes seated for 30 or more minutes (Y/N), TV viewing (minutes TV on), video game playing (Y/N)
Portable Play Environment	Presence of several types of play equipment that can be transported and used in various locations; includes jumping or twirling equipment, balls, hula hoops, and riding toys (all Y/N)
Fixed Play Environment	Equipment and space that is anchored or fixed within the center environment; includes climbing structures (Y/N), balancing surfaces (Y/N), running space (Y/N), and indoor play space (4-point rating)
Physical Activity Policies	Child care center written policies (all Y/N) related to: active and inactive time, TV use/viewing, play environment, supporting physical activity, and physical activity education.
Active Opportunities	Daily opportunities that may result in more MVPA; includes structured physical activity (# of occasions), outdoor play (# of occasions), and total minutes of active opportunity (any time play that *could* be rated as MVPA was an option or part of a structured lesson).
Physical Activity Training and Education	Training and education for children, staff, and/or parents that may increase participation or knowledge related to physical activity behavior; includes

	physical education curriculum, physical education observed, physical activity training for staff, physical activity education for parents (all Y/N)

Note. MVPA = moderate-vigorous physical activity; Y/N = yes/no. Reprinted with permission of the authors (D. Hales as corresponding author – personal communication, July 13, 2012)

requested from the childcare Directors for examination: physical activity policies; safety check documentation; physical activity curriculum; training materials for staff on physical activity; educational material for parents/guardians on physical activity; and fundraising materials (Ward et al., 2008).

Parent/guardian demographic questionnaire (Appendix G). Completed by parents/guardians prior to data collection, this questionnaire sought family and demographic information, including but not limited to: child's age, sex, height (inches), weight (pounds), household income, and family status.

Parents/guardians were asked to complete, at a minimum, the first four questions of the demographic questionnaire in order for their child to participate in the study (i.e., those children whose parents did not complete these questions, but did provide parental consent to participate were unable to participate in this study). These questions asked parents/guardians to report their child's age, sex, height, and weight. These measures were required prior to the onset of data collection as the accelerometers needed to be programmed for each individual child.

Given that some researchers believe that measuring heights and weights of children in non-clinical settings can result in negative unintended consequences for the child (e.g., stigmatization, self-esteem issues, etc.; Forman & Woods, 2009), parent-report was used in this study.

Data Collection

Data was collected between October and November 2010. Participating preschoolers were asked to wear the accelerometers for one day during childcare hours. At the start of the day of data collection, a researcher arrived on site to fit each participant with his or her individually-programmed accelerometer. Each accelerometer was securely

fastened to the participating child's hips using an elastic belt. The accelerometers were removed at end-of-day prior to the children leaving the centre.

The EPAO instrument was also administered by the researcher on the day of data collection. The researcher, who was present throughout the entire day, quietly and unobtrusively used this tool to assess and observe the childcare environment over the course of data collection. Data from the observational segment of the instrument concerning the physical activity subscales were tallied throughout the day during childcare hours only. As researchers suggest (Ward et al., 2008), the document review of the EPAO was completed following the day-long observation and consisted of examining the requested activity-related documents provided by the centre.

Data Analysis

All statistical analyses were performed using the statistical analysis software program SPSS (version 19). Based on the data collected from the parent/guardian demographic questionnaire, means, and standard deviations were calculated to describe the study's sample.

Data was downloaded from the accelerometers using Actical®-specific software and cleaned with the assistance of an Actical® accelerometer expert. With regards to analysis, Pfeiffer et al.'s (2006) preschooler physical activity cut points [sedentary activity (<50 counts·15 s^{-1}), light activity (≥50 ≤714 counts·15 s^{-1}·$epoch^{-1}$), moderate activity (≥715 ≤ 1410 counts·15 s^{-1}·$epoch^{-1}$), vigorous activity (≥1411 counts·15 s^{-1}·$epoch^{-1}$)] were applied in this study, where the collected activity data was compared against these population-specific cut points and then summed into minutes of daily activity. This information was then entered into SPSS to calculate the means and standard

deviations for time spent in sedentary, light, moderate, vigorous, and total activity. Based on a similar study conducted by Temple et al. (2009), only children with a minimum of four hours (240 minutes) of accelerometry data were included, as this wear time was deemed sufficient to evaluate the impact of the childcare environment on preschoolers' physical activity levels while in care. Moreover, rates of sedentary behaviour and physical activity per hour of wear time were calculated to account for the varying lengths of time participants spent in care.

To objectively assess which attributes within the childcare environment influenced physical activity, the results of the eight physical activity subscales from the EPAO instrument were tallied using a scoring tool (Appendix H) and specific guidelines provided by the tool's creators (Ward et al., 2008). All physical activity-related item responses from the observation and document review segment of the EPAO were converted to a three-point scale (ranging from 0 to 2), with items from the Sedentary Environment and Sedentary Opportunities subscales being reverse-scored. Individual scores for each subscale were calculated by averaging the ratings for the subscale-specific items and then multiplying by ten. A total physical activity environment score (ranging from 0 to 20) was calculated by averaging all the scores of the physical activity subscales, where the higher the score, the more supportive the environment with regards to physical activity. Similar to Bower et al.'s (2008) study, direct entry regression analyses were performed to describe the relationships between time spent in MVPA ($\geq$715 counts$\cdot$15 $s^{-1}\cdot epoch^{-1}$; dependant variable) and multiple independent variables (i.e., physical activity subscales from the EPAO tool, Total Physical Activity EPAO Score, and various participant characteristics).

Chapter 3: Results

Participant Demographics

The total number of eligible preschool-aged children enrolled in the five participating classrooms was 57, and 40 received parent/guardian consent to participate. However, on the day of data collection, two children refused to wear the accelerometer (therefore withdrawing from the study), and four children were absent, resulting in a response rate of 60%. In addition, the data of three participants were not included in the analysis because they did not wear the accelerometers for a minimum of four hours. Consequently, a total of 31 preschool-aged children (mean age = 4.10 years, *SD* = 0.85; 17 males and 14 females) from the five childcare centres participated in this study. The mean height of the participating children was 40.60 inches (*SD* = 3.59) and mean weight was 37.51 pounds (*SD* = 6.70). The number of children who participated from each centre ranged from 2 to 11 years. See Table 2 for complete participant demographic information.

Descriptive Analyses of Participants' Activity Levels

Accelerometry wear time on the day of data collection ranged from 246.00 to 561.00 minutes (mean = 451.77 minutes, SD = 81.12). Means and standard deviations for time spent in sedentary, light, moderate, moderate-vigorous, vigorous, and total physical activity are shown in Table 3. Based on these results, participants of this study spent, on average, 11.45 minutes engaged in MVPA and 132.60 minutes in total activity (i.e., total time spent in light, moderate, and vigorous activity). This translates to a mean rate of 1.54 minutes per hour (*SD* = 1.41) for MVPA and 17.42 minutes per hour (*SD* = 6.17) for *total* physical activity.

Table 2

Preschooler and Family Demographic Information (n = 31)

	N	*%*
Sex		
Male	17	54.8
Female	14	45.2
Preschooler's racial background		
White	23	74.2
African Canadian	1	3.2
Latin American	2	6.5
Asian	3	9.7
Other	2	6.5
Number of people in household		
2	2	6.5
3	10	32.3
4	14	45.2
5	5	16.1
Number of siblings		
0	10	32.3
1	15	48.4
2	4	12.9
3	0	0
4	1	3.2
Preschooler's family situation		
Single-parent	6	19.4
Double-parent	23	74.2
Other	1	3.2
Approximate yearly household income		
Less than $20,000	5	16.1
$20,000 - $59,999	7	22.6
$60,000 - $99,999	5	16.2
More than $100,000	4	13.0
Highest level of education completed by parent/guardian		
Some secondary school	1	3.2
Completed secondary school	2	6.5
Some college/university	3	9.7
Completed college/university	22	71.0
Completed graduate school	2	6.5

Preschooler's childcare status		
Part-time	16	51.6
Full-time	14	45.2
Parents' perceptions of their preschooler's activity levels during childcare hours		
Somewhat active	5	16.1
Very active	21	67.7
Do not know	4	12.9

Note. Some values shown in the table may not add up to 100% or n = 31 as some individuals chose not to answer certain questions.

Table 3

Summary of Participants' Physical Activity Levels in Minutes Per Day

Physical Activity Levels	*M*	*SD*
Sedentary	305.37	84.10
Light	121.15	50.20
Moderate	8.86	7.86
Moderate-Vigorous	11.45	10.63
Vigorous	2.59	3.35
Total Activity (light, moderate, and vigorous)	132.61	54.41

Analysis of the Childcare Physical Activity Environment

Given that all participants were from the same publicly-funded organization, there was a lack of variation in the Physical Activity Training & Education and Physical Activity Policy subscales. Specifically, none of the participating centres had any physical activity-related policies or staff training/education and consequently, these two scales were deleted from the analysis. Additionally, the Active Opportunities subscale and the Sedentary Environment subscale were excluded from the model due to multicolinearity (i.e., these subscales were highly correlated with some combination of predictors). Physical activity subscale scores and total physical activity EPAO scores for each participating centre are presented in Table 4.

EPAO physical activity subscales & minutes spent in MVPA. A direct entry linear regression analysis was undertaken to evaluate the impact of the EPAO physical activity subscales on time spent in MVPA. The results of this regression revealed that the model comprised of the subscales: Sedentary Opportunities; Portable Play Environment; Fixed Play Environment; and Staff Behaviour accounted for 49.30% of the variability in time spent in MVPA (as suggested by the adjusted $R^2 = 0.493$). This model was statistically significant, $F(4, 26) = 8.28$, $p < .01$. Upon examination of the unique contribution of each variable to the prediction of MVPA, it was found that the Portable Play Environment subscale and the Fixed Play Environment explain approximately 26.7% and 26.2% of the variability, respectively. The regression equation for predicting time spent in MVPA based on the Portable Play Environment is $\hat{Y} = 4.33 + .42x$. Similarly, the regression equation for predicting time spent in MVPA based on the Fixed Play Environment subscale is $\hat{Y} = 4.33 - .42x$. The coefficients, confidence intervals,

Table 4

Physical Activity Subscale Scores and Total Physical Activity EPAO Score for Participating Childcare Centres

Physical Activity Subscales	Centre 1	Centre 2	Centre 3	Centre 4	Centre 5	*M* (*SD*)
Active Opportunities	16.67	13.33	16.67	16.67	6.67	14.00 (4.35)
Sedentary Opportunities	13.33	6.67	6.67	6.67	13.33	9.33 (3.65)
Sedentary Environment	13.33	13.33	6.67	6.67	13.33	10.67 (3.65)
Portable Play Environment	5.71	11.43	5.71	11.43	5.71	8.00 (3.13)
Fixed Play Environment	8.75	13.75	8.75	10.00	10.00	10.25 (2.05)
Staff Behaviours	20.00	16.00	16.00	12.00	8.00	14.40 (4.56)
Physical Activity Training & Education	.00	.00	.00	.00	.00	.00 (.00)
Physical Activity Policies	.00	.00	.00	.00	.00	.00 (.00)
Total Physical Activity EPAO Score	9.72	9.31	7.56	7.93	7.13	8.33 (1.13)

Note. All scores range from 0 to 20. Total Physical Activity EPAO Score was calculated by taking the mean of all physical activity subscales. SD = standard deviation.

t- values, *p*-values, and partial correlations for each physical activity subscale included in this model are presented in Table 5.

Total physical activity EPAO score & time spent in MVPA. A second direct entry regression analysis was conducted to evaluate the prediction of time spent in MVPA from the total physical activity EPAO score of the childcare centres. This analysis resulted in an adjusted $R^2 = 0.101$, which suggests that this model accounted for 10.1% of the variability seen in time spent in MVPA. The model was statistically significant, $F(1,29) = 4.38$, $p < .05$. The regression equation for predicting time spent in MVPA based on the total physical activity EPAO score is $\hat{Y} = 6.36 - .55x$. The coefficient, confidence interval, *t*-test value, *p*-value, and partial correlation for the total physical activity EPAO score are presented in Table 6.

Participant demographic information & time spent in MVPA. Results from the final direct entry regression analysis suggest that there is a negligible predictive relationship associated with the independent variables (i.e., ethnicity, household income, sex, number of siblings, number of people living in the household) and time spent in MVPA (where the adjusted $R^2 = 0$). This model was not significant, $F(5,21) = .92$, $p = .50$. The coefficients, confidence intervals, *t*-test values, *p*-values, and partial correlations for each participant demographic variable included in this model are presented in Table 7.

Table 5

Summary of Coefficients, Confidence Intervals, t-Values, p-Values, and Partial Correlations for the Environment and Policy Assessment and Observation (EPAO) Physical Activity Subscales and Moderate-Vigorous Physical Activity (MVPA)

Physical activity subscale	B	95% CI [lower bound, upper bound]	*T*	*p*	Partial correlations
Sedentary Opportunities	-.09	[-.27, .10]	-.97	.34	-.19
Portable Play Environment	.42	[.14, .70]	3.08	.005*	.52
Fixed Play Environment	-.42	[-.70, -.14]	-3.04	.005*	-.51
Staff Behaviour	-.07	[-.20, .05]	-1.21	.24	-.23

Note. Model accounts for 49.3% of the variability in MVPA; $p < .01$; CI = confidence interval; * = significant subscale.

Table 6

Summary of Coefficient, Confidence Interval, t-Value, p-Value, and Partial Correlation for Total Physical Activity Environment and Policy Assessment and Observation (EPAO) Score and Moderate-Vigorous Physical Activity (MVPA)

	B	95% CI [lower bound, upper bound]	*t*	*p*	Partial correlations
Total physical activity EPAO score	-.55	[-1.09, -.01]	-2.09	.05*	-.36

Note. Model accounts for 10.1% of variability in MVPA; $p \leq .05$; CI = confidence interval; * = significant.

Table 7

Summary of Coefficients, Confidence Intervals, t-Values, p-Values, and Partial Correlations for Participant Demographic Variables and Moderate-Vigorous Physical Activity (MVPA)

Participant demographic variables	B	95% CI [lower bound, upper bound]	*t*	*p*	Partial correlations
Ethnicity	-.15	[-.16, .46]	.99	.33	.21
Sex	-.19	[-1.37, 1.00]	-.33	.75	-.07
# of people in household	.48	[-.34, 1.29]	1.22	.24	.26
# of siblings	.20	[-.47, .86]	.63	.54	.14
Household income	.01	[-.25, .27]	.07	.95	.02

Note. Model accounts for 0% of variability in MVPA; p =.50; CI = confidence interval.

Chapter 4: Discussion

The purpose of this study was to assess the impact of the childcare environment on physical activity levels of preschool-aged children. Specifically, this study sought to: (1) objectively measure the moderate-vigorous physical activity levels of a sample of preschool-aged children during childcare hours; (2) assess which attributes within the centre-based childcare environment influence physical activity; and (3) pilot the proposed methodology, recruitment strategy, and measurement tools to ensure the feasibility of undertaking a full-scale, city-wide study with a larger sample of preschoolers attending a variety of early learning environments. Considering these objectives, many findings warrant discussion.

The first major finding of this study is the low levels of MVPA accumulated by the preschoolers in this study. Given that the participants spent an average of 7.5 hours in care on the day of data collection, their corresponding 11.45 minutes of MVPA were quite minimal. This equates to a rate of 1.54 minutes per hour, which is akin to Temple and colleagues' (2009) finding of 1.76 minutes of MVPA per hour. The present study's finding regarding levels of MVPA was lower than those described by Pate and colleagues (2004), who found that mean minutes of MVPA varied from 4.4 to 10.2 minutes/hour depending on the preschool facility and its characteristics. Given the positive relationship between physical activity at higher intensities and health benefits during early childhood (Janz, Burns, & Levy, 2005; Moore, Nguyen, Rothman, Cupples, & Ellison, 1995; Sääkslahti et al., 2004), future health promotion interventions should encourage the accumulation of such activity in order for children to live and maintain healthy lifestyles.

Given the low levels of MVPA displayed by the participants, it is not surprising that they accumulated equally low levels of *total* physical activity as well as high levels

of sedentary behaviour during childcare hours. Specifically, the participants engaged in an average of 132.60 minutes of *total* physical activity (i.e., light, moderate, and vigorous) on the day of data collection; this finding is discouraging in light of the newly developed Canadian physical activity guidelines which proposes that children between the ages of 0 and 4 years should accumulate three hours (or 180 minutes) of daily physical activity at any intensity (CSEP, 2012a; Tremblay, LeBlanc, Carson, Choquette, Connor Gorber, Dillman, Duggan, Gordon, Hicks, Janssen, Kho, Latimer-Cheung, LeBlanc, Murumets, Okely, Reilly, Spence et al., 2012). Participants in the current study fell short of this recommendation by 47.40 minutes, highlighting the low levels of physical activity among participating preschoolers. Similar levels of low physical activity participation among preschoolers have been noted previously (Cardon & De Bourdeaudhuij, 2007; Pate et al., 2004; Temple et al., 2009).

In contrast to the physical activity levels of preschoolers in the current study, participants in Obeid and colleagues' (2011) recent investigation did not fail to meet the Canadian physical activity guidelines. The results of their accelerometry data revealed that preschoolers engaged in 220 minutes of daily physical activity; nearly 90 minutes more than what was accumulated by the preschoolers in the current study. However, it is important to recognize that the participants in Obeid et al.'s (2011) study were fitted with accelerometers during <u>all</u> waking hours (not just during childcare hours), therefore allowing children to accumulate additional minutes of physical activity throughout non-childcare hours. Furthermore, Obeid et al. used the ActiGraph® (ActiGraph, Florida) accelerometer which has unique respective cut-points and a shorter epoch length (3-seconds compared to the 15-second time sampling interval which was used in the present study). While variation in activity levels exist among these two Canadian studies, the

findings highlight the need for additional investigations of young children's activity patterns and that future studies should consider the collection of accelerometry data over more than one day to provide a more accurate depiction of preschoolers' habitual physical activity levels.

With regards to sedentary behaviour, participants spent an average of 305.37 minutes in sedentary play (~5 hours). This number is comparable to those reported by Temple et al. (2009), who noted the mean level of sedentary behaviour among their participants to be 39.80 minutes per hour (or 286.56 minutes in total). Many other studies which have relied on objective measures of activity have found that preschoolers spend a significant proportion of their waking hours engaged in sedentary behaviour (Bower et al., 2008; Kelly, Reilly, Jackson, Montgomery, Grant, & Paton, 2007; Metallinos-Katsara, Freedson, Fulton, & Sherry, 2007; Pate et al., 2004). The outcomes of this study echo those of Tremblay, LeBlanc et al. (2011), Reilly (2008), and McWilliams et al. (2009), which all stressed the importance of limiting the amount of time children spend in sedentary activity. Moreover, these findings are particularly disconcerting given that the Canadian sedentary guidelines for children aged 0 to 4 years postulate that young children should minimize sedentary behaviour during waking hours, spending no more than one hour at a time seated or restrained (CSEP, 2012b; Tremblay, LeBlanc, Carson, Choquette, Connor Gorber, Dillman, Duggan, Gordon, Hicks, Janssen, Kho, Latimer-Cheung, LeBlanc, Murumets, Okely, Reilly, Steams et al., 2012). Future research should focus on interventions that best minimize sedentary opportunities within the childcare environment (i.e., limiting screen viewing time and seated activities), especially since this type of behaviour is closely linked with high levels of physical inactivity and negative health consequences. Given the large amount of time preschoolers spend in non-parental care

each day, accumulating additional minutes of activity outside of care may be difficult, therefore placing greater responsibility on the childcare providers to create an active environment for the children in their care. Collectively, these findings further stress the need to address the health-compromising behaviour of inactivity and to improve physical activity participation among this age group.

A second major finding deserving of attention is the influence of the childcare environment on physical activity behaviours of preschoolers. Perhaps not surprising, the higher the Total Physical Activity EPAO score, the more active the preschoolers, and thus, the more supportive the childcare environment with regards to physical activity. Similar findings were seen in Bower et al.'s (2008) study where the centres which received higher physical activity environment scores had children who were more active while in care.

While previous studies have indicated that the childcare environment accounts for a large proportion of the variability in preschoolers' physical activity levels (Dowda et al., 2004; Finn, Johannsen, & Specker, 2002; Pate et al., 2004), this study further advances the current body of literature by identifying specific attributes within the childcare centre that best support/hinder this healthy behaviour. Specifically, this study found that the Sedentary Opportunities subscale (i.e., opportunities that may result in little to no participation in physical activity), the Fixed Play Environment subscale (i.e., presence of permanent play equipment and space for use within the childcare environment), the Portable Play Environment subscale (i.e., presence of an assortment of play equipment for use in various locations of the childcare environment), and the Staff Behaviours subscale (i.e., interactions between children and staff that encourage/discourage participation in physical activity) accounted for approximately half of the variability in time spent in

MVPA. It is worth noting the inverse relationship between the Sedentary Opportunities subscale and time spent in MVPA, as an increase in sedentary opportunities would result in less time spent in MVPA. Moreover, an inverse relationship between the Fixed Play Environment subscale and the Staff Behaviour subscale and MVPA was revealed. One possible explanation for the relationship between MVPA and fixed play equipment might be that fixed play equipment only allows children to climb up and slide down, rather than run on, as the fixed equipment structures are often quite small in childcare centers, unlike the opportunities for physical activity provided by portable equipment (e.g., bikes, balls, etc). In addition, it is also possible that children tend to sit on fixed equipment, rather than move, given the structures *fixed* and *permanent* characteristics. With regard to staff behaviour, it is plausible that a lack of staff prompts to be active, or inactive role modeling may discourage activity participation among these young children.

Bower and colleagues (2008) observed similar findings in their study where the Sedentary Opportunities, Portable Play Environment, Staff Behaviour, and Fixed Play Environment subscales were all found to be important predictors of mean activity levels and of time spent in MVPA among their preschool sample. Given that all participants in the present study attended childcare centres within the same organization, it is not surprising that the significant predictors are those which are unique to each site (such as the staff and play equipment), as opposed to those shared by all sites (such as physical activity-related curriculum, policies, and training).

The results of this research support the conclusions of Gordon et al.'s (under review) recent meta-analysis, which suggested that environmental interventions in childcare settings, such as the addition of pavement markings or portable playground equipment, play an important role in increasing preschoolers' levels of physical activity.

Likewise, studies by Brown et al. (2009), Dowda et al. (2009), and Hannon and Brown (2008) also found that the presence of portable play equipment was associated with less sedentary behaviour. Portable play equipment provides the opportunity for preschoolers to play with the equipment while continuing to move, in addition to providing variation in toys/equipment with which children can play. This variation may also be important to keep children interested and engaged in physical activity.Taken together, these findings clearly emphasize the importance of portable play equipment (e.g., balls, hula hoops, tricycles, etc.) on the physical activity behaviours of young children.

Childcare providers play an important role in limiting sedentary play and encouraging physical activity (or active play) among the children in their care. As demonstrated in the literature (O'Connor & Temple, 2005; Tucker, van Zandvoort, Burke, & Irwin, 2011), many childcare providers understand the importance of incorporating physical activity in the lives of young children. Interestingly, however, the current study's findings depict an inverse relationship between staff behaviour and time spent in MVPA. Given this association, physical activity-related training and professional development should be of top priority, particularly in light of past research which stresses its importance with regards to preschoolers' physical activity levels (O'Connor & Temple, 2005; Pagnini, Wilkenfield, King, Booth, & Booth, 2007; Poest, Williams, Witt, & Atwood, 1989; Tucker et al., 2011). Given the predictability of time spent in MVPA with regards to staff behaviour, future health promotion interventions should consider the importance of staff training and education as a means of increasing preschoolers' activity levels. As suggested in a recent paper by Tucker and colleagues (2011), it may prove useful to involve childcare providers in the creation of interventions or programs aimed at

promoting physical activity among preschoolers, especially given the unique relationship they share with the children in their care.

The present research is grounded in the Precede-Proceed model (Green & Kreuter, 2005), and as such, this study proved useful in identifying which attributes best support (or hinder) physical activity among preschoolers in childcare. Specifically, the undertaking of an ecological assessment (Phase 3 of the model) provided researchers with an opportunity to understand what strengths exist within the childcare centre and where improvements are needed with regards to physical activity participation. The results of this study provide a base for additional research as well as for the development of future health promotion interventions. While this assessment uncovered various *enabling* (e.g., access to and availability of fixed and portable play equipment) and *reinforcing* factors (e.g., positive/negative statements and prompts provided by childcare providers to increase/decrease physical activity; restricting active play as punishment), this research also highlighted the minimal role that *predisposing* (i.e., identifying physical activity-related knowledge or personal beliefs/values regarding physical activity, socio-demographic characteristics, etc.) factors play in hindering or facilitating preschoolers' motivations to engage in regular physical activity. Moreover, given that the present study provided a clearer understanding of how certain attributes within the childcare environment influence physical activity among preschoolers, a next step may include the implementation of an intervention which incorporates the findings from this study as well as the evaluation of the intervention.

Lastly, it is important to discuss the feasibility of utilizing the proposed methodology in a full-scale study. With regards to recruitment strategies, the use of a convenience sample in this feasibility study was reasonable, as the research team had

established relationships with the participating childcare organization. However, larger studies should rely on a randomized sampling strategy to ensure a more representative and diverse sample. The use of the EPAO instrument and accelerometers as measurement tools worked well with this setting and population and provided objective data. Given the good response rate, the strong participation from the childcare centres, and the ease of both staff and children to participate (i.e., was not onerous for participating parties), moving forward with a full-scale study is both feasible and important.

Limitations and Future Directions

This study produced important findings for childcare staff, health promotion professionals, and parents/guardians; however, this study is not without its limitations. First, this study used proxy-report measures of preschoolers' heights and weights, where parent-reported data have the tendency to underestimate weight (Carnell, Edwards, Croker, Boniface, & Wardle, 2005; Huybrechts, De Bacquer, Van Trimpont, De Backer, & De Henauw, 2006). A second possible limitation of this study was the use of a 15-second epoch length to measure preschoolers' physical activity instead of a shorter sampling interval (i.e., 3-seconds). While the use of a 3-second epoch length may prove even more effective at capturing the spontaneous physical activity patterns of preschoolers (Bailey et al., 1995; Baquet, Stratton, Van Praagh, & Berthoin, 2007), the Actical® accelerometers are unable to capture activity data using a time sampling interval shorter than 15-seconds. A recent study which examined the influence of epoch length on physical activity found that when compared with a 3-second epoch length, the use of a 15-second sampling interval only resulted in 2.9 minutes of missed MVPA (Obeid et al., 2011). Moreover, a 15-second epoch length is consistently used in the preschool literature

(Adamo, Prince, Tricco, Connor-Gorber, & Tremblay, 2008; Cliff et al., 2009; Temple et al., 2009; Ward, Evenson, Vaughn, Brown Rogers, & Troiano, 2005).

A final limitation that should be acknowledged is the fact that all participating childcare centres belonged to the same organization, therefore minimizing the variability observed between centres. It is not surprising that little variation was seen with regards to physical activity policies and physical activity training and education since all classrooms/centres would be following the same mandated curriculum and policies. Consequently, this limitation reinforces the need for a full-scale study, drawing upon a variety of different childcare arrangements from various organizations.

Conclusion

Despite the aforementioned limitations, this study highlights many important findings: levels of physical activity (notably, MVPA) among preschoolers are quite low, where large proportions of their day are spent being sedentary; factors such as staff behaviour, fixed and portable play equipment, and sedentary opportunities appear most predictive of MVPA behaviours (although the use of a larger, more diverse sample may help achieve more varied data with regards to the physical activity subscales); and lastly, this methodology was appropriate and feasible to measure the preschoolers' MVPA behaviours. The results of this study not only support the notion that the childcare environment is a good place to study preschoolers, but also underscore the appropriateness of this venue to intervene with regards to improving physical activity behaviours among this population. Furthermore, this study highlights the crucial role that the environment (specifically, that of the childcare setting) plays in promoting physical activity among preschool-aged children. Overall, this study adds to the growing, yet much

needed, area of research regarding the physical levels and behaviours among Canadian preschoolers.

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Appendix A: Parent/Guardian Letter of Information

The Influence of the Childcare Environment on Physical Activity among Preschool-Aged Children

Letter of Information

Investigators:

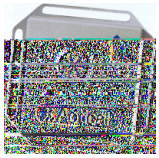
Dr. Trish Tucker, PhD, Faculty of Health Sciences, University of Western Ontario
Dr. Shauna Burke, PhD, Faculty of Health Sciences, University of Western Ontario
Dr. Andrew Johnson, PhD, Faculty of Health Sciences, University of Western Ontario
Dr. Jennifer Irwin, PhD, Faculty of Health Sciences, University of Western Ontario
Ms. Melissa van Zandvoort, MSc, Research Associate, Middlesex-London Health Unit
Ms. Leigh Vanderloo, MSc(c), Faculty of Health Sciences, University of Western Ontario

Background:

Researchers at the University of Western Ontario and the Middlesex-London Health Unit are conducting a pilot study to assess the influence of the childcare environment on physical activity among preschoolers. The information collected will identify essential elements of the centres' infrastructure, and staff training and education. The pilot data will also serve to confirm the feasibility of expanding this study to include a larger and more diverse sample of childcare centres (i.e., public and private facilities), to inform the development of future childcare policies and regulations, and provide research-informed guidance for future health promotion programs implemented in the childcare environment.

What will happen in this study:

If you agree to participate, your preschool-aged child will wear an accelerometer during childcare hours for one day (insert date of data collection). A pager-like device in size (please see picture below), the accelerometer would be worn on a belt around the child's waist (over top of clothing) to collect information about the amount and intensity of his/her movements. While wearing the accelerometer, your child would still be able to participate in all normal childcare activities. A researcher will also be present the day of data collection to acquire information on the policies and environment of the childcare facility, and consequently, your child will be *indirectly* observed during this time (i.e., for the purpose of this study, it is the environment being directly observed, not the child). In addition to this letter of information and consent form, you will find a brief questionnaire included. Parents are being asked to complete this survey to seek demographic information about your preschooler and to seek your child's height and weight (which are necessary to input into the Actical® accelerometer to calculate energy expenditure). Please complete this survey and send back in the enclosed envelope to your child's teacher.



Alternatives and your right to withdraw from the study:

Your participation (and your child's) in this study is voluntary. You may refuse to participate, refuse to answer any questions, or withdraw from the study at any time.

Alternatively, if you do not wish your child to participate in this study, you will be asked to sign a separate portion of the consent form which will allow your child to be indirectly observed in the classroom *only* (i.e., your child will not be asked to wear an accelerometer and data will not be collected on your child). However, a researcher will be present to observe the policy and environment of the childcare facility.

Possible benefits and risks to you for participating in the study:

There are no known risks for being in this study. You do not waive any of the legal rights you would otherwise have as a participant in a research study. The benefit to participating in this study might include changes to the childcare environment following this study may result in notable increased physical activity behaviours of your child.

Confidentiality:

We will keep your child's identity and physical activity level, as well as written records, confidential and secure. No names will appear on any publications generated during the course of this study.

Costs and compensation:

There is no cost to you for participating in the study. To acknowledge your contribution to the study, you will receive a small token of appreciation.

Publication of the results:

When the results of the study are published, your name/your child's name will not be used. If you would like to receive a copy of the overall results of the study, please put your name and address on a blank piece of paper and return it to the researchers along with your child's consent form.

For further information on this study, you can contact: Dr. Trish Tucker;
or Ms. Leigh Vanderloo; .

* If you have any further questions regarding your rights as a study participant, please contact the University of Western Ontario Office of Research Ethics at .

This letter is for you to keep.

Appendix B: Parent/Guardian Consent Form

The Influence of the Childcare Environment on Physical Activity among Preschool-Aged Children

I have read the Letter of Information, have had the nature of the study explained to me, and:

A) I agree to participate. All questions have been answered to my satisfaction.

Date	Participant's name (please print)	Parent/Guardian Name (please print)	Parent/Guardian Signature

Date	Name of person responsible for obtaining informed consent (please print)	Signature

B) I do not wish to participate but will allow my child to be indirectly observed on the day of data collection.

Date	Participant's name (please print)	Parent/Guardian Name (please print)	Parent/Guardian Signature

Date	Name of person responsible for obtaining informed consent (please print)	Signature

Appendix C: Letter of Thanks for Parents/Guardians

The Influence of the Childcare Environment on Physical Activity among Preschool-Aged Children

Dear Parent/Guardian:

On behalf of our research team, I would like to thank you for consenting to your child's participation in this study. The information collected may inform the development of future childcare policies and regulations and provide research-informed guidance for future health promotion programs implemented in the childcare environment relative to physical activity participation.

Please accept the enclosed gift card as a token of our appreciation for your child's involvement in this project.

With thanks.

Yours sincerely,

Dr. Trish Tucker
Assistant Professor
School of Occupational Therapy
The University of Western Ontario

Appendix D: Letter of Thanks for Directors

The Influence of the Childcare Environment on Physical Activity among Preschool-Aged Children

Dear Director:

On behalf of our research team, I would like to thank you for consenting to your centre's participation in this study. The information collected may inform the development of future childcare policies and regulations and provide research-informed guidance for future health promotion programs implemented in the childcare environment relative to physical activity participation.

Please accept the enclosed gift card as a token of our appreciation for the involvement of your preschool classroom in this project.

With thanks.

Yours sincerely,

Dr. Trish Tucker
Assistant Professor
School of Occupational Therapy
The University of Western Ontario

Appendix E: Ethics Approval Notice

Appendix F: Environment and Policy Assessment and Observation Instrument[1]

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EPAO Observation

Center Name

Date of Observation: ☐☐ / ☐☐ / ☐☐☐☐ (month / day / year)

Observer ID#: ☐☐

Start time: ☐☐ : ☐☐

Number of children in classroom: ☐☐

Ages of children: *[Mark all that apply]*
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6

Eating Occasions Observed: *[Mark all that apply]*
- ○ Breakfast
- ○ AM Snack
- ○ Lunch
- ○ PM Snack

Total Physical Activity occasions observed: ☐☐

End time: ☐☐ : ☐☐

Initials of Teacher Observed: _____

Weather:

Eating Occasions - Foods

1. How was **breakfast** served? *[Choose one.]*
   - ○ family style
   - ○ delivered and served in prepared portions
   - ○ delivered in bulk and portioned by staff
   - ○ N/A

2. How was **a.m. snack** served? *[Choose one.]*
   - ○ family style
   - ○ delivered and served in prepared portions
   - ○ delivered in bulk and portioned by staff
   - ○ N/A

3. How was **lunch** served? *[Choose one.]*
   - ○ family style
   - ○ delivered and served in prepared portions
   - ○ delivered in bulk and portioned by staff
   - ○ N/A

1 of 21

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EPAO Observation

4. How was **p.m. snack** served? *[Choose one.]*

- O family style
- O delivered and served in prepared portions
- O delivered in bulk and portioned by staff
- O N/A

5. How many times was **fruit** served the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

6. How many times was **fruit** served fresh, frozed or canned in own juice the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

7. How many times was **100% fruit juice** served the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

8. How many times were **vegetables** (not including French fries or fried vegetables) served the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

9. How many times were **dark green, red, orange or yellow vegetables** served the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

10. Was **margarine, butter, or meat fat** visible on vegetables?

- O yes
- O no ➔ 10a. According to staff, during the day of observation were vegetables prepared with added fat? O yes O no O unsure
- O no vegetables served

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EPAO Observation

11. Are vegetables **typically** served with added fat? (ask classroom staff or cook) — O yes O no O unsure

12. How many times were **fried or pre-fried vegetables** (e.g., tator tots, french fries, fried okra, fried zucchini and hashbrowns) served the day of observation? — O 0 O 1 O 2 O 3 O other →

13. How many times were **fried or pre-fried meats** (e.g., chicken nuggets, fish sticks) served the day of observation? — O 0 O 1 O 2 O 3 O other →

14. How many times were **high fat meats** (e.g., ground beef, bologna, hotdogs, ham) served the day of observation? — O 0 O 1 O 2 O 3 O other →

15. How many times were **lean meats/fish** (e.g., baked chicken or turkey breasts, baked fish, deli turkey, tuna and salmon) served the day of observation? — O 0 O 1 O 2 O 3 O other →

16. How many times were **beans/lentils** served the day of observation? — O 0 O 1 O 2 O 3 O other →

17. How many times were **high sugar and/or high fat foods(not condiments)** served the day of observation? — O 0 O 1 O 2 O 3 O 4 O 5 O other →

18. How many times were **high sugar and/or high fat condiments** served the day of observation? — O 0 O 1 O 2 O 3 O 4 O 5 O other →

19. How many times were **high fiber grains** served the day of observation? — O 0 O 1 O 2 O 3 O 4 O 5 O other →

8024607489

EPAO Observation

Eating Occasions - Beverages

20. Was drinking water for children visible in the classroom?

- ○ yes → 20a. How accessible was drinking water to children in the classroom?
  - ○ available for self-serve (child-level fountain or pitcher/cups on table)
  - ○ available by request only
- ○ no

20b. If no, is there a water fountain in a nearby hallway?

- ○ yes → 20b_1. How accessible is this fountain to children?
  - ○ available by request only (must ask permission to leave classroom)
  - ○ during teacher-designated water breaks
- ○ no

21. Did you witness teachers prompting children throughout the day to drink water?

- ○ yes, regularly (multiple times throughout the day, not just specific occasions such as coming in from outdoor play)
- ○ yes, at specific times only (such as coming in from outdoor play)
- ○ no

22. How many times were **sugar drinks** (Kool-aid, sports drinks, sweet tea, punch, sodas) served the day of observation?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → ☐☐

23. How many times was **milk** served the day of observation?

○ 0 ○ 1 ○ 2 ○ 3 ○ other → ☐☐

24. What type of **milk** was served **to the majority** of children at a majority of meals?
[Mark only one.]

○ Whole	○ Skim	○ Rice milk
○ 2%	○ Whole, flavored	○ Soy milk
○ 1%	○ Lower fat, flavored (2%, 1%, skim)	○ Lactaid

EPAO Observation

25. Note other types of **milk** served to **selected** children: *[Mark all that apply.]*

O Whole	O Skim	O Rice milk
O 2%	O Whole, flavored	O Soy milk
O 1%	O Lower fat, flavored (2%, 1%, skim)	O Lactaid

Eating Occasions - Staff Behavior

26. Did staff push children to eat more than they want to (e.g., clean your plate, you won't get dessert until you finish lunch)?

O yes → 26a. How many eating occasions was the behavior observed?

O no — O 1 O 2 O 3 O 4 O 5 O other → ☐☐

27. Did staff serve children second helpings without being asked for more by the child (see an empty plate and add food without request by child)?

O yes → 27a. How many eating occasions was the behavior observed?

O no — O 1 O 2 O 3 O 4 O 5 O other → ☐☐

28. Did staff positively and gently encourage children to try new or less favorite foods?

O yes → 28a. How many eating occasions was the behavior observed?

O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no (children resisted eating but were not encouraged)

O no children resisting eating observed

29. Was food used to control behavior?

O yes → 29a. How many eating occasions was the behavior observed?

O no — O 1 O 2 O 3 O 4 O 5 O other → ☐☐

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EPAO Observation

30. Did staff sit with children during lunch?

O yes → 30a. Did staff consume the same food as children? → O yes O no

O no

31. Did staff eat and/or drink less healthy foods in front of children?

O yes → 31a. How many meals? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

O did not observe staff eating

32. Did staff talk with children about healthy foods?

O yes → 32a. How many separate times did you observe staff talking to chilcren about healthy foods? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

33. Was any **formal** nutrition education for children observed?

O yes O no

Physical Activity - Child Behaviors

34. How many minutes of total active play time was observed (includes indoor, outdoor, structured and unstructured)?

☐☐☐ *minutes*

35. Was structured physical activity observed?

O no

O yes ↓

35a. How many occasions? O 1 O 2 O 3 O 4 O 5 O other ↓

35b. Total minutes of structured PA observed: ☐☐☐ *minutes* ☐☐

35c. Was the structured PA optional for children? O yes O no

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EPAO Observation

36. Did you observe any outdoor active play?

O yes → 36a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no → 36b. Was it due to weather (too hot, too cold, rain/snow)?

O yes O no O unsure

37. How many total minutes of outdoor active play (structured and unstructured) was observed?

☐☐☐ *minutes*

38. Was drinking water for children available outdoors?

O yes O no O no outdoor time observed → 38a. Did you see a drinking fountain located in the outdoor play area? O yes O no

39. While outdoors, did you witness teachers prompting children to drink water?

O yes O no O no outdoor time observed

Sedentary Activities - Child

40. Did you observe children seated for more than 30 minutes at a time (excluding nap and meal times)?

O yes → 40a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

40b. How many total minutes of seated activity (majority of the class seated) was observed?

☐☐☐ *minutes*

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EPAO Observation

41. Was a TV present in the room? O yes O no

42. Was TV viewing observed?

O yes → 42a. Total minutes TV was on: ☐☐☐ *minutes*

O no

42b. Was it on during meals? O yes → 42b_1. If yes, how many meals? O 1 O 2 O 3 or more

O no

42c. Was the TV used only for viewing educational programs? O yes O no

43. Was a VCR/DVD present in the room? O yes O no

44. Was there a video game system present in the room? O yes O no

45. Was a computer present in the room for use by children? O yes O no

46. Was video game or computer game playing observed?

O yes → 46a. Total number of minutes computer/video game playing was observed: ☐☐☐ *minutes*

O no

46b. Was it being used for educational purposes only? O yes O no

46c. How many total children participated in computer/video game playing during the entire day? ☐☐ *# of children*

5955607489

EPAO Observation

Physical Activity - Staff Behaviors

47. Did you observe restricting active play as punishment?

O yes → 47a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

48. Did staff join in active play?

O yes → 48a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

49. How many positive statements were made about physical activity (e.g., Good throw!, Running is fun!, I like the way you threw that ball!)?

O 1 O 2 O 3 O 4 O 5 O other → ☐☐

50. Did staff provide prompts to **increase** physical activity (e.g., Can you jump higher?, Can you hop on one foot?)?

O yes → 50a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

51. Did staff provide prompts to **decrease** physical activity (e.g., Slow down!, Give it a rest! Don't climb on the slide!)?

O yes → 51a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

52. Were any **formal** physical education lessons for children observed? O yes O no

53. Were any extra-curricular (special) physical activity programs provided to children on a fee basis (e.g., Tumbling Tots, Tumble Bus)?

O yes → 53a. Were any active alternatives provided for those children that did not participate? → O yes O no

O no

EPAO Observation

Center Environment

54. Where were soda and other vending machines located?

- ○ in entrance or front
- ○ in public areas, but not the entrance → 54a. Did they contain only healthy options (e.g., water, milk, 100% fruit juice, granola bars, pretzels, nuts)? → ○ yes ○ no
- ○ out of sight of parents and kids
- ○ no vending machines on site

Please indicate where these pieces of physical activity equipment (both fixed and portable) were located:

55. Fixed Play Equipment	***indoors only***	***outdoors only***	***both indoors & outdoors***	***not present***
a. balancing surfaces (balance beams, boards, etc.)	○	○	○	○
b. basketball hoop	○	○	○	○
c. climbing structures (jungle gyms, ladders, etc.)	○	○	○	○
d. merry-go-round	○	○	○	○
e. pool	○	○	○	○
f. sandbox	○	○	○	○
g. see-saw	○	○	○	○
h. slides	○	○	○	○
i. swinging equipment (swings, rope, etc.)	○	○	○	○
j. tricycle track	○	○	○	○
k. tunnels	○	○	○	○

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EPAO Observation

56. Portable Play Equipment	***indoors only***	***outdoors only***	***both indoors & outdoors***	***not present***
a. ball play equipment	O	O	O	O
b. climbing structures (ladders, jumble gyms, etc.)	O	O	O	O
c. floor play equipment (tumbling mats, carpet squares, etc.)	O	O	O	O
d. jumping play equipment (jump ropes, hula hoops)	O	O	O	O
e. parachute	O	O	O	O
f. push/pull toys (wagon, scooters, etc.)	O	O	O	O
g. riding toys (tricycles, cars, etc.)	O	O	O	O
h. rocking & twisting toys (rocking horse, sit-n-spin, etc.)	O	O	O	O
i. sand/water play toys (buckets, scoops, shovels, etc.)	O	O	O	O
j. slides	O	O	O	O
k. twirling play equipment (ribbons, scarves, batons, etc.)	O	O	O	O

57. Was outdoor running space . . .

- O unobstructed with plenty of space for groups games (tag, red rover, etc.)
- O some obstruction, but space was adequate for individual play (running, skipping, etc.)
- O plenty of space for play, but obstructed with play equipment
- O little running space or completely obstructed

58. Did staff limit or restrict outdoor play area in a way that substantially affect active play (more than 1/3 of total play space or quipment)?

O yes → 57a. How many outdoor play occasions? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

59. Was indoor play space suitable for . . .

- ○ quiet play (classroom is small and not a lot of room for movement)
- ○ limited movement/some active play (able to translocate by walking, skipping, hopping, jumping, etc.)
- ○ all activities (easily able to perform all gross motor activities)

60. Were any posters, pictures or displayed books about **physical activity** present in the observation room?

○ yes ➔ 60a. How many were present? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other ☐☐

○ no

61. Were any posters, pictures or displayed books about **nutrition** present in the observation room?

○ yes ➔ 61a. How many were present? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other ☐☐

○ no

EPAO Document Review 2689175402

Date of Assessment: ☐☐ / ☐☐ / ☐☐☐☐ (month / day / year)

ID#: ☐☐

Section 1: Menu Review - Observed Foods & Beverages

Fruits and Vegetables

1. Fruit (not juice):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times does fruit appear on the menu ***for the day of observation*** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type not specified on menu

c. How many total times does fruit appear on the menu ***for that full week?*** ☐☐

2. Vegetables (not including fried or prefried vegetables):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do vegetables appear on the menu ***for the day of observation*** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type of vegetable not specified on menu

c. How many total times do vegetables appear on the menu ***for that full week?*** ☐☐

3. Dark green, red, orange, or yellow vegetables:

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do vegetables (dark green, red, orange or yellow) appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type of vegetable not specified on menu

c. How many total times do dark green, red, yellow or orange vegetables appear on the menu ***for that full week?*** ☐☐

4. Added fat for cooked vegetables:

a. Is added meat fat, margarine, or butter specified on the menu for cooked vegetables?

O yes O no → a1. How many total times does it appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. How many total times do vegetables **with added fat** appear on the menu ***for that full week?*** ☐☐

Fried Foods and High Fat Meats

5. Fried or pre-fried meats (chicken nuggets) or fish (fish sticks):

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do fried or pre-fried meats appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do fried or pre-fried meats appear on the menu ***for that full week?*** ☐☐

6. Fried or pre-fried vegetables (French fries, tater tots, hash browns, fried okra):

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do fried or pre-fried vegetables appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do fried or pre-fried vegetables appear on the menu ***for that full week?*** ☐☐

7. High fat meats (sausage, bacon, hot dogs, bologna, ground beef):

a. Is menu consistent with observation for frequency served?

O yes O no → a1. How many total times do high fat meats appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do high fat meats appear on the menu for ***that full week?*** ☐☐

8. Lean meats (baked or broiled chicken, turkey or fish):

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do lean meats appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do lean meats appear on the menu ***for that full week?*** ☐☐

9. Beans/Lentils:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do beans/lentils appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do beans/lentils appear on the menu ***for that full week?*** ☐☐

Beverages

10. 100% fruit juice:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times does 100% fruit juice appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times does 100% fruit juice appear on the menu ***for that full week?*** ☐☐

11. Sugar drinks (Kool-aid, sports drinks, sweet tea, punches, soda) other than 100% fruit juice:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do sugar drinks appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do sugar drinks appear on the menu ***for that full week?*** ☐☐

12. Milk:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times does milk appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no O type not specified on menu

c. How many total times does milk appear on the menu ***for that full week?*** ☐☐

d. What type is indicated on the menu as ***"usually"*** served?

O Whole	O Skim	O Rice milk
O 2%	O Whole, flavored	O Soy milk
O 1%	O Lower fat, flavored (2%, 1%, skim)	O Type not specified on menu

EPAO Document Review 1845175405

Menus and Variety

13. Menus include high fiber grain foods (whole wheat bread, oatmeal, brown rice, Cheerios):

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do high fiber grain foods appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do high fiber grain foods appear on the menu ***for that full week?*** ☐☐

Meals and Snacks

14. High sugar and/or high fat foods (not including condiments):

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do high sugar and/or high fat foods appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do high sugar and/or high fat foods appear on the menu ***for that full week?*** ☐☐

15. High sugar and/or high fat condiments:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do high sugar and/or high fat condiments appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do high sugar and/or high fat condiments appear on the menu ***for that full week?*** ☐☐

EPAO Document Review 0128175408

Section 2: Menu Review - Weeky Menus

Menus and Variety

16. Weekly menus include foods from a variety of cultures:

a. How many times are foods from a different culture present on the menu ***for the observation week*** only?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ other → ☐☐

Section 3: Guideline Reviews

Foods offered outside of regular Meals and Snacks

17. Does the center have written guidelines addressing holiday/celebration foods?

○ yes → a. If yes, are healthier items encouraged? ○ yes ○ no

○ no

○ no documents received from center

18. Did you review past/future fundraising projects or guidelines?

○ yes → a. If yes, how many were non-food only?
- ○ all
- ○ more than half
- ○ half
- ○ less than half
- ○ none

○ Center guidelines do not address the type of fundraising, or fundraising at all

○ Center doesn't do fundraising

Nutrition Policy

19. Does the center have a written policy on nutrition and food service?

○ yes → a. If yes, what areas of NAP SACC are covered? *[Mark all that apply.]*

○ no

○ no documents received from center

- ○ F&V
- ○ Fried food
- ○ High fat meats
- ○ Beverages
- ○ Menus and variety
- ○ Meals and snacks
- ○ Foods offered outside of reg meals & snacks
- ○ Support for healthy eating
- ○ Nutrition education

EPAO Document Review 6506175404

Play Environment

20. Did you review any documentation of safety checks?

O yes → a. If yes, frequency of checks:
O no
O only when installed O once a week
O once a year O other →
O once a month

Center Physical Activity Policy

21. Does the center have written policy on physical activity?

O yes → a. If yes, what areas of NAP SACC are covered? *[Mark all that apply.]*
O no
O no documents received from center
O Active play and inactive time O Supporting PA
O TV use and TV viewing O PA education
O Play environment

Section 4: Training & Curriculum Review

Nutrition Education For Children, Parents and Staff

22. Does the center provide nutrition training for staff?

O yes → a. If yes, how often?
O no
O no documents received from center
O 2 times/year or more O 1 time/year O less than 1 time/year
b. If yes, what was the content of the trainings?

23. Does the center have a documented nutrition curriculum for kids?

O yes → a. If yes, what was the content of the curriculum?

O no

24. Does the center have documentation of parent nutrition education/workshop materials?

O yes → a. If yes, what was the content of the education workshops?

O no

Physical Activity Education For Children, Parents and Staff

25. Does the center provide physical activity training for staff?

O yes → a. If yes, how often?

O 2 times/year or more O 1 time/year O less than 1 time/year

O no

O no documents received from center

b. If yes, what was the content of the trainings?

26. Does the center have a documented physical activity curriculum for kids?

O yes → a. If yes, what was the content of the curriculum?

O no

27. Does the center have documentation of physical activity education/workshop materials?

O yes → a. If yes, what was the content of the workshops?

O no

Please use the following citation when referencing this instrument:

Ball SC, Benjamin SE, Hales DP, Marks J, McWilliams CP, Ward DS. 2005. The Environment and Policy Assessment and Observation (EPAO) child care nutrition and physical activity instrument. Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill.

Please use the following citation when referencing instrument protocol and interobserver agreement:

Ward DS, Hales D, Haverly K, Marks J, Benjamin SE, Ball SC, Trost S. An instrument to assess the obesogenic environment of child care centers. Am J Health Behavior. 2008 Jul-Aug;32(4):380-6.

Appendix G: Parent/Guardian Demographic Questionnaire

The Influence of the Childcare Environment on Physical Activity among Preschool-Aged Children

Answers to the first four questions are required to program the accelerometers to collect accurate information about your preschooler's physical activity behaviours. As such, if any of the next 4 questions are not answered, your child will <u>NOT</u> be able to participate in this study.

What is the gender of your preschooler?

- ☐ Male
- ☐ Female

What is your preschooler's date of birth?

_____ day (DD) / _____ month (M/M) / _____ (YYYY)

How tall is your preschooler?

_____ feet _____ inches

What is your preschooler's weight?

_____ pounds

Thank you. That is the end of the required questions; however, we ask that you please complete the remaining questions.

What is your relationship to the preschooler?

- ☐ Parent
- ☐ Grandparent
- ☐ Guardian
- ☐ Other (please specify): _____

What is your preschooler's racial background / ethnicity?

- ☐ White
- ☐ African Canadian
- ☐ Native / aboriginal
- ☐ Arab
- ☐ Latin-American
- ☐ Asian
- ☐ Other: _____
- ☐ I prefer not to answer

How many people live in your household?

□ 2 □ 3 □ 4 □ 5 □ 6 □ 7 or more

How many siblings does your preschooler have?

□ 0
□ 1
□ 2
□ 3
□ 4
□ 5 or greater

***What is the approximate yearly income of your household*?**

□ < $20,000
□ $20,000 - $39,999
□ $40,000 - $59,999
□ $60,000 - $79,999
□ $80,000 - $99,999
□ $100,000-$119,999
□ > $120,000
□ Choose not to answer

What is your preschooler's family situation with you?

□ Single-parent
□ Double-parent
□ Guardian-led
□ Other (please specify): _____

What is the highest level of school you have completed?

□ Some elementary school
□ Completed elementary school (grade 8)
□ Some high school
□ Completed high school
□ Some college/university
□ Completed college/university
□ Completed University - graduate school such as Master's or Doctorate degree

What is your preschooler's childcare status?

□ Part-time
□ Full-time

In your opinion, does the childcare centre your preschooler attends incorporate physical activity into the curriculum?

□ Yes
□ No

In your opinion, how active is your preschooler during childcare hours?

□ Not at all active
□ Somewhat active
□ Very active
□ Don't know

Appendix H: Environment and Policy Assessment and Observation Scoring Tool[2]

EPAO Scoring Guidelines

Areas

1. Total Nutrition = (FV+ Grains+HSHF+ Bev+ NutrEnv+SBnutr+ NutrTE+NutrPol)/8
2. Total Physical Activity = (Act+ Sed+ SedEnv+ PortEnv + Fix Env + PaTE +SBpa+ PaPol)/8

Sub-Areas

1. Fruits and Vegetables = FV
2. Whole grains and low fat meats = Grains
3. High sugar/high fat foods = HSHF
4. Beverages = Bev
5. Nutrition Environment = NutrEnv
6. Staff Behaviors-Nutrition = SBnutr
7. Nutrition Training and Education = NutrTE
8. Nutrition Policy = NutrPol
9. Active Opportunities = Act
10. Sedentary Opportunities = Sed
11. Sedentary Environment = SedEnv
12. Portable Play Environment = PortEnv
13. Fixed Play Environment = FixEnv
14. Staff Behaviors-Physical Activity = SBpa
15. Physical Activity Training and Education = PaTE
16. Physical Activity Policy = PaPol

Nutrition

1. FV = (sum of question scores/9) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #5	How many times was fruit served the day of observation?	0	0
		1	1
		2 and greater	2
Doc Review #1c	How many total times does fruit appear on the menu for that full week	0-3	0
		4-6	1
		7 and greater	2
Observation #6	How many times was fruit served fresh, frozen or canned in own juice the day of observation	0	0
		1	1
		2 and greater	2
Observation #8	How many times were vegetables (not including French fries or fried vegetables) served the day of observation	0	0
		1	1
		2 and greater	2

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Doc Review #2c	How many total times do vegetables appear on the menu for that full week	0-3	0
		4-6	1
		7 and greater	2
Observation #9	How many times were dark green, red, orange or yellow vegetables served the day of observation	0	0
		1 or greater	2
Doc Review #3c	How many total times do dark vegetables appear on the menu for that full week	0-3	0
		4 or greater	2
Observation #10	Was margarine, butter, or meat fat visible on vegetables	No	1
		Yes	0
		No vegetables served	missing
Observation #11	Are vegetables typically served with added fat?	No	1
		Yes	0
		Unsure	missing
Doc Review #4a	Is added meat fat, margarine, or butter specified on the menu for cooked vegetables	No	2
		Yes	0

2. Grains = (sum of question scores/6) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #15	How many times were lean meats/fish served the day of observation	0	0
		1 or greater	2
Doc Review #8c	How many total times do lean meats/fish appear on the menu for that full week	0	0
		1 or greater	2
Observation #16	How many times were beans/lentils served the day of observation	0	0
		1 or greater	2
Doc Review #9c	How many total times do beans/lentils appear on the menu for that full week	0	0
		1 or greater	2
Observation #19	How many times were high fiber grains served the day of observation	0	0
		1 or greater	2
Doc Review #13c	How many total times do whole grains appear on the menu for that full week	0	0
		1-3	1
		4 or greater	2

3. HFHS = (sum of question scores/9) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #12	How many times were fried or pre-fried vegetables served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #6c	How many total times do fried or pre-fried vegetables appear on the menu for that full week	0	2
		1-3	1
		4 or greater	0
Observation #13	How many times were fried or pre-fried meats served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #5c	How many total times do fried or pre-fried meats appear on the menu for that full week	0	2
		1	1
		2 or greater	0
Observation #14	How many times were high fat meats served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #7c	How many total times do high fat meats appear on the menu for that full week	0	2
		1	1
		2 or greater	0
Observation #17	How many times were high sugar and/or high fat foods (not condiments) served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #14c	How many total times do high sugar and/or high fat foods (not condiments) appear on the menu for that full week	0	2
		1-3	1
		4 or greater	0
Observation #18	How many times were high sugar and/or high fat condiments served the day of observation	0 or 1	2
		2	1
		3 or greater	0

4. Bev = (sum of question scores/11) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #7	How many times was 100% fruit juice served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #10c	How many total times does 100% fruit juice appear on the menu for that full week	0-1	2
		2	1
		3 or greater	0
Observation #20	Was drinking water for children visible in the classroom?	No	0
		Yes	2
Observation #20b	If no, is there a water fountain in a nearby hallway?	Yes	1
		No	0
** Observation #20 and 20b are combined questions and should be included as one question.			
Observation #21	Did you witness teachers prompting children throughout the day to drink water?	Yes, regularly	2
		Yes, at specific times only	1
		No	0
Observation #38	Was drinking water for children available outdoors?	Yes	2
		No	0
		No outdoor time observed	Missing
Observation #39	While outdoors, did you witness teachers prompting children to drink water?	Yes	2
		No	0
		No outdoor time observed	Missing
Observation #22	How many times were sugar drinks served the day of observation	0	2
		1 or greater	0
Doc Review #11c	How many total times do sugar drinks appear on the menu for that full week	0	2
		1 or greater	0
Observation #23	How many times was milk served the day of observation	0	0
		1	1
		2 or greater	2

Observation #24	What type of milk was served to the majority of children at a majority of meals	Whole	0
		2%	1
		1%	2
		Skim	2
		Whole, flavored	0
		Lower fat, flavored	1
		Rice milk	2
		Soy milk	2
		Lactaid	2
Doc Review #12c	How many total times does milk appear on the menu for that full week	0-3	0
		4-6	1
		7 or greater	2

5. SBnutr = (sum of question scores/6) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #26	Did staff push children to eat more than they wanted to?	Yes	0
		No	2
Observation #27	Did staff serve children second helpings without being asked for more by the child?	Yes	0
		No	2
Observation #28	Did staff positively and gently encourage children to try new or less favorite foods	Yes	2
		No	0
		No children resisted eating	Missing
Observation #29	Was food used to control behavior	Yes	0
		No	2
Observation #30	Did staff sit with children during lunch	Yes	1
		No	0
Observation #30a	Did staff consume the same food as children	Yes	1
		No	0
**Observation #30 and 30a are combined questions and should be scored as one question			
Observation #31	Did staff eat and/or drink less healthy foods in front of children	Yes	0
		No	2
		Did not observe staff eating	1

6. NutrEnv (sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #3	How was lunch served?	Family style	2
		Delivered and served in prepared portions	0
		Delivered in bulk and portioned by staff	0
		N/A	0
Observation #54	Where were soda and other vending machines located	In entrance or front	0
		In public areas, but not front	0
		Out of sight of parents and kids	0
		No vending machines on sight	2
Observation #54a	Did they contain only healthy options?	Yes	1
		No	0
** Observation #54 and 54a are combined questions and should be scored as one question			
Observation #61	Are any posters, pictures or books about nutrition displayed in observation room	No	0
		Yes	2

7. NutrTE = (sum of question scores/5) x 10 Range = 0-20

Variable Name	Variable Label	Answer	Score (0, 1, or 2)
Observation #32	Did staff talk with children about healthy foods	No	0
		yes	2
Observation #33	Was any formal nutrition education for kids observed	No	0
		Yes	2
Doc Review #23	Does the center have a documented nutrition curriculum for kids?	No	0
		Yes	2
Doc Review #24	Does the center have documentation of parent nutrition education/workshop materials?	No	0
		Yes	2

Doc Review #22	Does the center provide nutrition training for staff?	No	0
		Yes	0
		No documents received	0
Doc Review #22a	If yes, how often	2 times/year or more	2
		1x/year	2
		Less than 1x/yr	0
**Doc Review #22 and 22a are combined questions and should be counted as one question.			

8. NutrPol = (sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Doc Review #17	Does the center have written guidelines addressing holiday/celebration foods?	No	0
		Yes	0
		No documents received	Missing
Doc Review #17a	Healthier items encouraged	No	0
		Yes	2
**Doc Review #17a and 17a1 are combined questions and should be scored as one question.			
Doc Review #18	Did you review past/future fundraising projects or guidelines?	No	0
		Yes	0
		Center doesn't do fundraising	2
Doc Review #18a	If yes, how many were non-food only	All	2
		More than half	2
		Half	1
		Less than half	0
		none	0
**Doc Review #18a and 18a1 are combined questions and should be scored as one question.			
Doc Review #19	Does the center have a written policy on nutrition and food service?	No	0
		Yes	0
		No documents received	Missing
19a1	*These are filled/not filled questions. If one of 19a1-19a9 is filled (1) then score as 1, if more than one are filled (1) then score as 2. If DRV19a=1, but none of the 19a1-19a9 is filled then score as a 0.		
19a2			
19a3			
19a4			
19a5			
19a6			
19a7			
19a8			
19a9			

Physical Activity

9. Act = (sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #34	How many minutes of total active play time was observed?	0-59 min	0
		60-119 min	1
		120 or greater	2
Observation #35	Was structured physical activity observed	No	0
		Yes	0
Observation #35a	If yes, how many occasions	1-2	1
		3 or greater	2
**Observation 35 and 35a are combined questions and should be counted as one question.			
Observation #36	Did you observe any outdoor active play	No	0
		Yes	0
Observation #36a	If yes, how many times/day	1	1
		2 or greater	2
**Observation 36 and 36a are combined questions and should be counted as one question. If ORF36 =1 and 36a is blank score as a 1.			

10. Sed =(sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #40b	How many total minutes of seated activity was observed	0-59 min	2
		60 or greater min	0
Observation #42	Is TV Viewing observed	No	2
		Yes	0
Observation #42a	Total minutes TV was on	0-29 min	1
		30 or greater min	0
**Observation #42 and 42a are combined questions and should be counted as one question.			
Observation #46	Is video game or computer game playing observed	No	2
		Yes	0

11. SedEnv =(sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #41	Is a TV present in the room	No	2
		Yes	0
Observation #45	Is a computer present in the room for use by children	No	2
		Yes	0
Observation #60	Are any posters, pictures or books about physical activity displayed in observation room	No	0
		Yes	2

12. PortEnv =(sum of question scores/7) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #56a	Is ball play equipment present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56d	Is jumping play equipment present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56e	Is a parachute present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56f	Are push/pull toys present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0

Observation #56g	Are riding toys present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56h	Are rocking/twisting toys present?	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56k	Is twirling play equipment present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0

13. FixEnv =(sum of question scores/8) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #55b	Is a basketball hoop present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #55e	Is a pool present?	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #55h	Are slides present?	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0

Observation #55j	Is a tricycle track present?	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #55k	Are tunnels present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #57	Was outdoor running space...	Unobstructed with plenty of space for group games	2
		Some obstruction, but space was adequate for individual play	1
		Plenty of space for play, but obstructed with play equipment	1
		Little running space or completely obstructed	0
Observation #58	Did staff limit or restrict outdoor play area in any way that affected active play?	Yes	0
		No	2
Observation #59	Was indoor play space suitable for...	Quiet play	0
		Limited movement/some active play	1
		All activities	2

14. SBpa = (sum of question scores/5) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #47	Did you observe restricting active play as punishment	No	2
		Yes	0
Observation #48	Did staff join in active play	No	0
		Yes	2
Observation #49	How many positive statements were made about physical activity	0	0
		1 or greater	2

Observation #50	Did staff provide prompts to increase physical activity?	Yes	2
		No	0
Observation #51	Did staff provide prompts to decrease physical activity?	Yes	0
		No	2

15. PaTE = (sum of question scores/4) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #52	Were any formal physical education lesions for children observed	No	0
		Yes	2
Doc Review #25	Does the center provide physical activity training for staff?	No	0
		Yes	0
		No documents received	0
Doc Review #25a	If yes, how often	2 times/year or more	2
		1x/year	2
		Less than 1x/yr	0
**Doc Review #25 and 25a are combined questions and should be scored as one question.			
Doc Review #26	Does the center have a documented physical activity curriculum for kids?	No	0
		Yes	2
Doc Review #27	Does the center have documentation of physical activity education/workshop materials?	No	0
		Yes	2

16. PaPol=scorex10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Doc Review #21	Does the center have a written policy on physical activity?	No	0
		Yes	0
		No documents received	Set as missing
21a1	*These are filled/not filled questions. If one of 21a1-21a6 is filled (1) then score as 1, if more than one are filled (1) then score as 2. If DRV21a=1, but none of the 21a1-21a6 is filled then score as a 0.		
21a2			
21a3			
21a4			
21a5			

Please use the following citation when referencing instrument scoring:
Ward DS, Hales D, Haverly K, Marks J, Benjamin SE, Ball SC, Trost S. An instrument to assess the obesogenic environment of child care centers. Am J Health Behavior. 2008 Jul-Aug;32(4):380-6.

Curriculum Vitae

Personal Information

Name: Leigh M. Vanderloo

Place of Birth: Calgary, Alberta, Canada

Citizenship: Canadian

Education, Awards, & Honours

EDUCATION

Master's of Sciences – Health & Rehabilitation Sciences Sept 2010 – present
Field: Health Promotion
University of Western Ontario, London, ON

Honours Bachelor of Health Sciences Sept 2006 – April 2010
Specialization in Health Sciences
University of Western Ontario, London, ON

Master's Thesis Title

The Influence of the Childcare Environment on the Physical Activity Levels of Preschool-Aged Children: A Feasibility Study

AWARDS & HONOURS

2011–2012

- Canadian Institutes of Health Research Master's Award: Frederick Banting and Charles Best Canada Graduate Scholarship ($17,500 – competitive)
- Ontario Graduate Scholarship ($15,000 – competitive – declined)
- Faculty of Health Sciences Graduate Student Conference Travel Award, University of Western Ontario ($244)

2010–2011

- Ontario Graduate Scholarship in Science and Technology ($10,000 – competitive)
- Faculty of Health Sciences Graduate Scholarship, University of Western Ontario ($1,000)
- Raymond Hétu Prize in Acoustics, Canadian Acoustics Association (competitive)

Paper title: *Sorry, Can You Repeat That?: A Health Promotion Campaign Addressing Noise-Induced Hearing Problems Among Senior Health Sciences Students*

2009–2010

- Dean's Honours List

2008–2009

- Dean's Honours List
- Maude Gordon Educational Award ($500)

2007–2008

- Western Scholarship of Distinction ($1,500)
- Queen Elizabeth II Aiming for the Top Scholarship ($3,500)

Related Work Experience

RESEARCH EXPERIENCE

Research Coordinator May 2010 – present
Child Health and Physical Activity Lab, University of Western Ontario, London, ON

Supervisor: Dr. Patricia Tucker

- Assist with the preparation of ethics submissions; organize participant recruitment; liaise with childcare stakeholders; format Actical accelerometers; collect data using Actical accelerometers and an environmental scan at childcare facilities; assist with data entry, cleaning, and analysis; assist with manuscript writing; assist with the dissemination of study results

Undergraduate Research Assistant May 2009 – April 2010
Faculty of Health Sciences, University of Western Ontario & Middlesex-London Health Unit, Public Health Research, Education, & Development Program, London, ON

- Co-moderated focus group discussions; cleaned, coded and analyzed data using QSR-NVivo software; formatted and edited manuscripts for publication; conducted literature searches and reviews; created and updated Reference Manager databases; measured participants' heights and weights (for calculating BMI); assisted with grant writing; assisted with verifying the accuracy of data entries; created participant and stakeholder summaries from a research study; assisted with questionnaire development

TEACHING EXPERIENCE

Lab Instructor January – April 2011
HS 2330b/Kin2222b – Systematic Approach to Functional Anatomy
Faculty of Health Sciences, University of Western Ontario, London, ON

ADDITIONAL WORK EXPERIENCE

Volunteer Coordinator Sept 2003 – August 2010
The Canadian Medical Hall of Fame, London, ON

- Managed volunteer program (including developing volunteer schedules, recruiting, and training new volunteers, etc.); aided in the facilitation of various educational programs for elementary and secondary school students; assisted with writing grant proposals and with the preparation of various communication material

Publications & Presentations

PUBLICATIONS

Published Refereed Papers

Vanderloo, L., Tucker, P., Ismail, A., & van Zandvoort, M. (2012). Physical activity opportunities in Canadian childcare facilities: A provincial/territorial review of legislation. *Journal of Physical Activity & Health, 9*(4), 461-472. Retrieved from http://journals.humankinetics.com/jpah

Mandich, G.*, & **Vanderloo, L**.* (2012). Obesity and diabetes among children: Nutrition-related educational and practical barriers and future opportunities. *Health Science Inquiry, 3*(1), 78-79. Retrieved from http://hsinquiry.sa.utoronto.ca/

*Authors listed in alphabetical order – contributed equally to this work

Technical Reports (non-refereed)

Tucker, P., van Zandvoort, M., Irwin, J.D., Burke, S.M., & **Vanderloo, L.** (2010). *Community advocacy plan for improved physical activity opportunities in childcare*. London, ON: Middlesex-London Health Unit & University of Western Ontario.

CONFERENCES & PRESENTATIONS

Academic Conferences & Presentations

Vanderloo, L., Tucker, P., Irwin, J. D., Burke, S. M., Johnson, A., & van Zandvoort, M. (2012, March 22-24). *The influence of the childcare environment on the physical activity behaviours of preschool-aged children: A pilot study.* Eastern Canada Sport and Exercise Psychology Symposium. London, ON. *Abstract and Oral Presentation.*

Vanderloo, L., Tucker, P., Irwin, J. D., Burke, S. M., Johnson, A., & van Zandvoort, M. (2012, February 8). *The influence of the childcare environment on physical activity among preschoolers: A feasibility study.* Health & Rehabilitation Sciences Graduate Research Forum, University of Western Ontario. London, ON. *Abstract and Oral Presentation.*

Vanderloo, L., Tucker, P., Irwin, J. D., Burke, S. M., & Johnson, A. (2011, March 26). *Environmental influences of childcare centres on preschoolers' physical activity levels: A pilot study.* Eastern Canada Sport and Exercise Psychology Symposium. Waterloo, ON. *Abstract and Oral Presentation.*

Tucker, P., **Vanderloo, L**., Ismail, A., & van Zandvoort, M. M. (2011, March 25). *Physical Activity Opportunities in Canadian Childcare Facilities: A Provincial/Territorial Review of Legislation.* Faculty of Health Sciences Research Day, University of Western Ontario. London, ON. *Poster Presentation.*

Vanderloo, L., Tucker, P., Irwin, J. D., Burke, S. M., & Johnson, A. *Are Canadian preschoolers sufficiently active? An objective assessment of physical activity levels and environmental influences in childcare centres.* (2011, February 9). Health & Rehabilitation Sciences Graduate Research Forum, University of Western Ontario. London, ON. *Abstract and Oral Presentation.*

Vanderloo, L., Tucker, P., van Zandvoort, M. M., Burke, S. M., & Irwin, J. D. (2010, April 7). *Decreasing Barriers: Advocating for Physical Activity in Childcare*. Independent Study Research Forum, Faculty of Health Sciences, University of Western Ontario. London, ON. *Abstract and Oral Presentation.*

Guest Lectures

Vanderloo, L. (2011, June 9). *Childhood obesity in Canada: A major public health concern*. An invited lecture for the undergraduate level course, HS 3700 – Child & Adolescent Health Issues. University of Western Ontario. London, ON. Oral Presentation.

Vanderloo, L. (2010, November 1). *Bullying: Bystander Intervention among Elementary Students*. An invited lecture for the graduate level course, HS9721a – Current Topics in Health Promotion. University of Western Ontario. London, ON. *Oral Presentation.*

Services & Administration

COMMUNITY SERVICE

Health Promotion Field Mentor Sept 2011 – present
Health & Rehabilitation Sciences Program, University of Western Ontario, London, ON

June 2011 – April 2012
2012 Eastern Canada Sport and Exercise Psychology Symposium (ECSEPS) Organizing & Planning Committee
University of Western Ontario, London, ON

Ambassador for SPARK Together for Healthy Kids Initiative May 2010 – present
Heart & Stroke Foundation of Ontario, London, ON

January 2009 – present
Board Member and Chair of Fund Development & Public Relations Committee
Vanier Children's Services, London, ON

GenNext Events Planning Committee Member Sept 2008 – August 2010
United Way of London & Middlesex, London, ON

VP Communications, Health Studies Students' Council Sept 2009 – April 2010
School of Health Studies, University of Western Ontario, London, ON

Weekly Volunteer July 2007 – Sept 2009
London Health Sciences Centre – University Hospital, London, ON

PROFESSIONAL MEMBERSHIPS & AFFILIATIONS

Chapter Vice-President 2011 – present
Canadian Obesity Network, University of Western Ontario Chapter, London, ON

Member 2011 – present
Child & Youth Network, London, ON

Member 2011 – present
North American Society for Pediatric Exercise Medicine

Professional Development and Additional Training/Certifications

WHO Growth Chart Training Program (Modules 1-5) April 2012

Workplace Hazardous Material Information System (WHMIS) training February 2011

National Institute of Health's Office of Extramural Research course on Protecting Human Research Participants December 2010

Interagency Advisory Panel on Research Ethics' Introductory Tutorial for the Tri-Council Policy Statement: Ethics Conduct for Research Involving Humans (TCPS) Sept 2010

Successful completion of Teaching Assistant Training Program (TATP), University of Western Ontario, London, ON August 2010

Leadership Education Program – Individual Leadership, University of Western Ontario, London, ON April 2009

Languages

1. English (native)
2. French (proficient, both orally and written)