

**EFFECTS OF AN INSTRUCTIONAL RESOURCE ON PRESCHOOL
CHILDREN'S PHYSICAL ACTIVITY LEVELS**

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Abstract

Children are not obtaining adequate amounts of physical activity (PA) and it is important to determine how we can increase PA. The purpose of this study was to explore the effect of a physical activity curriculum resource, Busy Bodies©, on preschool children's physical activity levels. A total of five preschools from the NW quadrant of Calgary, Alberta were included in this study. The 48 participants involved in the study were all 4 years old. The preschools were divided into three groups: Control Group (no intervention), Intervention Group (school received the resource), and Intervention and Teacher Training Group (schools received the resource and teacher training). The researcher placed pedometers on all participants and observed selected participants using the System of Observing Fitness Instruction Time (SOFIT). The results of this study did not confirm that teacher training impacted physical activity levels. The effects of the resource on the Intervention and Intervention and Teacher Training groups were similar as derived from pedometer and direct observation. Alternative forms of teacher intervention may further increase physical activity.

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Chapter 1: Introduction

The prevalence of physical inactivity among Canadian children is increasing at an alarming rate (Tremblay & Willms, 2003; Tucker, Irwin, Sangster Bouck, He, & Pollett, 2006). This issue is multifaceted and has both immediate and long-term implications to an individual's mental and physical health. This study explored the impact of a physical activity resource for teachers on preschool children's physical activity levels.

Presently, there are no standardized curricula or accredited preschool programs in Alberta. As a result, there can be ambiguity in the delivery of such programs. In order to operate as a licensed business, preschools must comply with Alberta regulations. The legislation states that "a pre-school program means a child care program provided to pre-school children and kindergarten children for less than 4 hours per child in each day the program is provided" (Government of Alberta, 2008, para. 1). The mandate of the program is "to provide a program that is keeping with the physical, social, intellectual, creative and emotional needs of children in the program" (Government of Alberta, 2008, Schedule 5, para. 1). Beyond such requests, there is no further obligation, in regard to curriculum objectives, of preschool programs.

The objective of preschool programs is to offer programs suitable to meet the needs of children in regard to social, physical, and intellectual development (Government of Alberta, 2008). Due to the prevalence of physical inactivity among children, the issue of whether preschools are meeting the needs of children's physical development undoubtedly comes into question.

This study evolved from my involvement on a physical activity committee at Mount Royal University in Calgary, Alberta. The department of Physical Education and

Recreation, in collaboration with Early Childhood Studies, examined physical activity levels of preschool-aged children in child care settings (Clark et al., 2008). The research project consisted of three different phases. Phase 1 included identifying the following: barriers that child care providers face when implementing physical activity programs; guidelines that may be available regarding physical activity; knowledge and educational levels of caregivers; and the beliefs and attitudes caregivers have regarding preschool-aged children and physical activity. A survey was developed to help answer these questions. Phase 2 attempted to gain a better understanding of what tools/resources child caregivers would benefit from and what actions would be required to distribute the resource tool. The intention of Phase 3 was to develop a resource package that could be utilized by child care providers. The study was a combined project of the Calgary Health Region, Calgary and Area Child and Family Services Regional, and Mount Royal University (Integrative Health Institute, Department of Physical Education and Recreation and the Child Care Centre).

The study demonstrated that children in daycare settings are not meeting the guidelines established by the National Association for Sport and Physical Education (NASPE), which states that children should receive 60 minutes of structured physical activity as well as 60 minutes of unstructured play daily (National Association for Sport and Physical Education [NASPE], 2002). Only 14% of the children from this study were found to meet the standards of physical activity as defined by NASPE. These findings demonstrate that preschool-aged children are not getting enough physical activity throughout the day. Many of the caregivers (92%) felt that their educational training in

the Early Learning and Child Care Diploma should have more focus on concepts and supports to promote physical in preschool-aged children (Clark et al., 2008).

Clark et al. (2008) identified five basic themes that limited physical activity in child care settings:

- A lack of space and equipment;
- A lack of suitable ideas for structured physical activities;
- A high emphasis on free play with little to no adult involvement and;
- Caregivers rarely getting involved in play scenarios, often not taking the opportunity to facilitate activities or encourage or extend children's play (Clark et al., 2008).

Clark et al. (2008) identified that preschool-aged children are not meeting recommended levels of physical activity. It also identified several components of the daycare setting that may hinder physical activity, including environmental characteristics and lack of teacher training. Clark et al. (2008) concluded that preschool physical activity curriculum development, including detailed instruction on the teacher's role, is needed.

Issue

Canadian children are not meeting the physical recommendations for physical activity as outlined by NASPE (Clark et al., 2008; NASPE, 2002). At the same time, there has been a significant increase in the number of overweight and obese children in Canada over the past twenty years (Canning, Courage, & Frizzell, 2004; Edwards, Evans & Brown, 2008; Shields, 2006).

Excessive weight can have social, psychological, physical, and economic implications (Canning et al., 2004). It is estimated that physical inactivity costs the

Canadian government \$5.3 billion annually in healthcare (Public Health Agency of Canada, 2008). Lack of physical activity is suggested to be one impetus of obesity. The reality is that Canadians, both young and old, are struggling with serious weight and inactivity issues. Preschool may be the ideal time to introduce interventions in the hope of preventing adult obesity and the negative of health and psychosocial consequences (Wang & Lobstein, 2006). A Canadian study conducted by Tucker et al. (2006) examined parental perceptions about their children's physical activity patterns and screen time behaviours. This study surveyed families from different socio-economic backgrounds and from a variety of childhood programs. It found that parents were not concerned about their children's screen viewing time, but agreed that it is important to find ways to increase children's participation in physical activity (Tucker et al., 2006). A number of suggestions for doing so were offered by parents, including: a walk to school program; drop in programs at local community centres; turning off the television; and accessible programs [including low cost programs, scheduling and transportation, offering subsidy or coupons to help offset costs and utilizing local facilities to eliminate transportation costs (Tucker et al., 2006)].

Although many practical suggestions were offered by parents, limitations were quickly identified. Financial costs and program scheduling also limit children's ability to be physically active. This study suggested that program availability should occur throughout the day to help accommodate working parents (Tucker et al., 2006).

Tucker et al. (2006) reported that parents felt physical activity programs should be communicated to parents by physicians, preschool and childcare programs, and through the media. Parents need to be aware of the wide range of opportunities that exist within

their own communities to engage their children in physical activity. Promoting such initiatives and making parents aware of resources available to them may help foster an atmosphere of healthy, active living for children.

One program that may help increase activity levels in children is the Busy Bodies© resource. This is a Canadian program created specifically for young children. The program is intended for small spaces and limited equipment. This resource is simple to follow making implementation relatively easy.

Purpose of Study

The purpose of this study is to examine the impact of a physical activity resource on preschool-aged children's levels of physical activity in preschool settings. More specifically, this research will examine the following questions:

1. Does a curriculum resource package (Busy Bodies©) containing physical activity ideas increase levels of physical activity among preschool students?
2. Does a curriculum resource package (Busy Bodies©) containing physical activity ideas embedded with teacher training further increase students' levels of physical activity?

Hypotheses

In conducting this study two predictions were made.

Hypothesis #1 – Physical activity levels at preschool will increase for the preschool group that receives the Busy Bodies© resource package. This will be determined by an increase in pedometer step count and direct observation between the control group (CG) and the other two groups.

Hypothesis #2 – Physical activity levels at preschool will increase for the preschool group that receives the Busy Bodies© resource package and teacher training. This will be determined by an increase in pedometer step count and direct observation between the intervention only group (INT) and the intervention and training group (I&T).

It is hoped that by providing preschool teachers with tangible resources and professional development that physical activity levels in preschool-aged children will increase.

Chapter 2: Literature Review

Physical Activity

For the purpose of this study, physical activity will be defined as “any body movement achieved by contraction of skeletal muscles that increases energy expenditure above resting levels” (Nowicka & Flodmark, 2007; Sirard & Pate, 2001). There are many ways to define physical activity; however, this study will specifically look at the movement of children’s bodies.

The Public Health Agency of Canada (2005) suggests that children should have 90 minutes daily of physical activity and decrease the amount of computer and video time by the same amount. These standards, as mentioned earlier, are similar to those outlined by NASPE (2002). NASPE (2002) has the following suggestions for preschoolers, i.e., those children between the ages of three and five:

- Preschoolers should receive 60 minutes daily of structured physical activity;
- Preschoolers should receive a minimum of 60 minutes daily of unstructured physical activity.
- Children in this age bracket should not be sedentary for more than 60 minutes, unless sleeping;
- Preschoolers should develop competence in basic movement skills in order to develop more complex movement skills;
- These children should have the opportunity to participate in physical activity in indoor and outdoor spaces that meet the necessary safety standards in order to perform large muscle activities, and;

- Those responsible for the care of young children should understand the importance of physical activity and facilitate the development of these movement skills.

Incorporating physical activity into the daily lives of children can be difficult. Parental work schedules and other commitments may make this difficult. However, we need to encourage children to be physically active.

Categorizing activity patterns for young children can be difficult. Physical activity in young children may be more appropriately described as play, “spontaneous activity in which children engage to amuse and to occupy themselves” (Timmons, Naylor, & Pfeiffer, 2007, p.46). Typical physical activity engaged in by preschool children tends to be brief in bouts of movement and with little time spent at vigorous activity levels (Timmons et al., 2007).

Three types of play were identified by Pellegrini and Smith (1998): rhythmic stereotypes (in infancy); exercise play (in early childhood); and rough and tumble play (in late childhood and early adolescence). Each of these stages occurs at different points of time in child development.

Rhythmic stereotypes, typically seen in the first year of life, demonstrate gross motor activities that occur without a describable purpose and account for 40% of an infant’s activities (Pellegrini & Smith, 1998). These movements that occur possibly serve to develop the infant’s control of specific motor patterns and correspond with maturational milestones (Pellegrini & Smith, 1998). The movements that occur in this stage, as well as parent-initiated play, are probably the main source of physical activity play in early life (Pellegrini & Smith, 1998).

Exercise play peaks around the ages of 4-5 but has the function of developing physical skills such as strength, endurance, and enhanced skill and movement (Pellegrini & Smith, 1998). Not only are there physical benefits associated with this form of play but it is also suggested that there are cognitive and psychological benefits (Pellegrini & Smith, 1998). As this stage of play declines it is replaced in the early years of elementary school with rough and tumble play.

The final stage of play, rough and tumble, typically occurs around the age of five and is a shift to more formal games, competition, group activities, and cooperative play (Pellegrini & Smith, 1998). The development of these skills occurs over a period of time and further helps children's proficiency in movement. The more opportunity children have to develop motor learning, the greater chance of success with physical activity. Children with higher levels of physical activity have better motor skills (Pellegrini & Smith, 1998).

Often, physical activity in preschool-aged children is in the form of play and the benefits can be seen in children's cognitive, physical, social, and emotional well-being (Timmons et al., 2007). Decreasing symptoms of depression and anxiety, as well as enhancing an individual's self-esteem and assisting in maintaining a healthy weight are only a few of the benefits of physical activity (Timmons et al., 2007).

The overall goal of physical activity should be to have children understand the intrinsic benefits of being physically active so they can live a life that is free from chronic disease and illness (Canada's Report Card on Physical Activity for Children and Youth, 2008). According to the Canadian Fitness Lifestyle Research Institute, the benefits of being physically active in childhood include: strengthening growing bones, muscles,

heart and lungs; helping prevent obesity; increases self-esteem; and promoting lower levels of anxiety and stress (Canadian Fitness and Lifestyle Research Institute, 2005; Hills, King, & Armstrong, 2007; Nowicka & Flodmark, 2007; Tucker et al., 2006). In addition, children who experience appropriate nutrition and physical activity throughout their development tend to experience healthy patterns of physical maturation that consistent with their genetic potential (Hills et al., 2007).

Active Healthy Kids Canada (2009) highlights the benefits attributed to regular physical activity. These include: increased levels of self-confidence and self-image; reduced misbehaviour at school; improved cognitive function; and reduced levels of anxiety (Active Healthy Kids Canada, 2009). Improved academic performance is an additional benefit. Physical activity “enhances memory and learning, promotes the generation of new nerve cells in the brain, and protects the nervous system from injury and disease” (Active Healthy Kids Canada, 2009, p. 17). Many benefits are associated with participation in physical activity.

Where Do Canadian Children Rank for Physical Activity?

Canada’s Report Card on Physical Activity for Children and Youth (2008) evaluated Canadian children’s health levels in relation to physical activity and levels of overweight and obesity. The report card gave Canadian children and youth a rating of D. A ‘D’ categorization is described in this way: “insufficient appropriate physical activity opportunities and programs are available to the majority of Canadian children and youth” (Canada’s Report Card on Physical Activity for Children and Youth, 2008, p. 2). Canadians have maintained this grade since 2002, and the results indicate an increased need to address the issue of physical inactivity.

The latest information from Active Healthy Kids Canada (2009) declares that 87% of Canadian children do not meet Canadian guidelines of being physically active for 90 minutes a day. The percentage of children meeting the criteria has increased from 9% in 2005/2006 to 13% in 2009 (Active Healthy Kids Canada, 2009). While this is an improvement, there are still many children who do not meet the standard. By 2015, the Ministers of Sport, Physical Activity and Recreation hope to have the number of Canadian children who are physically active increased to 20% (Active Healthy Kids Canada, 2009).

Measuring Physical Activity in Young Children

Defining physical activity levels in young children can be difficult due to an assumption that young children are inherently active (Timmons et al., 2007). Furthermore, measuring physical activity can be problematic because of the spontaneous and intermittent nature of physical activity that young children engage in (McKee, Boreham, Murphy, & Nevill, 2005; Puhl, Greaves, Hoyt, & Baranowski, 1990). Few studies have been conducted that measure physical activity in very young children. Present guidelines and intervention strategies have focused initiatives towards school-aged children 6-18 years with little attention directed towards children less than five years old (Timmons et al., 2007). Due to the rapid increase in the number of overweight and obese individuals, strategies need to be identified to address the issue.

A variety of strategies have been employed to assess physical activity levels in children. However, determining type and amount of physical activity that is needed for optimal growth and development is still unknown (Timmons et al., 2007). Assessing physical activity patterns in children will help establish links between physical activity

and health outcomes as well as the effectiveness of intervention programs (Oliver, Schofield, Kolt, & Schluter, 2007).

Direct observation. Direct observation is often cited as an effective measurement tool of physical activity due to the ability of the observer to capture short-term patterns and sudden changes in physical activity that are important when studying young children (Pate, McIver, Dowda, Brown, & Addy, 2008; Sirard & Pate, 2001). This type of measurement is perceived by many researchers to be the most effective way of collecting data regarding physical activity levels (Hills et al., 2007; Pate et al., 2008; Puhl et al., 1990). Additional benefits include the ability of the observer to provide information on the specific activity that is occurring; it is not limited to recall or individual bias; it can be done in a variety of settings, and it does not require equipment (Puhl et al., 1990).

However, it has been suggested (Oliver et al., 2007) that direct observation is subjective as a result of researcher interpretation. A bias of what is considered physical activity can occur, thereby providing inaccurate results. Other limitations may include reactivity or “Hawthorne” effect by the participants involved in the study (Puhl et al., 1990; Sirard, Trost, Pfeiffer, Dowda, & Pate, 2005). Direct observation can also be costly and time consuming, and it requires diligence by the observer (Oliver et al., 2007; Puhl et al., 1990; Sirard et al., 2005).

Presently, several observation tools exist to measure physical activity levels. Two of these include: The System for Observing Fitness Instruction Time (SOFIT) and the Children’s Activity Rating Scale (CARS) (McKenzie, Sallis, & Nader, 1991; Puhl et al., 1990). Observation as a form of measurement is conducive to a variety of settings for any given period of time and does not require the use of equipment (Puhl et al., 1990).

The System for Observing Fitness Instruction Time is one method used for direct observation (McKenzie et al., 1991). Many similarities exist between CARS and SOFIT. Both observational tools are intended to measure children's physical activity levels and both use a five-point rating scale to assess physical activity levels (Greaves, Hoyt, & Baranowski., 1990; McKenzie, 2009). Energy expenditure is validated by using heart rate monitors or measuring oxygen uptake. The SOFIT tool can be used to measure children's activity levels in the school system (McKenzie et al., 1991). One study examined physical activity levels of grade 1-2 students using pedometer and SOFIT and found a high correlation ($r=.74-.86$) between the two methods (Scruggs, Beveridge, Eisenman, Watson, Shultz, & Ransdell, 2003). The most significant difference between CARS and SOFIT is that SOFIT goes on to explore many more components other than measuring physical activity levels of children. SOFIT further examines the lesson context and the behaviours of the teachers instructing the class (McKenzie et al., 1991; McKenzie, 2009). The SOFIT tool observes children in 20 second intervals, 10 seconds for observation and 10 seconds for recording data (McKenzie, 2009). This tool requires the trained observer to review videotape for reliability purposes and necessitates that the observer hear audio to direct them when to observe and record data (McKenzie, 2009). McKenzie (2009), in the development of the SOFIT protocol, has included assessment sheets and audio files for the observer to begin assessing children's physical activity levels. The rating of physical activity levels in the SOFIT program are as follows:

1. Lying down
2. Sitting
3. Standing

4. Walking
5. Vigorous (McKenzie, 2009).

The CARS observation tool was developed as a combination of the measurement of children's oxygen uptake while examining children's heart rate (Louie & Chan, 2003; Puhl et al., 1990). The interaction of these two elements resulted in the establishment of the observational tool. The CARS rating scale is divided into the following five categories of varying degrees of intensity:

Level 1 – Stationary – no movement (i.e., lying, sitting)

Level 2 – Stationary – with movement (i.e., standing/coloring)

Level 3 – Translocation – slow/easy (i.e., walk 2.5 mph)

Level 4 – Translocation – medium/moderate (i.e., walk 2.5 mph with 5-10% grade)

Level 5 – Translocation – very fast/strenuous (i.e., walk 2.5 mph with 15% grade)

(Greaves et al., 1990).

Regardless of the limitations of direct observation, it is an effective tool for measuring children's physical activity levels and it is particularly useful for the validation of other measurement tools (Oliver et al., 2007; Puhl et al., 2007). Many studies have combined direct observation with more objective forms of measurement. The benefits of direct observation have been identified; however, if used in conjunction with other forms of measurement, it provides a strong indication of children's activity levels.

Pedometers. Pedometers are a good alternative form of measurement that can be used to record children's physical activity. Pedometers are an inexpensive tool that tabulates children's step counts during an activity (Louie & Chan, 2003). This

measurement tool is reliable and provides valid results of measurement (Oliver et al., 2007). One limitation of pedometers, however, is that they do not account for intensity levels of physical activity or for physical activity that may occur while stationary (Sirard & Pate, 2001).

One study (Oliver et al., 2007) measured children's physical activity levels by utilizing CARS and pedometers. This study found that a great deal of variability existed between the measurements recorded by pedometers and CARS. There may be several considerations to take into account when using pedometers. Gait, speed, and placement of the pedometer on the child (hip versus back) may produce less accurate results (Oliver et al., 2007).

Although this study found discrepancies between the results of the measurement tools, there is still a place in research for both tools. This article (Oliver et al., 2007) suggests that if researchers are looking to establish a general base of physical activity levels in preschool children, pedometers provide effective forms of measurement (Oliver et al., 2007). Another suggestion is that pedometers be placed on the children's hips rather than on their backs (Oliver et al., 2007). Placement of the pedometer on children's backs resulted in ambiguous results (Oliver et al., 2007).

Louie and Chan (2003) conducted a similar study to measure children's physical activity patterns using both pedometers and the CARS rating scale. This study found there was a positive correlation between the results found using pedometers and CARS.

Consequences of Physical Inactivity

Continued monitoring of physical inactivity is an important component to chronic disease prevention (Katzmarzyk, 2006). The significant prevalence of inactivity is

negatively affecting the Canadian population. Physical inactivity has led to increased numbers of obese children and adults (Katzmarzyk, 2006). The diseases related to physical inactivity include coronary heart disease, stroke, hypertension, colon cancer, breast cancer, and type 2 diabetes (Katzmarzyk, 2006; Shields, 2006). A variety of measures need to be employed to target risk reduction for such diseases while at the same time focus on health promotion. Adopting an active lifestyle will increase life expectancy (Katzmarzyk, 2006).

The concern for children's health and well-being is a well-documented topic in today's society (e.g., Clark et al., 2008; Dubois & Girard, 2006; Katzmarzyk et al., 2008; Merchant, Dehghan, Behnke-Cook, & Anand, 2007; Reilly, 2008; Shields, 2006; Tremblay & Willms, 2003; Tucker et al., 2006; Yaussi, 2005). According to Hills et al. (2007), obesity has become a global epidemic with a particular concern for children. It is predicted that today's children could be the first generation in over a century to see a decline in life expectancy due to being overweight and obese (Daniels, 2006; Hills et al., 2007; Wang & Lobstein, 2006). In the United States, obesity is the second leading cause of preventable death, following only smoking (Wang & Lobstein, 2006). The same is true in Canada, where the leading causes of death and disability are chronic non-infectious illnesses such as cardiovascular disease, type 2 diabetes and cancer (Sheilds, 2006). One of the common risk factors for each of these illnesses is overweight and obesity. Being overweight, according to the World Health Organization, is one of the greatest challenges and risk factors in the 21st century (Sheilds, 2006).

The impact of overweight and obesity is colossal in scope with implications for both developed and developing nations. Industrialized countries are experiencing a

substantial increase in childhood obesity (Kelly, Yang, Chen, Reynolds, & He, 2008 Wang & Lobstein, 2006). The prevalence of overweight and obesity between 1970 and 1990 for school-aged children has doubled and even tripled in countries such as Canada, the United States, Brazil, Australia, Japan, Finland, Germany, Greece, Spain and the United Kingdom (Wang & Lobstein, 2006). The magnitude of overweight and obesity varies throughout the world. However, the data suggests that for most of the industrialized world, overweight and obesity have become a serious problem.

Wang and Lobstein (2006) summarized available information from different countries to predict trends in child overweight and obesity. By 2010, it is predicted that 46% of school-aged children in the Americas will be overweight and one in seven will be obese (Wang & Lobstein, 2006). They argued that the causes for this may be attributed to ethnicity and low socio-economic status which makes it more difficult to obtain high quality food. In addition, changes to people's lifestyles in their working, living, and school environments, as well as changes to eating habits and activity patterns can impact obesity rates (Wang & Lobstein, 2006). The lure of the 'western' lifestyle may negatively affect developing countries. The 'western' diet and abundance of automated devices and vehicles (which may decrease physical activity levels) could put developing countries at risk for increasing their levels of obesity (Wang & Lobstein, 2006).

Another study recently conducted by Kelly et al. (2008) examined the global concern of obesity and made projections for 2030. Data for this study was collected from 106 countries. Two methods were used to predict overweight and obesity. The first method assumed that the number of overweight and obese individuals would remain constant, and the second method looked at an increase in the numbers based on secular

trends (Kelly et al., 2008). The study concluded that the highest prevalence of overweight and obesity occurred in developing countries that had established market economies (Kelly et al., 2008). Kelly et al. (2008) also found that both methods of prediction indicated an increased trend in obesity. In 2005, the number of overweight and obese adults 20 years and older totalled 33% of the population (Kelly et al., 2008). It is predicted that by 2030, 57.8% of the world population will be overweight or obese (Kelly et al., 2008). Of particular interest in this study is the increase of overweight and obesity in developing countries. Developing countries have large populations, and as they age and experience urbanization, changes to their lifestyle may occur that will negatively affect their eating habits and physical activity levels (Kelly et al., 2008). Such changes may result in an increase in overweight and obesity in developing countries.

Being overweight or obese has become a global concern, but remains most prevalent among developed countries (Kelly et al., 2008; Wang & Lobstein, 2006). This has been attributed to several factors, including: socio-economic status, environmental influences (including changes to working, living and school environments), and changes to eating habits and activity patterns (Wang & Lobstein, 2006). Present predictions estimate that the number of overweight or obese individuals will continue to rise in developed and developing countries as a result of the change occurring in individual lifestyle habits.

The issue of overweight and obesity has become a global issue and is negatively affecting Canadians. It is important to address this issue early so that we can decrease the negative repercussions that are associated with this disease.

Obesity in Canada

In Canada, the incidence of obesity is increasing among all segments of the population. A substantial increase in overweight and obesity has occurred over the past 25 years in all economically developed countries with respect to children's height and weight (Shields, 2006).

In Canada, researchers investigating overweight and obesity among preschool children show a trend towards increasing body weight (Canning et al., 2004). Canadian studies have found that one in four preschool-aged children are overweight or obese (Canning et al., 2004; Flynn et al., 2005; Story, Kaphingst, & French, 2006; Tucker et al., 2006).

A study done in the province of Newfoundland and Labrador found that issues of overweight and obesity were cause for concern dating back to the 1980s (Canning, Courage, Frizzell, & Seifert, 2007). The study compared children's height and weight between two different groups of children. One group was born in 1984 and tested in 1987 and the other consisted of children born in 1997 and tested in 2000. The results indicated that those children born in 1997 were markedly heavier when compared to their peers born in 1984 (Canning et al., 2007). The findings show that children born in 1997 were 1.7 times more likely to be overweight or obese compared to the 1984 cohort (Canning et al., 2007).

Another study specifically examined the levels of overweight and obesity in the 7,369 children between 4-6 years old in the Capital Health Region of Alberta (Edmonton, Alberta and surrounding area: population approx. 1 million) (Edwards, Evans, & Brown, 2008). This study, done in 2004, obtained data from children's preschool immunizations

which included regular measurements of height and weight. Approximately 74% of children within this region received regular immunizations (Edwards et al., 2008). The results found that 25% of children aged four to six were overweight or obese (Edwards et al., 2008).

The results of this research are similar to a synthesis of research conducted through the Public Health Vaccination Clinics in Calgary, Alberta (Flynn et al., 2005). Parents were surveyed to determine if they would be willing to participate in a surveillance program that monitored overweight and obesity in preschool children and to provide advice to families in order to promote healthy weight (Flynn et al., 2005). Height and weight measurements were plotted for those who participated in the study. The results found that 25% of preschool-aged children were overweight or obese (Flynn et al., 2005). The study also found that 87% of families involved found the resources provided by the clinic and the health care practitioners very positive in helping them promote healthy weights in their children (Flynn et al., 2005).

As the studies above allude to, Canada is experiencing a rapid increase in the number of children becoming overweight and obese. Based on body mass index (BMI), measurements, and longitudinal studies, 25% of preschool-aged children are now considered overweight or obese (Canning et al., 2007; Edwards et al., 2008; Shields, 2006).

Identifying/Defining overweight and obesity. Due to the substantial increase in the number of overweight and obese individuals in our population, valid and reliable monitoring methods are critical. There are many ways to track growth, but it is important that precise anthropometric measurements use appropriate equipment and techniques to

accurately plot growth charts for age and gender (Dieticians of Canada, 2004). Doctors distinguish between being overweight and obese by determining an individual's BMI by calculating their body weight in kilograms divided by their height in metres squared. The results are then compared to other individuals of the same age and gender (Centers for Disease Control and Prevention [CDC], 2006; Shields, 2006; Yaussi, 2005). When testing children's BMI, it is often referred to as BMI-for-age; this distinguishes BMI of children from adults. BMI-for-age is age and sex specific (CDC, 2006). For adults, the testing does not include the age or sex of the individual being tested. Testing children's BMI provides a reliable indicator of body fat (CDC, 2006). It does not provide exact measures of body fat, but is similar to other methods of attaining body fat measurements such as underwater weighing (CDC, 2006). Adult weight status is determined by BMI, where children's BMI is compared to other youth of the same sex and age in a similar population (Nihiser et al. 2007). Categories for weight, according to the body mass index scale, are as follows: BMI under 18.5 – underweight; BMI between 18.5 and 25.9 – normal weight; BMI between 26 and 29.9 – overweight; and BMI equal to or greater than 30 - obese (Nihiser et al., 2007). For example, a boy who is 13 years old, 62 inches tall, weighs 138 pounds, and has a body mass index of 25.2 would be considered overweight.

Consequences of obesity. The immediate, negative consequences associated with obesity include fatigue, shortness of breath, and lack of motivation. All of these can lower concentration levels and make learning difficult (Yaussi, 2005). The long-term effects of overweight and obesity can be much more problematic. For example, hypertension, type 2 diabetes, high cholesterol, and liver disease are a few of the diseases that are attributed to being overweight or obese (Tucker et al., 2006; Yaussi, 2005).

Carrying excessive weight as a person ages can also result in greater risk of heart disease, heart failure, stroke, bladder and reproductive problems, arthritis-related problems, and an increased risk of some cancers (Brunet, Chaput, & Tremblay, 2007; Canning et al., 2004; Green & Reese, 2006; Mason et al., 2006; Yaussi, 2005).

There is an extensive list of negative (and generally agreed upon) consequences associated with being overweight or obese. This issue is of great concern not only as a result of the many negative physical consequences to the body, but also because of the potential to negatively impact children's development. Overweight and obese children tend to experience frustration in physical activity due to their difficulty in completing tasks. They often encounter ridicule from their peers, they may be picked last for teams, and these components (acting alone or in concert) may contribute to these children not enjoying participating in physical activity or school in general (Green & Reese, 2006). This may cause children to display antisocial behaviour, which can create a cycle of isolation, leading to greater withdrawal, and inadvertently causing food to become a source of comfort (Green & Reese, 2006). Clearly, this issue needs to be addressed in order to help our children lead emotionally and physically healthy lives.

It is estimated that 80% of overweight and obese children will continue to stay overweight and obese into adulthood (Green & Reese, 2006; Yaussi, 2005). Once an adult is overweight it is very difficult to return to the normal weight range (Shields, 2006). Therefore children who struggle with weight will continue to struggle into adulthood. A strong correlation was found between overweight adolescents and overweight adults (Guo, Roche, Chumlea, Gardner, & Siervogel, 1994). A child, who is

overweight at the high end of the BMI scale, has a 40-80% chance of maintaining this weight into adulthood (Guo et al., 1994).

If children between the ages of two and five are overweight or obese, without overweight or obese parents, the probability of them becoming overweight or obese as an adult is 24% (Daniels, 2006). If young children have one overweight or obese parent, their chance of becoming overweight adults increases to 62% (Daniels, 2006). Dubois and Girard (2006) support this claim, confirming that children with one obese parent double their odds of becoming overweight and triple their odds if both parents are overweight. Several negative consequences of overweight and obesity are summarized in Table 1 (Brunet et al., 2007; Canning et al., 2007; Daniels, 2006; Green & Reese, 2006; Mason et al., 2006; Tucker et al., 2006; Yaussi, 2005).

Table 1

Consequences of Overweight and Obesity

Physical	<p>High blood pressure</p> <p>Type 2 diabetes</p> <p>Increased risk of heart disease, heart failure, stroke</p> <p>Increased risk of some cancers</p> <p>Likelihood of being overweight/obese increases if parents are overweight/obese</p>
Social	<p>Difficulty in completing tasks</p> <p>Experience ridicule from their peers</p> <p>Picked last for teams</p> <p>May cause kids to feel isolated</p>
Economics	<p>Overweight and obesity is taxing our financial system due to the burden it is placing on Canadian health care.</p>

Determinants of physical inactivity and obesity. It is suggested (Jago, Baranowski, Baranowski, Thompson, & Greaves, 2005) that obesity is caused by an energy imbalance in which children's caloric consumption exceeds their energy expenditure. In order for children to maintain a healthy weight, there needs to be a balance between food consumption and physical activity. Sedentary behaviour, (e.g., television watching), has been associated with unhealthy dietary behaviour (Jago et al., 2005). A reduction in television viewing, therefore, may be one simple way to help eradicate obesity in later life.

Poor eating habits and physical inactivity are associated with increased rates of obesity (Public Health Agency of Canada, 2007). For many individuals, lifestyle choices cause them to struggle with their weight. Individuals who struggle with weight often come from families that have struggled with poor eating and exercise habits (Yaussi, 2005). As a result, the problem of obesity continues to be prevalent.

The environment can also have implications on children's dietary and activity patterns. Tremblay and Willms (2003) found that the increasing prevalence of overweight and obesity could be attributed to excessive television watching and video gaming which may be a catalyst for excessive eating and sedentary behaviour. Automated labour saving devices and easy accessibility to calorie dense foods are also possible contributors to increasing rates of child obesity (Dwyer, Needham, Simpson, & Heeney, 2008; Tremblay & Willms, 2003).

A cross-sectional study (Merchant et al., 2007) examined diet, physical activity, and adiposity in children from two economically different neighbourhoods. The study found that children in low socio-economic neighbourhoods had parents who were less educated and received lower incomes. These children had higher BMI's when compared to their counterparts in high socio-economic neighbourhoods. In addition, children in the lower income neighbourhood reported more time watching television than those in high socio-economic neighbourhoods (Merchant et al., 2007). One of the elements found in the research, however, indicated that one of the primary reasons for sedentary behaviour in the low socio-economic group was a result of environmental influences. Children in low socio-economic neighbourhoods had less opportunity to be physically active. Schools were not within walking distance and residents of the community scored their

neighbourhood low in regard to domains of safety, aesthetics, and population density (Merchant et al., 2007). The results suggest that the neighbourhoods in which children live may predispose them to obesity. In the less advantaged neighbourhoods, food is more expensive and of lower quality and limited variety (Merchant et al., 2007). The healthy food choices are much more expensive than the less healthy alternatives, thereby promoting unhealthy eating habits and, indirectly, promoting obesity (Merchant et al., 2007). In addition, the opportunity for physical activity was found to be limited in such neighbourhoods. Fewer recreational facilities exist in low socio-economic neighbourhoods, which could account for the decreased participation in physical activity (Merchant et al., 2007). The cost of participation in physical activity is also a barrier to enabling children to be physically active.

Other research found that children's physical activity levels were largely influenced by the schools that the preschool children attended. It is suggested that policies and practices aimed at increasing physical activity in preschool-aged children could positively influence children's activity levels (Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004). One of the factors found to influence physical activity was the amount of time children were given to play freely in settings conducive to physical activity (Pate et al., 2004). Those children who were allowed to play freely in playgrounds and gymnasiums exhibited higher rates of physical activity (Pate et al., 2004).

Preschool Teacher Qualifications

In the Province of Alberta there are three levels of certification in the Early Childhood Education program. A minimum certification of Child Development Assistant is required to work in Preschools (Government of Alberta, 2008). This certification

requires individuals to complete a course in child care that is approved by their director, or to show competencies that the director considers equivalent to a course in child care (Government of Alberta 2008). All preschool teachers involved in this study held a minimum certification of Child Development Assistant. This position was typically held by the preschool assistant. Training as a Child Development Assistant is a minimum requirement by the Alberta Government (Government of Alberta, 2008). In three of the preschools, the primary preschool teacher had a Level 3 certification in Early Childhood Education. Two primary preschool teachers held a Bachelor of Education degree. Each preschool classroom had a minimum of one teacher and one volunteer.

The Preschool Curriculum

The overall goal of preschool programs in the province of Alberta is to develop the physical, social, intellectual, creative and emotional needs of children (Government of Alberta, 2008). The delivery of these goals is up to the discretion of the childcare providers within each given preschool. There is no established curriculum that dictates to childcare providers how much time should be allotted to the development to each of these specific areas. Therefore, there is a lot of discrepancy amongst preschool programs in delivering curriculum.

To assist childcare providers in successfully achieving each of the program goals it may be beneficial to establish specific curricula. One possible suggestion for fostering physical activity would be to provide teacher training and a curriculum resource specific to implementing physical activity in preschool programs. An example of such a resource is Busy Bodies©.

Busy Bodies[®] Instructional Resource

Busy Bodies[®] is a Canadian program that was created to promote positive change in children's physical activity and nutritional habits (Nutrition Resource Centre, 2007). The program is a combined effort between the Nutrition Resource Centre and the Ontario Public Health Association. Since March 2007, over 80,000 English copies and 12,000 French copies have been distributed (M.E. Prange, personal communication January 7, 2010). Although no formal evaluations or research have been done on the program, the overall response has been positive (M.E. Prange, personal communication, January 7, 2010)

The package is a simple, colourful, and easily accessible resource. The program is two sided, offering both nutritional and physical activity suggestions. The physical activity component is designed for children between the ages of three and five to engage in physical activity in small spaces with limited equipment.

The resource provides individuals with a variety of activities to choose from. Some of these activities include music and encourage children to be creative. 'Do the Twist', 'Strike up the Band' and 'Walk to the Rhythm of the Beat' are just a few examples in the Busy Bodies[®] resource (Nutrition Resource Centre, 2007). Other activities work on developing children's manipulative skills such as 'It's Never Too Late to Skate', 'Wacky Hockey', 'Have a Ball' and 'Sponge Play'. These activities require kids to manipulate their bodies in a variety of ways with different pieces of equipment (Nutrition Resource Centre, 2007). Some of these activities also ask kids to strike or catch an object with different parts of their body.

Presently, no research or formal evaluation has been done to document the effectiveness of the Busy Bodies© resource (M.E. Prange, personal communication, January 7, 2010). Furthermore, the resource does not incorporate a teacher training program, nor does the Nutrition Resource Centre intend to offer such professional development for the resource to supplement the program (M.E. Prange, personal communication, January 7, 2010).

Based on the wide scale problem of physical inactivity among our children, possible solutions need to be identified to address the issue. Providing childcare providers with tangible resources to promote physical activity may be one solution. Busy Bodies© may be a practical teaching tool that could give childcare providers alternatives for keeping children active.

Current Intervention Strategies

The Government of Canada has recognized the problem of physical inactivity faced by many Canadians and has introduced several initiatives to combat the issue (Public Health Agency of Canada, 2007). These initiatives include:

- Canada's new Food Guide – this guide is inclusive of First Nations, Inuit and Métis dietary needs;
- Money allotted to a revised public campaign titled ParticipACTION – an attempt to encourage citizens to maintain a physically active lifestyle;
- Children's Fitness Tax Credit – the Government, as of 2007, provides families with a tax credit for up to \$500 for children to participate in physical fitness;
- WinterActive and SummerActive initiatives - established to help promote community-based physical activity;

- Canada's Physical Activity Guides - providing direction to children and youth to maintain a healthy lifestyle through regular physical activity. These guidelines suggest that children should initially increase their daily physical activity to 30 minutes per day and decrease their screen time by the same amount.

These are a few of the most commonly recognized intervention strategies presently offered by the Government of Canada. A comprehensive list of all possible interventions is beyond the scope of this study.

Limitations of current intervention strategies. Although the government has introduced several initiatives to combat physical inactivity among children, it does not appear to have had an impact on children's activity levels. Many of the above-mentioned intervention strategies are new initiatives that may need more time to determine if they will have a direct impact in fighting overweight and obesity. As illustrated in the Alberta (Edwards et al., 2008) and Newfoundland and Labrador studies (Canning et al., 2004), the percentage of children who struggle with being overweight or obese continues to increase. Many of the initiatives that have been introduced by the government to date do not specifically target children within the preschool age bracket. There is an assumption that young children are highly active, but this assumption is false (Reilly, 2008). In reality, these children are not meeting the recommended amount of daily physical activity (NASPE, 2002). One of the difficulties in targeting this age bracket is the fact that these children are under the care and influence of their parents (Tucker et al., 2006). In order to positively implement change in children within this age bracket, the parents need to be

targeted. Innovative measures need to be introduced to parents to assist them in making healthy active choices for their children (Tucker et al., 2006).

Tucker et al. (2006) looked at obesity prevention by studying parents' perspectives on physical activity and screen viewing behaviours to determine if there are programs that may assist in increasing physical activity and decreasing screen time. The parents in this particular study did not appear to be concerned about their child's screen time, but were more concerned with their child's activity level (Tucker et al., 2006). Several suggestions were discussed to increase children's activity levels. Suggestions included: a walk-to-school program; participation in community programs that promote physical activity; and utilization of accessible programs such as drop in programs (e.g., child playrooms) (Tucker et al., 2006). The study also discussed limitations with the suggestions made. These included: inability to walk to school due to locations as well as issues of safety; costs associated with participating in structured, organized activities; transportation (e.g., unavailability of a vehicle or public transportation); and a lack of availability of evening classes (Tucker et al., 2006).

When creating intervention strategies, the strategies should be designed to prevent obesity rather than treat it (Tucker et al., 2006). Presently, little is known about effective intervention methods (Heitmann, Koplan, & Lissner, 2009; Reilly & McDowell, 2003).

Exposure to sedentary behaviour (television watching) has been associated with increased paediatric obesity risk (Reilly & McDowell, 2003). Common strategies to combat overweight and obesity have included decreasing screen time (e.g., television and computers) and increasing physical activity for children (Nowicka & Flodmark, 2007; Reilly, 2008; Reilly & McDowell, 2003; Tucker et al., 2006). Focusing on reducing

sedentary behaviour, according to Reilly and McDowell (2003), may indirectly affect food habits such as dietary intake. Reilly (2008) argues that there may be too many interventions at a given time, which may complicate the goal of reducing obesity. Instead, he recommends that one intervention be introduced at a time.

Benefits of intervention. The Government of Canada has recognized the need for promoting positive eating habits and encouraging physical activity with the initiation of several tactics. This government awareness must be conveyed to all citizens. Regardless of the intervention used, the goal is the same — to reduce the growing prevalence of overweight and obesity within our country. What needs to be determined is the best strategy to deal with this issue. Presently, it appears that decreasing screen time and increasing physical activity have had the most positive results (Nowicka & Flodmark, 2007; Reilly, 2008; Reilly & McDowell, 2003; Tucker et al., 2006). Further education about such strategies for parents, child care providers, educators and health care practitioners may help promote positive change. Presently, further research should occur to identify which intervention methods will have greatest success. One possible suggestion is to engage those adults, who care for children, in activities that are safe and suitable to the developmental needs of children. Professional development through newsletters, conferences and workshops may be one avenue to promote educational training.

Professional Development

Professional development is an additional strategy that can be adopted to implement change. Incorporating print resources and/or in-services may be ways to provide educators with new educational information. Determining effective delivery of

such information is pertinent to successful professional development. If long-term change is to be everlasting, then the quality and delivery of the information is important.

Due to the increasing rates of overweight and obesity and the concern for children's health and well-being, many school teachers are being asked to teach physical education to their students. One study conducted by McKenzie, Sallis, Faucette, Roby, & Kolody (1993) examined the difference that a quality in-service program had on the quantity and quality of elementary physical education. This study involved grade 4 students from 7 different schools in the United States (n=28) and found that the group of teachers who received the extensive in-service training had increased rates of student activity levels, improved lesson context, and teacher behaviour (McKenzie et al., 1993). The key components to staff development in this example included: creation of an awareness of the program and its differences from prior programs; specific skill training; ongoing administrative support; and, finally, group support with feedback (McKenzie et al., 1993). Providing teachers with training that is specific and tangible will have larger benefits. Due to limited information of PA to students in Early Childhood Education programs such teacher training will have to occur in alternative forms (i.e., in-services). Child care providers should be given the opportunity to receive the information in a format that encourages the opportunity to ask questions and support to incorporate new initiatives into their existing programs. These strategies for professional development are similar to those suggested by Guskey.

Guskey (1991) highlights that although professional development is often about changes to policies; it is a very personal journey. Several suggestions have been offered to make professional development successful. To begin, individuals need to be aware of

the purpose of professional development and the potential for personal benefits. Embarrassment or anxiety may be concerns that individuals may have when engaging in professional development (Guskey, 1991). This research was derived from prior research that examined effective professional development. To alleviate such concerns, individuals should be informed of the potential benefits they will receive by engaging in the professional development opportunity. Secondly, when introducing professional development, it should occur in small, gradual steps (Guskey, 1991). Professional development should occur in a format that is inviting to participants rather than overwhelming. Having individuals see themselves as part of a team can eliminate feelings of isolation and encourage collegiality among staff. Guskey (1991) also offers that if individuals are experiencing success with new professional development, then they are more likely to adopt the new practices. Experiencing success can be motivating for individuals to continue incorporating change into their classroom practice. Final components for successful professional development are continued support and follow up. It is suggested that few people move from professional development to successfully incorporating the new information into practice (Guskey 1991). Incorporating professional development into daily practice is often difficult for individuals (Guskey 1991). Offering individual support is vital for success.

Key components for successful professional development include: having individuals understand the significance and personal benefits of it; enforcing a sense of team; and providing ongoing support as individuals try to incorporate the change into daily practice (Guskey, 1991; McKenzie et al, 1993).

Summary

The rate of physical inactivity among children is escalating at an unprecedented rate and future projections reinforce the need for early intervention. Furthermore, the consequences of physical inactivity are apparent. Present Canadian statistics suggest that one in four children are overweight or obese and the global scope suggests that overweight and obesity has become a serious issue (Canning et al., 2004; Flynn et al., 2005; Story et al., 2006; Tucker et al., 2006). There is strong evidence that suggests if children are overweight or obese at a young age, then this will continue into adulthood (Guo et al., 1994). An imbalance between physical activity and food consumption appears to be occurring among our youth. Sedentary behaviour such as television viewing and gaming may act as a catalyst for reduced activity and excessive eating (Tremblay & Willms, 2003). To exacerbate this issue, children that come from lower socio-economic areas do not have the same opportunities to engage in physical activity as children from higher socio-economic areas (Merchant et al., 2007). Merchant et al. (2007) determined that disadvantaged areas had fewer recreational facilities and environmental constraints that limited children from walking safely to school resulting in limited physical activity opportunities for children.

Although several initiatives have been introduced to promote physical activity, it appears that they have had little influence in combating the issue of overweight and obesity. Present statistics and future predictions suggest it is an issue of great concern. More research needs to be done to examine intervention strategies aimed toward preschool children and the possible impact that these interventions may have on future obesity. As opposed to treatment of the disease, prevention should be the primary focus.

The Busy Bodies© resource is one intervention tool that may be used to increase PA levels in preschool-aged children. The resource is specifically designed for this age bracket and requires limited equipment and space. It is hoped that such resources promote PA.

Chapter 3: Methodology

Subject Recruitment

A total of 21 preschools in the NW quadrant of Calgary, Alberta, with children between the ages of three and five, were officially invited to participate in this study. The owner/administrator and the teachers of each preschool were contacted via letter (Appendix A). Seven preschools expressed interest in participating in the study. Each of the preschools were contacted and asked several questions to determine eligibility for participation (Appendix B). The individuals contacted ranged amongst, owners, teachers and board members. Of the seven preschools, five met the established criteria.

Preschool Setting

Each preschool setting had an established play area separate from the classroom learning centre. According to Alberta regulations, a preschool is best defined as “a child-care program provided to preschool and kindergarten children for less than 4 hours per child in each day the program is provided” (Government of Alberta, 2008, para. 1). All preschool programs are required to provide a minimum net floor area of 2.5 square metres per child (Government of Alberta, 2008). The regulation from the Alberta Government (2008) for net floor area is calculated on the basis of two components: licensed capacity and primary play space measurements.

In addition to space requirements, preschools have parameters for furnishings and equipment included in the facility. A preschool licence holder must provide the following furnishings: play equipment and play materials that are safe and maintained in good repair, developmentally appropriate for children, and of sufficient quantity and

variety for children; and books, toys, and play equipment that support literacy development (Government of Alberta, 2008).

All facilities in this study offered a variety of equipment for children to use when engaging in physical activity. This information was collected from an eligibility checklist completed prior to the commencement of the study (Appendix B). This ensured similarity amongst the five preschools.

Preschool programs typically occur over a two-hour time frame. Although this is not standardized in Alberta it was common amongst all preschools involved in this study. Once children enter the facility, they place their backpacks on hooks and are allowed free time. After all children have arrived, the preschool teacher discusses the day of the week and the weather, and then reads a story. After the story, children are given instructions to create a special craft for that day. Following the craft, children are permitted free time at the different activity centres while other children complete their crafts. These activity centres include; building puzzles and playing with toys/blocks. Children have a quick snack and then participate in physical activity. Following physical activity, children sing songs and read a final story before they are dismissed for the day.

Once all preschools were identified, preschool owners/administrators completed consent forms (Appendix A). Parents of all children from each of the respective preschools were also required to complete consent forms to participate in the study (Appendix C). The only requirement for children to participate was the ability to walk. All children met the criteria. Once all consent forms were received, the researcher divided the preschools into three different groups of participation (control group, intervention group, and intervention and teacher training). Group selection occurred

randomly. The names of all preschools were placed in a hat. The first 2 groups comprised the Control group, the third preschool became the Intervention group and the final two preschools became the Intervention and Teacher Training group. In the event that a child was not in attendance during the study, that child's data was not included.

Measurement Tools

To measure physical activity, pedometers and direct observation were used.

Pedometers. The pedometer selected for this study was the Digi-Walker SW-200, Yamax. The Digi-Walker does not provide information on the intensity or temporal location of activity, but rather provides information on total step count within a given period of time (Barfield et al., 2004).

Several studies have found the results of the Digi-Walker to provide valid and reliable data when measuring physical activity levels in preschool-aged children (Barfield et al., 2004; Louie & Chan, 2003). Barfield et al. (2004) found that the pedometers provided accurate results with varying intensity levels when used with young children.

Observation. In addition to pedometers, the SOFIT observation tool (McKenzie, 2009) was used for all preschools participating in the study (Appendix D). The SOFIT tool was used to further validate physical activity as recorded by pedometers. The observation tool monitored children's activity levels in 20 second intervals. As described in the SOFIT protocol, children were observed for 10 seconds and the data were recorded for 10 seconds. During observation, the researcher determined the level of physical activity to best describe the participant's activity level during that specified time frame. An average activity level was tabulated daily and over the course of the study for each participant on each day of observation. The results were then compared amongst all three

groups. Student activity levels were recorded (Appendix E) based on movement categories outlined by the SOFIT program and are as follows (McKenzie, 2009):

Level 1 – lying down

Level 2 – sitting

Level 3 – standing

Level 4 – walking

Level 5 – vigorous

The number of participants selected for observation in this study is based on data collected from prior research (Fairweather, Reilly, Grant, Whittaker , & Paton, 1999; Oliver et al., 2007). This research determined that a sample size of 8-10 participants is sufficient to provide statistical significance (Fairweather et al., 1999; Oliver et al., 2007). The length of the study (six weeks) and the number of children wearing pedometers were selected to ensure sufficient data and to determine if the intervention impacted physical activity levels.

Up to five participants from each preschool were randomly selected for observation. The number of children selected for observation is identified in Table 2.

Table 2

Number of Children Observed at Each Preschool

Group	Number of Preschools	Total Number of Children Observed/Group	Preschool
Control	2 preschools	8 children	Preschool A – 4 children Preschool B – 4 children
Intervention	1 preschool	5 children	Preschool A – 5 children
Intervention and Teacher Training	2 preschools	8 children	Preschool A – 4 children Preschool B – 4 children

For each day of observation each selected child was observed for a total of 4 minutes. Within the 4 minutes a total of 12 observations were recorded. All 12 observations were tallied to provide an average physical activity score for each child and individual activity scores were combined to provide an average activity score for each preschool. Table 3 demonstrates the average activity level of children in each of the preschools across the three days of observation. The level of activity, as defined by SOFIT, was tabulated for each child and then an averaged.

Table 3

Average Physical Activity Levels of Preschool-Aged Children as Categorized by SOFIT

SOFIT Level	Control Group	Intervention (INT) Group	Intervention and Teacher (I&T) Training Group
< 2	0	0	0
2.0-2.9	11	0	4
3.0-3.9	9	6	15
4+	4	9	5
Total Number of observations	24	15	24

The activity levels as defined by SOFIT (McKenzie, 2009) are as follows.

Level 1 – lying down

Level 2 sitting

Level 3 – standing

Level 4- walking

Level 5 - vigorous

Observer reliability. Intra-related reliability was performed using the SOFIT observer training DVD that was developed by Dr. Tom McKenzie and is available through Active Living Research in San Diego (McKenzie, 2009). The researcher used the DVD supplied by SOFIT for training purposes and compared the results of measurement of physical activity to the results provided by the DVD. Reliability was checked twice

before observation occurred and once during observation. A minimum reliability rate of 80% is required by the SOFIT program, the researcher was able to maintain 92%.

Reliability testing scores were 89%, 93% and 95% on each of the respective tests.

Procedures

Five preschools were purposely selected to be included in this study. These preschools were further divided into three separate groups. Selection of group participation was done by a random draw. Two preschools served as the control group. One preschool acted as the intervention group which received the Busy Bodies© resource and the final two preschools formed the intervention and teacher training group which received the Busy Bodies© resource and teacher training. Only those children who received parental consent and were able to walk were involved in the study.

In order to minimize factors that might influence the data several initiatives were conducted at the beginning of the study. Before the study began students were given the opportunity to become familiar with the researcher and with the pedometers. The students were provided with an explanation of pedometers and the format of the study. Students were told that the researcher would be visiting their preschool on five separate occasions and that she would watch their class for a 30-minute period. During this time she would be writing about the activities that the children were participating in while listening to her music player. Children were told that the researcher was not listening to music but to instructions telling the researcher what to do. At this time students were given the opportunity to become familiar with pedometers and allowed to view their step count. If a belt or waistband was unavailable an elastic waistband was provided. To reduce bias preschool teachers were not told which children were being observed.

All pedometers were validated prior to the commencement of the study to ensure they were working correctly. The researcher wore the pedometers for 50 steps. If the pedometer step count was within +/- 3 (48-52) steps the pedometers were considered valid. Pedometer validation was done for each pedometer.

All preschool children were asked to wear pedometers on five separate occasions. The preschool teachers and the researcher placed pedometers on the children participating in the study. Pedometers were placed on each child's right hip and set to '0' at the beginning of the designated physical activity period for each day of the study. Pedometers were worn between 16-30 minutes on each day. A total pedometer step count was tabulated for each child on each day of the study (Appendix E). Pedometer data for each day of collection was then divided by the amount of time spent in physical activity to convert total pedometer step count to steps per minute. This data was collected for each preschool and then compared between the three groups.

Baseline pedometer data was collected for all participants at each of the respective preschools on two separate days prior to intervention. This data was used to help determine if a change in pedometer step count occurred over time and as a result of intervention for the intervention and intervention/teacher training groups.

After baseline data were collected, the first group (the control group) continued with their daily activities as normal. This group did not receive any intervention or additional information. The second group (the intervention group) received the Busy Bodies© resource and were encouraged to include some of the activities into their physical activity routine. Finally, the third group (the intervention and teacher training

group) received the Busy Bodies© resource and teacher training to supplement the curricular resource.

In addition to pedometers, the participants' physical activity was observed on three separate occasions throughout the study. Direct observation was conducted in conjunction with pedometers to validate the data collected from pedometers. The information collected from observation assisted in identifying the type and intensity of physical activity performed by the children. Observation data was collected for all groups the final three days of the study.

All students from each preschool, who received parental consent, wore pedometers on five separate occasions. Each pedometer was identified by a number. Children lined up, prior to physical activity and a pedometer was randomly selected and placed on their waistband. A class list was used to match the child's name with the pedometer. The names of students were only used to ensure that on each day of the study the children wore the same pedometer. Connecting the names of children with pedometers also established consistency for collecting pedometer as well as observation data. Pedometers were taken off directly after physical activity had occurred. This routine of pedometer placement occurred each day of the study.

In addition to pedometer data, up to five participants (from each preschool) were selected for direct observation. The SOFIT observation tool was used for observing and recording participants' physical activity levels. Participants were randomly selected for observation were randomly selected. Children who selected pedometer 2, 4, 6, 8, and 10 were observed. To maintain consistency in data collection, students wore the same

pedometer over the course of the study. Those students who were not present for a day of data collection did not have their results included in the final analysis.

Observation occurred at each preschool on the final three days of the study. The same students were observed on each day of observation. Each participant was observed for a total of four minutes during the class period. Observation of physical activity occurred in 10 second intervals and then data was recorded for 10 seconds. After the first child (Child '2') was observed for four minutes, Child '4' was observed for four minutes, followed by Child '6', Child '8', and Child '10'. Each child was observed once on each of the three observation days.

All participants assigned to the control group wore pedometers to measure physical activity levels for a total of five days. In addition, four participants from each of the two preschools involved in the control group were selected for observation. This group did not receive the physical activity resource and were asked not to research it. Over the duration of the study this group continued with their daily routine. Upon the completion of the study the preschools involved in this group received the resource and teacher training.

The same measures of pedometer data collection and observation selection used for the control group were applied to the participants in the intervention group. In addition to pedometers and observation, this group received the Busy Bodies© resource. The resource was introduced to the preschool teacher after baseline data were collected. Teachers were encouraged to look through the resource and incorporate as many activities as possible during their physical activity time.

The same procedures were also applied to the intervention and teacher training group of participants. However, in addition to the resource this preschool group received teacher training to assist in successfully implementing the Busy Bodies© resource into their preschool program.

This training, provided by the researcher, occurred after baseline pedometer step counts were collected (Appendix F). Training ranged between 40-60 minutes. The resource was introduced as a physical activity tool designed for children between the ages of three and five with limited equipment and space. In addition to providing suggestions for physical activity, the preschool teachers were also told that the two-sided resource contained nutritional suggestions. All activities in the resource were discussed one by one with various suggestions for modifications (e.g., space and equipment). Preschool teachers were also given the opportunity to have activities demonstrated. All teachers declined.

The preschools were divided into the three groups (control, intervention and intervention and teacher training) in early Spring. The study was conducted between April and June 2010 (Appendix G). Table 4 identifies a timeline of data collection

Table 4

Data Collection Timeline

	Time 1	Time 2		Time 3	Time 4	Time 5
Control Group	Baseline data collected	Baseline data collected		Pedometer and Observation data collected	Pedometer and Observation data collected	Pedometer and Observation data collected
Intervention Group	Baseline data collected	Baseline data collected	Intervention	Pedometer and Observation data collected	Pedometer and Observation data collected	Pedometer and Observation data collected
Intervention & Teacher Training	Baseline data collected	Baseline data collected	Intervention & Training	Pedometer and Observation data collected	Pedometer and Observation data collected	Pedometer and Observation data collected

Analysis

Two methods were used in this study to measure physical activity among preschool-aged children. Pedometers were used during designated physical activity time to measure physical activity levels of children. To complement pedometers, direct

observation was utilized to further provide information regarding children's activity levels.

Repeated measures of analysis of variance (ANOVA) was used to examine the effects of time and the introduction of the BusyBodies© resource on physical activity levels. If effects were identified, pairwise comparisons were executed and adjusted for multiple comparisons. To determine if a relationship existed between the pedometer and observation data, a Pearson product moment correlation was performed. The analysis was conducted using a Statistical Program for Social Sciences (SPSS) with a significance threshold of $p < .05$.

Chapter 4: Results

Preschool Characteristics

Control group. The control group consisted of a total of 16 participants (6 girls, 10 boys) in two preschools. Both preschools provided an open space to conduct physical activity. One preschool had a full gymnasium; the other preschool had the equivalent of half a regular gymnasium. One preschool operated out of a community centre and the other out of a church basement.

Intervention group. The intervention group (INT) consisted of one preschool with a total of 12 children (8 girls, 4 boys). In addition to the preschool teachers, there was a parent volunteer in the classroom each day of the study. This preschool was located in a local community centre and had access to a large gymnasium and dance studio.

Intervention and teacher training group. Two preschools comprised the intervention and teacher training group (I&T). Between the two preschools there were 20 children in total participating in this study (14 girls, 6 boys). Both of these preschools operated out of a community centre and had access to large open spaces. One of the preschools engaged in physical activity in was able to play outdoors in an open field and had access to a playground. This playground consisted of a climbing structure, slide, swing set and teeter totter.

Table 5 shows the subject characteristics including number of preschools and children involved.

Table 5

Number of Preschools and Children Involved in Study

Group	Number of Preschools	Total Number of Children
Control	2	16
Intervention	1	12
Intervention and Teacher Training	2	20

Teacher Qualifications

The qualifications of each of the preschool teachers varied, but all teachers met the minimum criteria for participation in this study (Appendix B). Table 6 identifies the qualifications held by each of the preschool teachers.

Table 6

Preschool Teacher Qualifications

Group	Number of Preschool Teachers	Level of Certification
Control	Preschool A – 2 teachers Preschool B – 2 teachers	Preschool A - 1 Bachelor of Education degree, 1 Level 1 ECE Preschool B - 1 Level 3 and 1 Level 1 ECE Certification
Intervention	Preschool A – 2 teachers	1 Bachelor of Education degree 1 Level 1 ECE Certification
Intervention and Teacher Training	Preschool A – 2 teachers Preschool B – 1 teacher	Preschool A – 1 Level 3, 1 Level 1 ECE Certification Preschool B – 1 Level 3 ECE Certification

Pedometer Data

Not all preschools participated in equal amounts of physical activity and time spent in physical activity ranged from 16-30 minutes per day. In order to control for differences in physical activity time in each of the preschools, the step counts, were expressed as steps per minute. Figure 1 identifies the average baseline steps per minute for each group. It shows that at the beginning of the study, the control group had an average of 19 steps per minute, the intervention (INT) group 42 steps per minute and the intervention and teacher (I&T) training group 49 steps per minute. At the commencement of the study, the control group averaged lower pedometer step counts compared to the INT and I&T groups ($p < .05$).

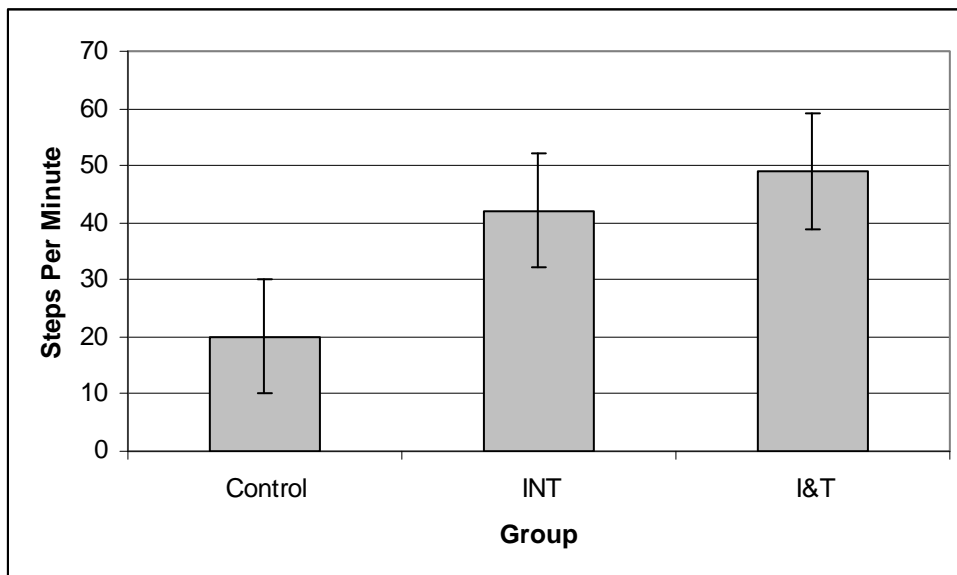


Figure 1. Average baseline pedometer data collected for the control, intervention and intervention and teacher training groups.

Physical activity was significantly lower at baseline for the control group compared to the intervention and intervention and teacher training group. After baseline

step counts were obtained, the intervention was introduced for the intervention (INT) and intervention and teacher (I&T) training groups. The intervention group received the resource after preschool occurred on the second day of baseline data collection. The subsequent days of data collection occurred one week apart from each other. Teacher training for the intervention and teacher training group occurred 2 days after baseline data was collected for one preschool and 2 weeks after baseline data for the second preschool. The final three days of data collection occurred within one month of teacher training.

Figure 2 compares the pre- and post-intervention pedometer data collected throughout the study. There was a significant difference across time in steps per minute $p < .05$. Steps per minute on Day 3 were significantly higher than on Day 1 (pre-intervention). However, steps per minute declined after Day 3 as step counts on Day 3 were higher than on Day 4 ($p < .05$). This suggests that pedometer step count decreased over time from Day 3 to Day 4.

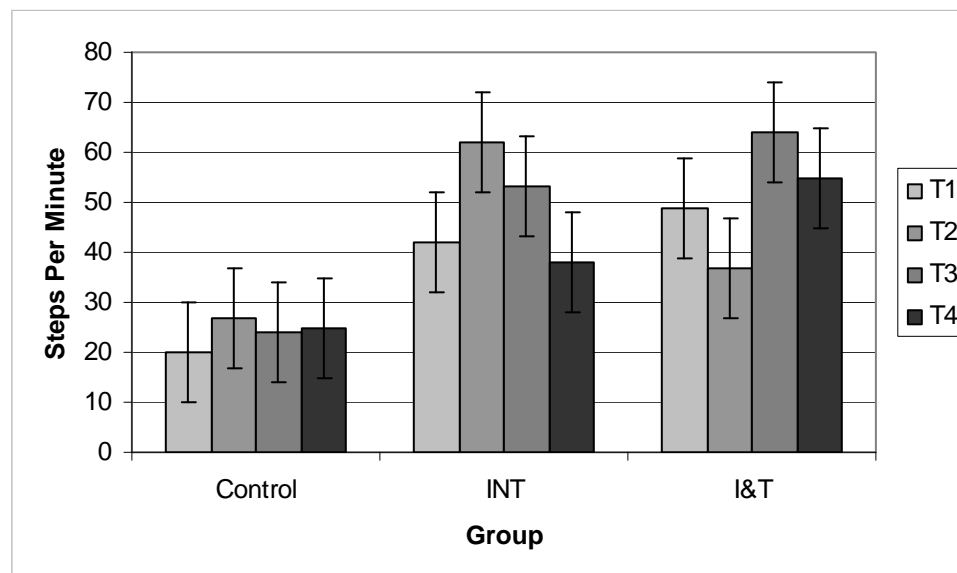


Figure 2. Step counts per minute for all three groups. (T1 = pre-intervention, T2 = first day post intervention, T3 = second day post intervention, T4 = third day post

intervention)

There was also a significant group effect for physical activity as measured by pedometers (Figure 2). The number of steps per minute taken by the control group was significantly lower than the step count taken by the INT and I&T groups $p < .05$. On average the control group took between 25 -27 steps per minute fewer than the INT and I&T groups. A significant interaction between time and group participation was not identified.

Observation Data

Physical activity was also monitored via observation on three separate days after intervention occurred. The SOFIT observation tool was used to observe children's levels of physical activity.

The observation data collected for each preschool, is shown in Figure 3. This figure demonstrates the average level of physical activity of children in each preschool on each day of observation.

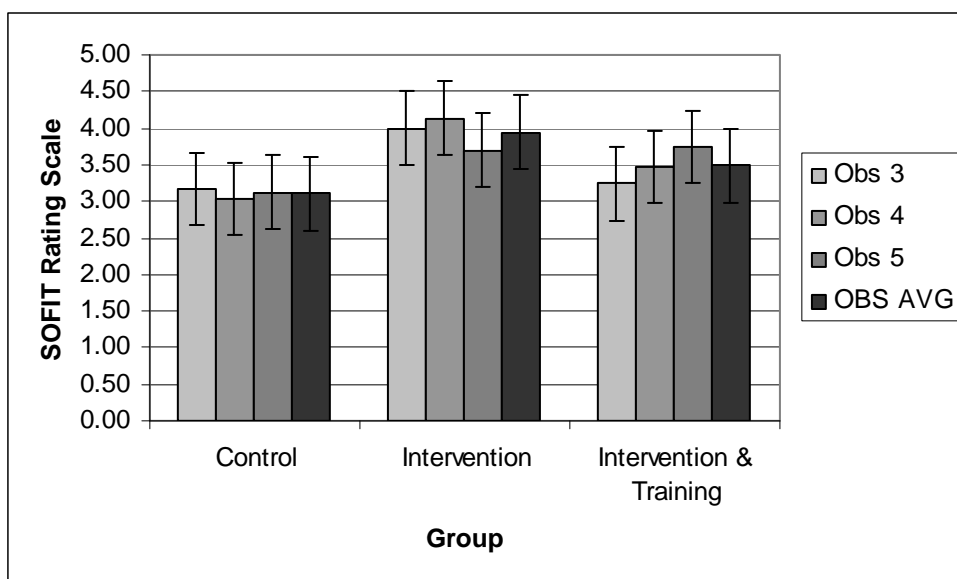


Figure 3. Physical activity scores of each preschool based on observation using SOFIT.

Figure 3 shows the observation data collected for each of the respective preschools for each day of participation. Although there was not a significant difference across time in observed physical activity, the control group did have significantly lower physical activity than the intervention group ($p < .05$).

To determine if a relationship existed between the pedometer and observation data, a Pearson's product moment correlation test was performed. There were 63 points of data collected and tested between observation and pedometer information. This test established that a moderate correlation ($r = .603$) existed between the two measures of physical activity. This result was significant at the $p < .001$ level.

Chapter 5: Discussion

Summary of Findings

This study examined the effects of an instructional resource on preschool children's physical activity levels. I hypothesized that the introduction of a PA resource would increase PA levels. I also predicted that physical activity levels of preschool-aged children would further increase if additional teacher training was provided with the resource. Although pedometer step count did not consistently increase over the duration of the study, for any of the three groups involved, time did influence the results. A statistically significant increase in pedometer step count occurred between Day 1 and Day 3 of the study. This is a positive finding suggesting the possibility that the information in the resource increased physical activity levels. However, this time effect also showed that pedometer step count decreased between Day 3 and Day 4. This seems to suggest that the effect of the resource and resource and teacher training did not have a long lasting effect.

Baseline differences amongst the three groups influenced the results. The control group took far fewer steps than the children in the intervention and intervention and teacher training group throughout the study. Children in this control group were more likely to engage in sedentary activities such as sitting and standing. The intervention group engaged in the greatest volume of physical activity. These children were mostly involved in moderate levels of physical activity such as walking and vigorous activities such as skipping and running. The intervention and teacher training group typically stood or walked during physical activity time.

Data Collection

Issues with participants, preschool teachers, and the preschool environment impacted the results of this study. Some of the participants invited to participate in this study were inconsistent with their attendance and, as a result were not included in the final results. On some occasions, children were not as active for various reasons (e.g., tired, not feeling well).

Preschool teachers also influenced the findings of this study. At times the preschool teachers were inconsistent with providing children the opportunity to be physically active. On a couple of occasions, a craft took precedence over physical activity and the researcher had to reschedule. Or, physical activity occurred in the classroom rather than in the gymnasium thus changing the dynamics of physical activity.

The preschool environment itself, at times, was erratic. On different occasions walls were being painted and a gymnasium floor was being resurfaced. As a result of such factors, physical activity levels were compromised.

Pedometer Measurement

A total of 48 preschool children were involved in this study. All children wore pedometers during designated physical activity time. Physical activity time in each of the three groups varied, ranging between 16-30 minutes. Group assignment was done by random selection.

The number of children and adults who are overweight or obese is increasing (Canning et al., 2004; Edwards et al., 2008; Shields, 2006). Recent research is striving to determine how much physical activity is needed in order to maintain a healthy lifestyle. Quantifying physical activity has begun to occur for adults and school-aged children.

A reasonable estimate of pedometer step count values for adults to live a healthy lifestyle is estimated at 10,000 steps/day (Tudor-Locke & Bassett, 2004). It is suggested that many adults, even those living with chronic diseases, can achieve this estimate. However, when it comes to children, this number may be too low in battling obesity (Tudor-Locke & Basset, 2004).

One research study created a youth habitual activity step-curve for individuals between 6-18 years of age (Tudor-Locke, McClain, Hart, Sisson, & Washington, 2009). This study identified children's activity patterns over the course of a day at different time points such as recess, lunch, physical education class as well as examining differences between weekday and weekend activity levels. In general, this study found that boys average between 10,000-16,000 steps per day compared to girls who take an average of 10,000-13,000 steps per day (Tudor-Locke et al., 2009).

Another study explored the number of steps grade one and two children took in a 30-minute physical education class. It found that boys took an average of 1200-2000 steps compared to girls who took between 1000-1800 steps (Scruggs et al., 2003). Further research was conducted from this study to quantify pedometer step count per minute. Researchers wanted to determine how much time children participated in Moderate to Vigorous Physical Activity (MVPA) during a 30-minute physical education class. This research suggests that children should spend approximately 10-15 minutes of a 30-minute physical education class engaged in MVPA which is equivalent to approximately 33% to 50% of the class time (Scruggs, Beveridge, Watson, & Clockson, 2005). It was discovered that these children in grade one and two took between 61-65 steps per minute

(SPM) (Scruggs et al., 2005). The higher the pedometer count the more time spent in MVPA.

Although new research is emerging to quantify physical activity levels, very few studies have been conducted on children under the age of 6 (Louie & Chan, 2003). A study using pedometers and observation, conducted by Louie and Chan (2003), examined physical activity levels of children between the ages of 3-5. The intended purpose of this study was to determine if a difference in physical activity levels existed amongst different child-care environments for preschool-aged children. Pedometers and direct observation using the Children's Activity Rating Scale (CARS) were used. This study found that the average SPM was 58.50 for children during a 25-minute free play physical activity class (Louie & Chan, 2003).

Identifying SPM was very important in this study because it provided the opportunity to compare the data to other similar research. In this study the mean step count for each of the three groups in this study varied immensely. The control group averaged 27 SPM, the intervention group 42.5 SPM and finally, the intervention and teacher training group had an average of 63 SPM. When comparing the data to other studies it appears that all three groups take fewer steps per minute. However, the control group is significantly less active compared to the other two groups. Although the SPM derived from other studies are not guidelines they provide a point of reference for an average step per minute count for young children.

Control group pedometer data. This group began the study with the lowest amount of average pedometer step count. On average, this group took 25-27 SPM fewer than the other two groups. A total of two preschools were combined to create this group.

The activities selected for physical activity varied greatly between these two preschools. Preschool A classified physical activity as the time children spent moving between the different activity centres such as creating a craft, playing with puzzles and building blocks. Although an open space was available, the children remained in the classroom. For 30 minutes this was the physical activity performed and observed in the classroom. However, on two separate occasions some of the children were involved in structured physical activity from a sporting organization. This physical activity was arranged as a special activity. All children were invited to participate, for an additional fee. Fewer than half of the children chose to become involved in this optional activity. Two of the children selected for observation were involved in this extra-curricular activity. These activities were performed in the open gym space. The unfortunate part of this structured PA was that children performed the activities one at a time. As a result, many of the children engaged in little activity as they stood and waited for their turn.

The second preschool, Preschool B, engaged consistently in 30 minutes of physical activity in a gymnasium. The predominant activities included playing Red Light, Green Light; What Time is it Mr. Wolf? and allowing children to have free time playing with various equipment. This preschool also engaged the children in yoga activities. On individual mats children were asked to stretch like different animals. Children became birds, cows and even trees in this activity. Children were also provided the opportunity to create their own animal poses. In addition to indoor activities in the gymnasium children also had the opportunity to play in an outdoor playground.

Both preschools remained consistent with their levels of physical activity over the duration of the study. However, because many of the activities were performed in a

stationary position and did not require a high degree of movement, little pedometer data was collected. Through the duration of the study it did not appear that the researcher influenced the data collected as levels of activity remained consistent from the beginning to the end of the study.

Intervention group pedometer data. Only one preschool comprised the intervention group. This group consistently committed to participating in physical activity for 30 minutes each day of observation in an open gymnasium. Activities in this group included playing the games What Time is it Mr. Wolf? and Red Light, Green Light. Creative movement activities also occurred in this preschool such as singing and dancing where the children were encouraged to move their bodies to different pieces of music. Children in this preschool were also given the opportunity to play in an outdoor playground.

The intervention group saw an increase in pedometer data from baseline to the first day after intervention, Day 2. It is possible that this group was excited about the activities found in the resource and an increase in pedometer step count was observed. Unfortunately for this group, pedometer count decreased from the initial spike in activity levels. On each subsequent day, after Day 2, pedometer step count decreased. A number of factors influenced the results. On different days some children appeared tired and therefore were not as active. Also, limited pedometer data was collected on days when children engaged in stationary activities such as yoga and balancing a bean bag on their body. Although the children enjoyed themselves immensely, the activities were stationary requiring the children to sing or move their bodies in one spot. For example, when singing to the songs they may have been swinging their arms or wiggling their body on

the spot. Such activities did not require children to travel and had implications to the pedometer data findings. This preschool did incorporate several of the activities found in the resource such as Sing and Dance and Hop to It where children acted out different types of animals that could hop.

Intervention and teacher training pedometer data. Two different preschools were included in this group. Both preschools were very interested to learn about the resource. In the teacher training session, each activity was discussed individually and modifications were suggested to enhance the activities. The teacher training sessions were between 45 minutes and 60 minutes. The Busy Bodies© resource provided the opportunity for great dialogue between the researcher and preschool teachers. Great conversation occurred regarding the activities in the resource and alternative activities. The preschool teachers were quick to share the different types of activities that were similar to the activities in the resource and offered their own variations to some of the activities.

The pedometer data collected for the intervention and teacher training groups demonstrates that the first day of data collection the children were fairly active. After intervention was introduced, pedometer data initially decreased, then increased Day 3 of the study and decreased again on the final day of the study.

Of all the preschools involved in the study, these two preschools saw the greatest disturbances to their daily routine. On several occasions physical activity was shortened, or the gymnasium space was unavailable due to renovations. During such instances the activities were either shortened in length or modified due to limited space. This was the case for Preschool A the first day after intervention. For this preschool, physical activity

was modified after intervention occurred which possibly affected the results of the data. The first day after intervention of the study, children at Preschool A were busy completing a difficult craft which required them to miss some of their physical activity time. As a result of limited time, physical activity took place in the preschool classroom rather than in the gymnasium. The children engaged in bean bag activities which required children to balance a bean bag on different body parts which did not require a lot of movement. Such activities influenced pedometer count and were demonstrated in calculating SPM. An increase in pedometer activity did occur after Day 2 of the study and remained higher than the data collected at baseline.

Both the intervention and teacher training groups had access to a large variety of equipment and a large open space. Each of these preschools provided the opportunity for both structured and unstructured activities. A few of the activities discussed in the teacher training sessions were incorporated into the children's physical activity time. However, some of the activities were incorporated differently than discussed. For example, one of the activities, Soaring Across the Sky, asks children throw and collect a Frisbee. Instead of children throwing the Frisbee for distance and having the students run to collect them, one teacher had the children toss the Frisbees into the air and catch them. This impacted the lateral movement collected by pedometers. Although the children enjoyed this form of activity, little movement was recorded by the pedometer.

Several of the activities that were discussed in the teacher training session were incorporated into the physical activity component at each preschool. Playing with pool noodles and beach balls (Wacky Hockey), traveling as different animals (It's a Zoo Out There) and with a variety of equipment (Having a Ball) are just a few examples.

Limitations of pedometers. The researcher visited all preschools prior to the commencement of the study and introduced the children to the pedometers and researcher. Children were encouraged to wear pedometers and given the opportunity to see their pedometer values. After this introduction, children were not disturbed by wearing pedometers. Pedometers remained fastened and secured on children's waistband or the elastic belt provided. Overall, the use of pedometers on four-year-old children worked very well. Although pedometers did not tabulate all bodily movement performed by children, it provided an overview of the amount of PA conducted by children in during preschool.

Although pedometers were not able to identify intensity of the physical activities that the children engaged in, they were able to provide information on how active the children were during their designated PA time. Observation data was recorded to provide a point of reference for the intensity of the different types of physical activities that occurred in the preschool environment.

Observation Data

The SOFIT observation tool was used to observe levels of physical activity in up to five children at each preschool. This observation tool categorized children's activity patterns into five different levels. In the SOFIT protocol, walking is identified as the minimum standard of MVPA. A Pearson's product moment correlation test was executed to determine if the observation data was related to the pedometer data. A moderate correlation between the two different measures was identified. This suggests that the observation data were representative of the information collected by pedometers.

The observation data found in this study helped identify activity that was not recorded by pedometers. On several occasions children participated in PA that was not recorded by pedometers, as mentioned earlier. Activities such as yoga or balancing a bean bag on different body parts or some creative movement activities were not included in pedometer data due to the pedometers inability to collect movement other than lateral movement. Although in such instances children did not have substantial lateral movement physical movement did occur, however this movement was not ambulatory. It was important in this study to perform two different methodologies of data collection. Both pedometer and observation data provided a stronger representation of the types of physical activities performed by children.

The observation data for the control group identified that this group engaged in activity that can be categorized as sitting and standing. This is quite representative of the PA selected for this group. Many of the activities such as making crafts or creating puzzles involved little locomotor activity.

The intervention group was involved in the most vigorous forms of PA such as walking and running activities. Playing various running games and performing activities which required the children to manipulate their bodies in different ways categorized the types of activities performed by this group of children.

Finally, the intervention and teacher training groups were involved in activities that included standing and walking. The data collected identifies the type of activities that children engaged in.

Data Summary

Although the hypotheses for this study were not confirmed, valuable information was gained. The opportunity to share physical activity suggestions from the Busy Bodies© resource with the preschool teachers was extremely positive. Many of these teachers had limited activities in their repertoire to engage children in movement. Most importantly, the discussion that emerged from teacher training provided a wealth of knowledge sharing. Many of the teachers recalled activities that they had previously done that children really enjoyed. The teacher training session stimulated conversation about physical activity and offered new ideas.

Despite the challenges, there were important benefits to early childhood physical activity research. One such strength of this study was its ability to demonstrate that pedometers and direct observation are valuable tools of data collection in measuring physical activity levels in young children. A moderate correlation was found between pedometers and observation through a Pearson Correlation test ($p < .01$). When pedometer scores were high, observation numbers corresponded by reflecting high activity levels. This demonstrates that the observation tool positively reflected the physical activity levels of participants as indicated by pedometer step count.

By including two different methodologies into this study, another layer of credibility was added within the results. Observation data alone could have been affected by observation bias, potentially affecting the results positively or negatively. Pedometers alone would not have provided the study with the categorization of the type of physical activities performed by children in this study. Pedometers provided data on ambulatory movement, as executed by children, but did not identify the type or intensity of the

activities. Together, pedometers and direct observation provided strength to the results of this study.

Recommendations for future research

There are several factors that could have contributed to the final results. To begin, when examining baseline data, the initial numbers for the intervention and intervention and teacher training group were significantly higher when compared to the control group. Therefore, it may have been more difficult for the intervention and intervention and teacher training groups to experience a significant increase in physical activity. This is because the intervention groups were extremely active at the onset of the study. Purposeful group selection, which identifies the group with the lowest levels of physical activity at the onset of the study, may identify if a resource and resource and teacher training impact physical activity levels. In future, it may be wise to purposefully select group participation rather than create the groups by random selection. This would allow for a stronger argument in determining if intervention or intervention and teacher training impacted physical activity levels. It is difficult in this study to interpret the results due to the higher pedometer values found in the baseline data for both the intervention and intervention and teacher training groups.

To provide a stronger argument for the hypotheses of this study it may be beneficial to increase the length of the study and include a larger sample size. An increase in the duration and number of participants in this study may provide a stronger representation of physical activity in the preschool classroom.

Time of Year

Conducting this study in late spring provided some additional challenges. At this time of year, many of the preschools were concluding their schooling year with various field trips, graduation ceremonies, and picnic celebrations. On several occasions, there were scheduling conflicts in which the researcher attempted to make accommodations. However, because the study was conducted so late in the year, there were not many opportunities to reschedule data collection. There simply were no available alternate dates to conduct the study. As a result of numerous variables, the data collected was not as predicted. However, the data collected is a true reflection of the activities that occur in a preschool setting.

Busy Bodies© Resource

The Busy Bodies© resource is a simple and easy resource for childcare providers to use to encourage PA children. The resource has limited instruction and requires limited space and equipment. This makes the resource easy to use. However, the limited instruction within this resource does not offer childcare providers, who may have little knowledge or experience with physical activity, suggestions to modify activities. As a result, teacher training may be beneficial in fostering greater levels of activity. This may allow the preschool teachers to understand the activities in the resource in greater depth.

Future Research

There are many opportunities to continue research from this study. One such recommendation would be to offer intervention and teacher training to preschools with the lowest baseline pedometer data. By doing so a stronger correlation between the effects of intervention and intervention/teacher training may be seen. It was difficult to

discern the effects of this study because of the initial high pedometer values of the intervention groups. As demonstrated in this study, those participants in the intervention/intervention and teacher training group initially (in baseline data) demonstrated higher levels of physical activity when compared to the control group. These two groups were already highly active, possibly making the intervention ineffective.

Another suggestion for future research would be to incorporate resource demonstration to the teacher training session. In addition to teacher training, the researcher could go into the preschool classroom and teach the physical activities to the children and have the preschool teacher observe the lesson. This may further promote understanding of the resource and how to implement the resource in the preschool classroom.

A final thought for future research would be to examine the attitudes of early childhood educators in regard to physical activity. For example, do the attitudes of childhood educators in regards to physical activity influence the amount of physical activity that occurs while children are in their care? By conducting this study, it appeared that physical activity was not a priority for some preschools. On several occasions other activities such as crafts and centres appeared to take precedence over PA. This however, may strictly be a result of the limited exposure that the researcher had in each of the preschool settings. Common themes of the types of PA selected amongst all preschools were also identified such as, Red Light, Green Light and What Time is it Mr. Wolf? Due to the lack of curricular training in physical education, in the Early Childhood Education programs, teacher training becomes extremely important. Teacher training would provide

preschool teachers with resources and knowledge on how to implement PA into their preschool program. It would be beneficial to investigate if a relationship existed between preschool teacher's values of physical activity and the amount of physical activity conducted within the preschool.

Conclusion

Physical activity is a strong component to leading a healthy lifestyle. In recent research, it has become apparent that Canadian children are not meeting the recommended guidelines of physical activity (Clark et al., 2008; NASPE, 2002). It is suggested that children should receive a minimum of 60 minutes/day of structured and unstructured physical activity (NASPE, 2002).

It is difficult to draw concrete conclusions from this study about physical activity levels in preschool-aged children. Due to the large discrepancy in physical activity levels, amongst all three groups at the onset of the study, it is difficult to discern if the resource and resource and teacher training impacted activity levels. It would be important in future research to disseminate valuable resources and teacher training to schools identified with limited physical activity.

It would be unrealistic to think that the Busy Bodies© resource will 'fix' the issues of sedentary behavior in preschool children. Using this resource, along with additional interventions throughout all stages of children's development, may result in healthier adults. In order to do this, we need to initiate, at a young age, habits of healthy behaviour. Providing teacher training and tangible resources to early childhood educators may foster an increase in movement experiences for children. It is hoped that the

information obtained from this study will continue to further promote physical activity as a way to encourage healthy living.

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Appendix A. Participant Consent Form (Preschool Owner/Administrator and Teacher)



PARTICIPANT CONSENT FORM (PRESCHOOL OWNER/ADMINISTRATOR AND TEACHER)

Busy Bodies©: Effects of an Instructional Resource on Preschool Children's Physical Activity Levels

Your preschool is being invited to participate in a study entitled *Busy Bodies©: Effects of an Instructional Resource on Preschool Children's Physical Activity Levels* that is being conducted by Nadine Van Wyk. I am a graduate student with the Faculty of Education at the University of Lethbridge and you may contact me if you have further questions by phone: (403) 440-6493 or email: nadine.vanwyk@uleth.ca.

As a graduate student, I am required to conduct research as part of the requirements for my Masters of Education (MEd). It is being conducted under the supervision of Dr. Daniel Balderson. You may contact my supervisor at any time via phone: (403) 329-5180 or email: daniel.balderson@uleth.ca.

The purpose of this research project is to investigate the following research questions: Will a resource package (Busy Bodies©) containing physical activity ideas increase levels of physical activity amongst preschool students? Also, will a resource package (Busy Bodies©) containing physical activity ideas and related instruction increase student's levels of physical activity?

Research of this type is important because the incidence of overweight and obesity amongst preschool-aged children is increasing at a staggering rate. Instilling basic components of active living to young children is an important step to addressing this issue. Early intervention accompanied by increased teacher training may be one solution for this problem.

If you provide consent to participate in this study, your students will be asked to wear pedometers for a total of five days over six weeks. Students will have the research study explained to them in language they understand. They will be told that they are invited to wear the pedometer but they don't have to. Teachers will monitor student interactions to ensure no stigmatization of non-volunteers. In addition, the researcher will go into the preschool classroom on these days to observe physical activity levels. Finally, your preschool may be given a resource that offers physical activity suggestions or your preschool teachers may be invited to a 30 minute workshop with teaching strategies on how to incorporate the resource package into your classroom. The study is expected to begin in the middle of March and conclude the middle of May.

There are no known or anticipated risks to the preschool children participating in this research.

The potential benefits of your preschool's participation in this research include adding to the existing body of knowledge about physical fitness. It is hoped that the preschool children continue to pursue some of the activities offered by the resource package outside the classroom environment.

Your preschool's participation in this research must be completely voluntary. If you do decide to withdraw your permission at any time there will be no negative consequences. Data that has been collected will not be used in the final analysis.

To make sure that you continue to give your consent, for your preschool's participation in this research, I will review procedures and welcome questions whenever necessary. You may contact me at (403) 440-6493 or by email at nadine.vanwyk@uleth.ca

In terms of protecting the preschool and children's identity both will be given pseudonyms. The confidentiality of the children and the preschool will be protected by adhering to the guidelines established by the University of Lethbridge. Final results of the study will be shared during a presentation at the University of Lethbridge in the Spring of 2010. It is hoped that the results will also be presented at a conference and published document.

The data collected from this study may be used to guide professional development conversations within the University of Lethbridge or other learning communities. Observation data and pedometer information will be destroyed after final results are disseminated. Copies of the academic paper and multi-media presentation will be offered to my committee. If parents of children in the study are interested, a summary report can be produced. A copy of the final report will be given to Dr. Daniel Balderson and the Graduate Studies Office, as part of the requirements for completion of the thesis.

In addition to being able to contact the researcher [and, if applicable, the supervisor] at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Chair of the Faculty of Education Human Subjects Research Committee at the University of Lethbridge (403-329-2425).

Your signature below indicates that you understand the above conditions of participation in this study, that you have had the opportunity to have your questions answered by the researchers, and that you consent to having your preschool participate in the study. Please return this letter of consent in the return envelope to the researcher. You will then be contacted about the start date of this study.

Thank you for your consideration,

<i>Nadine Van Wyk (Graduate Student)</i>	<i>Signature of Preschool Owner/Administrator</i>	<i>Date</i>
<i>Name of Preschool</i>	<i>Signature of Preschool Teacher</i>	<i>Date</i>

A copy of this consent will be returned to you, and a copy will be taken by the researcher.

Appendix B. Eligibility Checklist

Can you please answer the following questions to determine your preschool's eligibility of participation in this study?

	Control Group		Intervention Group	Intervention and Training Group	
	Preschool 1	Preschool 2	Preschool 3	Preschool 4	Preschool 5
How many children are involved in your preschool program?					
How many times a week do your preschool children engage in physical activity?					
What is the length of time of the designated physical activity?					
How many preschool teachers are there at your facility?					
What level of certification do your teacher's have?					
Open gym space					
30 minutes of physical activity at least once a week					

		Approx. Quantity		Approx. Quantity	Approx. Quantity
Balls					
Bean Bags					
Hula Hoops					
Additional equipment					
Additional equipment					

Appendix C. Parent Consent Form (Child)



PARENT CONSENT FORM (CHILD)

Busy Bodies©: Effects of an Instructional Resource on Preschool Children's Physical Activity Levels

Your child is being invited to participate in a study entitled *Busy Bodies©: Effects of an Instructional Resource on Preschool Children's Physical Activity Levels* that is being conducted by Nadine Van Wyk. I am a graduate student with the Faculty of Education at the University of Lethbridge and you may contact me if you have further questions by phone: (403) 440-6493 or email: nadine.vanwyk@uleth.ca.

I am currently a graduate student in the Master of Education (MEd) program. This research project is being conducted under the supervision of Dr. Daniel Balderson. You may contact my supervisor at any time via phone: (403) 329-5180 or email: daniel.balderson@uleth.ca.

The purpose of this research project is to investigate the following research questions: Will a resource package (Busy Bodies©) containing physical activity ideas increase levels of physical activity amongst preschool students? Also, will resource package (Busy Bodies©) containing physical activity ideas and related instruction increase student's levels of physical activity?

Research of this type is important because the incidence of overweight and obesity amongst preschool-aged children is increasing at a staggering rate. Instilling basic components of active living to young children is an important step to addressing this issue. Early intervention accompanied by increased teacher training may be one solution for this problem.

Your child is being asked to participate in this study because he or she is in the preschool age demographic. If you provide consent for your child to participate in this study, your child will be asked to wear pedometers for a total of five days over six weeks. Children will have the research study explained to them in language they understand. They will be told that they are invited to wear the pedometer but they don't have to. Teachers will monitor student interactions to ensure no stigmatization of non-volunteers. In addition, the researcher will go into the preschool classroom on these days to observe physical activity levels. Finally, your preschool may be given a resource that offers physical activity suggestions or your preschool teachers may be invited to a 30 minute workshop with teaching strategies on how to incorporate the resource package into your classroom. The study is expected to begin in the middle of March and conclude the middle of May.

There are no known or anticipated risks to your child by participating in this research. The potential benefits of your child's participation in this research include adding to the existing body of knowledge about physical fitness. It is hoped that they may continue to pursue some of the fitness activities, provided by the resource outside the classroom environment.

Your child's participation in this research must be completely voluntary. If you do decide to allow your child to participate, you may withdraw your permission (and your child from the study) at any time without any consequences or any explanation. If your child does withdraw from the study his/her data will not be used in the final analysis. To make sure that you continue to give your consent for your child to participate in this research, I will review procedures and welcome questions whenever necessary.

In terms of protecting your child's anonymity, the preschool they attend, and the name of your child will be given pseudonyms. Your child's confidentiality and the confidentiality of the data will be protected by adhering to the guidelines established by the University of Lethbridge. Final results will be shared during a defense held at the University of Lethbridge in the Spring of 2010. It is hoped that the results will also be presented at a conference and that the paper get published.

Data may also be used to guide professional development conversations within the University of Lethbridge or other learning communities. Observation data and pedometer information will be destroyed after 5 years. The data collected throughout the study will be kept in a locked file in the researcher's office. Final results are disseminated. Copies of the academic paper and multi-media presentation will be offered to my committee. If parents of children in the study are interested, a summary report can be produced.

In addition to being able to contact the researcher [and, if applicable, the supervisor] at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Chair of the Faculty of Education Human Subjects Research Committee at the University of Lethbridge (403-329-2425).

Your signature below indicates that you understand the above conditions of participation in this study, that you have had the opportunity to have your questions answered by the researchers, and that you consent to having your child participate in the study.

_____	_____	_____
<i>Name of Student</i>		
_____	_____	_____
<i>Name of Parent or Guardian</i>	<i>Signature</i>	<i>Date</i>

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Appendix D. SOFIT Recording Form

Date _____	School _____	Time Start _____	Time End _____
Interval	Student Activity	Lesson Context	Interactions
1	1 2 3 4 5	M K F S G O	I O N
2	1 2 3 4 5	M K F S G O	I O N
3	1 2 3 4 5	M K F S G O	I O N
4	1 2 3 4 5	M K F S G O	I O N
5	1 2 3 4 5	M K F S G O	I O N
6	1 2 3 4 5	M K F S G O	I O N
7	1 2 3 4 5	M K F S G O	I O N
8	1 2 3 4 5	M K F S G O	I O N
9	1 2 3 4 5	M K F S G O	I O N
10	1 2 3 4 5	M K F S G O	I O N
11	1 2 3 4 5	M K F S G O	I O N
12	1 2 3 4 5	M K F S G O	I O N
<hr/>			
13	1 2 3 4 5	M K F S G O	I O N
14	1 2 3 4 5	M K F S G O	I O N
15	1 2 3 4 5	M K F S G O	I O N
16	1 2 3 4 5	M K F S G O	I O N
17	1 2 3 4 5	M K F S G O	I O N
18	1 2 3 4 5	M K F S G O	I O N
19	1 2 3 4 5	M K F S G O	I O N
20	1 2 3 4 5	M K F S G O	I O N
21	1 2 3 4 5	M K F S G O	I O N
22	1 2 3 4 5	M K F S G O	I O N
23	1 2 3 4 5	M K F S G O	I O N
24	1 2 3 4 5	M K F S G O	I O N
<hr/>			
25	1 2 3 4 5	M K F S G O	I O N
26	1 2 3 4 5	M K F S G O	I O N
27	1 2 3 4 5	M K F S G O	I O N
28	1 2 3 4 5	M K F S G O	I O N
29	1 2 3 4 5	M K F S G O	I O N
30	1 2 3 4 5	M K F S G O	I O N
31	1 2 3 4 5	M K F S G O	I O N
32	1 2 3 4 5	M K F S G O	I O N
33	1 2 3 4 5	M K F S G O	I O N
34	1 2 3 4 5	M K F S G O	I O N
35	1 2 3 4 5	M K F S G O	I O N
36	1 2 3 4 5	M K F S G O	I O N
<hr/>			
37	1 2 3 4 5	M K F S G O	I O N
38	1 2 3 4 5	M K F S G O	I O N
39	1 2 3 4 5	M K F S G O	I O N
40	1 2 3 4 5	M K F S G O	I O N
41	1 2 3 4 5	M K F S G O	I O N
42	1 2 3 4 5	M K F S G O	I O N
43	1 2 3 4 5	M K F S G O	I O N
44	1 2 3 4 5	M K F S G O	I O N
45	1 2 3 4 5	M K F S G O	I O N
46	1 2 3 4 5	M K F S G O	I O N
47	1 2 3 4 5	M K F S G O	I O N
48	1 2 3 4 5	M K F S G O	I O N

SUM

Appendix E. Pedometer Tabulation Worksheet

	Preschool:						
	Child's Name	Date	Date	Date	Date	Date	Date
		Baseline 1	Baseline 2	Week 2	Week 4	Week 6	TOTAL
Child 1							
Child 2							
Child 3							
Child 4							
Child 5							
Child 6							
Child 7							
Child 8							
Child 9							
Child 10							
Child 11							
Child 12							

Pedometer Tabulation Worksheet, cont.

	Preschool:						
	Child's Name	Date	Date	Date	Date	Date	Date
		Baseline 1	Baseline 2	Week 2	Week 4	Week 6	TOTAL
Child 13							
Child 14							
Child 15							
Child 16							
Child 17							
Child 18							
Child 19							
Child 20							
Child 21							
Child 22							
Child 23							
Child 24							
Child 25							

Appendix F. Teacher Intervention Meeting

1. Introduction of myself and nature of study (4:00 - 4:05 pm)
 - Thank you for your participation
 - Graduate student at the University of Lethbridge in the Faculty of Education
 - The study is looking at the effects of the BusyBodies© resource on preschool children's levels of physical activity.
2. Distribute BusyBodies© resource (4:05 - 4:10 pm)
 - Two sided program focusing on nutrition and physical activity ideas
 - Allow preschool teachers time to review document
3. Describe the resource (4:10 - 4:25 pm)
 - Go over each activity explaining how to incorporate it into the preschool class.
 - Activities range from rhythm/dance, hand-eye coordination and imaginative play
4. Question period (4:25 - 4:30 pm)
 - Are there any activities that require clarification?

Appendix G. Timeline

Group	Date	Activity
Control Group		
Control Group 1	April 26, 2010	Baseline Data #1
Control Group 1	May 3, 2010	Baseline Data #2
Control Group 1	May 10, 2010	Observation #1
Control Group 1	May 17, 2010	Observation #2
Control Group 1	May 31, 2010	Observation #3
Control Group 2	May 7, 2010	Baseline Data #1
Control Group 2	May 14, 2010	Baseline Data #2
Control Group 2	May 21, 2010	Observation #1
Control Group 2	May 28, 2010	Observation #2
Control Group 2	June 4, 2010	Observation #3
Intervention Group	May 3, 2010	Baseline Data #1
Intervention Group	May 10, 2010	Baseline Data #2
Intervention Group	May 17, 2010	Observation #1
Intervention Group	May 26, 2010	Observation #2
Intervention Group	May 31, 2010	Observation #3
Intervention and Training 1	April 7, 2010	Baseline Data #1
Intervention and Training 1	April 14, 2010	Baseline Data #2

Group	Date	Activity
Intervention and Training 1	April 28, 2010	Teacher Training
Intervention and Training 1	May 5, 2010	Observation #1
Intervention and Training 1	May 12, 2010	Observation #2
Intervention and Training 1	May 26, 2010	Observation #3
Intervention and Training 2	April 16, 2010	Baseline Data #1
Intervention and Training 2	April 21, 2010	Baseline Data #2
Intervention and Training 2	April 23, 2010	Teacher Training
Intervention and Training 2	April 30, 2010	Observation #1
Intervention and Training 2	May 14, 2010	Observation #2
Intervention and Training 2	May 26, 2010	Observation #3