

Determining the “Spread of Effects” of Physical Activity Interventions from Children to
Parents/Guardians”

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Abstract

Title: Determining “Spread of Effects” of Physical Activity Interventions from Children to Parents/Guardians

Objectives: The purpose of this research was to determine whether parental involvement in a physical activity intervention delivered to children in-school could result in positive behaviour change in parents (“spread of effects”), as measured by increased levels of physical activity and reduced sedentary behaviour.

Methods: A sequential explanatory mixed methods design was used, consisting of a randomized control trial followed by phone interviews using nested sampling from the original population. Fifth grade students ($n = 27$) from eight classrooms and one respective parent/guardian for each student participated in the study as pairs. Classrooms were randomly assigned to the control or experimental treatments. All students received a Turnoff Week Challenge Tracker Form to encourage students to increase their physical activity and reduce their screen time behaviour. Both experimental and control student-parent/guardian pairs each completed an online pre- and post measure of physical activity and sedentary behaviour (Rapid Assessment of Physical Activity [RAPA] and Physical Activity Questionnaire for Older Children [PAQ-C] respectively). Student-parent/guardian pairs in the experimental group were assigned two homework assignments in order to facilitate parental involvement in the intervention and possible indirect treatment effects (“spread of effects”). Phone interviews ($n=17$) were completed with interested parents/guardians. Using thematic network analysis, the interviews furthered explored how children may influence their parent/guardian’s physical activity levels and to increase understanding of how spread of effects can occur in health education interventions.

Results: Physical activity levels were not significantly different when comparing the student treatment group to the control group, $t(10) = 1.13$, $p = .142$ (one-tailed). For the parents, the increase in activity in the treatment group was significant, $t(11) = 2.03$, $p = .033$ (one tailed), consistent with the spread of effect hypothesis. The telephone interviews revealed six organizing themes lead to the global theme that creating opportunities for parents and children to be jointly involved in and learning about physical activity could enhance parents’ and children’s levels of physical activity.

Conclusions: The findings from this thesis supported the concept that children do influence their parents’ level and frequency of physical activity. Children primarily influenced their parents’ level of physical activity by requesting that they engage in physical activity with them and parents reported enjoying participating in these activities with their children. The study also supported the idea that school-based physical activity interventions that involve parents may have a positive impact on the parents’ level of physical activity and lead to a “spread of effects”.

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Chapter One: Introduction

1.1. Purpose

The primary purpose of this research was to discover whether parental involvement in a school-based physical activity education intervention delivered to children would result in positive behaviour change in parents (“spread of effects”), as measured by increased levels of physical activity (in part via reduced sedentary behaviour). Additionally, the secondary purposes of the research were to:

1. Explore whether a Turnoff Week type challenge is effective at inducing short-term behaviour change of increased physical activity in both children and parents.
2. Explore possible mechanisms through which parents and children affect each other’s physical activity levels.

1.2. Objectives

The objectives of this research include the following:

1. To review the literature related to physical activity behaviours, sedentary behaviours, school-based health behaviour modification interventions and “spread of effects” in health behaviour modification interventions.
2. To conduct an experimental intervention to explore whether a “spread of effects” in physical activity behaviours from children to parents/guardians may occur.
3. To conduct telephone interviews with parents/guardians to explore possible mechanisms through which parents and children affect each other’s physical activity levels.

1.3. Definitions

Overweight and obesity. The terms overweight and obesity are derived from using body mass index (BMI) calculations (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011). An individual's BMI score is arrived at by dividing their weight in kilograms by their height in metres squared (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011). It is the most frequently used index to assess body fatness in a population (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011). A low/normal BMI ranges from 18.5-24.9, an overweight BMI score ranges from 25-29.9 and obesity is any BMI score of 30 or greater (with further classifications of obese II/III of BMI>35 (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011).

Physical activity and physical activity guidelines. Physical activity refers to motions a person engages in that elevates their heart rate compared to sedentary activity and/or requires energy output (Canadian Society for Exercise Physiology, 2012). Physical activity guidelines recommend that children aged 5-11 years and teenagers aged 12-17 should participate in at least one hour of moderate effort to intense effort physical activity each day (Tremblay et al., 2011a). Furthermore, the recommended guidelines include that children engage in vigorous-intensity activities and activities that strengthen bones and muscles at least three days per week respectively (Tremblay et al., 2011a). Participating in more daily physical activity above and beyond these guidelines can further enhance the health benefits of physical activity (Tremblay et al., 2011a).

Similarly, the recommended guidelines for adults aged 18-64 years include engaging in cardiovascular physical activity that requires moderate to intense levels of effort for a minimum of two and a half hours weekly (Tremblay et al., 2011a). Adults should also engage in strength

training exercises a minimum of twice weekly (Tremblay et al., 2011a). These requirements can be fulfilled through structured leisure and recreation, walking or biking to destinations or from a job that has physically active requirements (ie. mail person), but do not include the inconsequential necessary physical activity a person accumulates daily (Tremblay et al., 2011a).

Sedentary behaviours and sedentary behaviour guidelines for children and youth.

Sedentary behaviours are those that require little physical activity from the individual and often lead to lengthy time spent seated or otherwise stationary (Tremblay et al., 2011b). For example, sedentary behaviours would include using a car or bus to travel or spending prolonged time in front of a television or computer screen (Tremblay et al., 2011b). The first ever evidence-based Canadian guidelines addressing sedentary behaviour suggest that children (5-11 years) and youth (12-17 years) restrain time spent in sedentary behaviours to a maximum of two hours daily (Tremblay et al., 2011b). To date, similar evidence-based Canadian guidelines on sedentary behaviour for adults do not exist (Tremblay et al., 2011b).

Screen time. Screen time refers to time spent in front of a screen (Must & Tybor, 2005). Screen time activities include watching television programs, using a computer and video game use (Must & Tybor, 2005).

Spread of effects. A “spread of effects” occurs when an intervention or policy impacts other populations than originally intended (Berniell, Mata, & Valdes, 2010). It is sometimes also referred to as “indirect treatment effects” or “spillover effects” (Berniell et al., 2010).

The term “spread of effects” will be used for the duration of this thesis to refer to whether individuals indirectly targeted or affected (parents/guardians) by the intervention demonstrate the desired behaviour change of those directly targeted (students).

1.4. Significance of Study

Obesity in Canada. Between 1981 and 2009, the proportions of Canadian adults and children that are obese have increased two-fold (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011). Two and half times as many children aged 2-17 were obese in 2004 compared to 1979 (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011). More than a quarter of Canadian adults and almost 10% of children aged 6-17 years old are presently obese (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011). In fact, North American school-aged youth were found to be among the most obese in a comparison of 34 countries (Janssen et al., 2005) and a large proportion of children continue to be obese as adults (Rugg, 2004). It is expected that today's youth will be the first generation to have a shorter life expectancy than their parents (Olshansky, 2005). Increasingly inactive lifestyles and caloric intake that exceeds energy requirements help to in part explain the increased prevalence of obesity (Lau, Douketis, Morrison, Hramiak, Sharma & Ehud, 2007).

The implications of the increased prevalence of obesity are multi-faceted and include an elevated likelihood of individual health risks and financial strain for both individuals and the Canadian healthcare system. Obese adults are more likely to have chronic health issues such as type 2 diabetes, cardiovascular disease and several types of cancer (Guh, Zhang, Bansback, Amarsi, Laird Birmingham & Anis, 2009). Compared to a normal weight child, an obese child is more likely to be obese as an adult and endure the early onset of chronic health complications such as high blood pressure (Ball & McCargar, 2003; Singh, Mulder, Twist, Van Mechelen, & Chinapaw, 2008). The amount of adult deaths in Canada that can be attributed to being

overweight and obese (through theoretical modelling) has increased more than 4% between 1985 and 2000 (Katzmarzyk & Arden, 2004).

Finkelstein et al. (2008) calculated the expected obesity-related medical lifetime costs for obese men and women. They found that the lifetime costs for 20 year-old adults who were classified as class I obese ranged from \$5,340 to \$21,550 for women, with those costs escalating even higher in the class II/III obesity category (Finkelstein et al., 2008). Male 20 year-old adults in the class I obese category incurred lifetime costs ranging from \$12,290 to \$16,490 (Finkelstein et al., 2008). For those obese at 65 years of age, lifetime costs of a class I obese person ranged from \$4,660 to \$19,270 and \$7,590 to \$25,300 in obese classification II/III (Finkelstein et al., 2008). Similarly, Sari (2009) determined that on average, inactive people spend 38% more days in the hospital, and have more visits to health care providers, such as family physicians, specialists and nurses, compared to physically active people.

The direct and indirect costs of obesity pose significant financial repercussions to the Canadian economy. Direct financial costs include increased use of and therefore expense of hospital and physician care, while indirect costs include the costs of long term disability or early death (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011). The direct and indirect costs summed to \$4.6 billion in 2008, representing a substantial increase from the \$735 million in costs in 2000 (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011).

Physical activity and obesity. Regular physical activity for children facilitates healthy growth and proper development (Public Health Agency of Canada, 2011). It supports the development of children's aerobic endurance, muscular strength and endurance and bone density levels (Public Health Agency of Canada, 2011). Furthermore, physical activity assists in the

maintenance of a healthy body weight and improves mental health by increasing social confidence, self confidence and relieving anxiety and depression (WHO, 2011). Building the habit of regular physical activity as a child and teenager contributes significantly to preventing chronic disease and improving quality of life as an adult (Public Health Agency of Canada, 2011).

Regular physical activity for adults also offers health protection benefits (Tremblay et al., 2011a). Physically active adults have lower rates of cancer, heart disease, depression (WHO, 2011) and are less likely to experience a stroke or present with signs of osteoporosis (Public Health Agency of Canada, 2011).

A physically active lifestyle can reduce the health concerns that accompany aging. More physically fit adults can more easily sustain a healthy weight and are less likely to incur a hip or vertebral fracture (WHO, 2011). Nearly 50% of the physical decline that occurs between ages 30 and 70 is rooted in a physically inactive lifestyle; engaging in physical activity allows daily tasks to be completed with greater ease and less fatigue (Public Health Agency of Canada, 2011).

Psychological benefits of physical activity for adults include decreased stress, enhanced self-esteem, and positive mood (Association for Applied Sports Psychology, 2012). Physically active working adults demonstrate less absenteeism, enhanced work morale, more effective decision making, and higher levels of concentration and productivity (Statistics Canada, 2007).

As leisure time physical activity decreases, the prevalence of obesity increases (Public Health Agency of Canada, & The Canadian Institute for Health Information, 2011); this illuminates the importance of increasing physical activity among Canadians. Insufficient physical activity and high levels of screen time and sedentary behaviours are associated with a higher probability of being obese (Public Health Agency of Canada & The Canadian Institute for

Health Information, 2011). Physical inactivity is the strongest health behaviour risk factor for obesity in adults at the population level (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011).

Increasing physical activity among Canadians has the potential to reduce the prevalence and incidence of obesity. An adjusted population attributable risk (PAR) ratio, using a relative risk adjusted for health behaviours, represents the theoretical reduction in obesity in Canada that could occur by increasing levels of physical activity (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011). Current PAR analyses indicate that it would be possible to reduce obesity rates in women by 20% and by 10% in men physical inactivity was reduced (Public Health Agency of Canada & The Canadian Institute for Health Information, 2011).

The relationship between physical activity, sedentary behaviour and childhood obesity appears to be less straight forward for children than it is for adults. Prentice-Dunn and Prentice-Dunn (2012) conducted a systematic review of the association between physical activity and sedentary behaviour and being overweight or obese as a child using cross-sectional studies from 2000 to 2010 (n=17). They found mixed results of the relationship between physical activity levels and child obesity levels. For example, while five studies found strong negative associations, another five studies found no negative association (Prentice-Dunn & Prentice-Dunn, 2012). Furthermore, gender differences in outcomes and cardiovascular fitness as a potential mediator were observed in some of the studies, indicating a less than clear cut relationship between physical activity and childhood obesity (Prentice-Dunn & Prentice-Dunn, 2012).

Physical activity education in schools. The Quality Daily Physical Education (QDPE) program was established by the Canadian Association for Health, Physical Education, Recreation and Dance (CAHPERD) in 1988 (Raine, 2004). QDPE ensures quality and comprehensive daily physical activity programs in schools by establishing standards and benchmarks for performance (Raine, 2004). Less than 5% of Canadian schools currently uphold QDPE standards (Raine, 2004). Specifically, less than 60% ensure that the minimally recommended time devoted to physical education is met (Hardman & Marshall, 2000) resulting in only 20% of parents having reported that their child was engaged in physical activity daily (Craig, Cameron, Storm, Russell, & Beaulieu, 2001). Additionally, only half of Canadian schools have established policies to ensure adequate opportunities for physical activity (Cameron, Wolfe, & Craig, 2007).

Given that children spend a large portion of their time in school, increasing school-based physical activity may significantly contribute to achieving the national physical activity targets. The Government of Canada has committed to addressing the relationship between obesity and physical activity and nutrition (Public Health Agency of Canada, 2010). The government has set targets to see 20% more Canadians by 2015 achieving three key indicators: engaging in physically activity, consuming a healthful diet and being a healthy weight (Public Health Agency of Canada, 2010). To achieve these targets, it is prudent to investigate opportunities to elicit behaviour change and provide opportunities for physical activity for the greatest number of people possible.

1.5. Theoretical Framework and Interventions Mapping for Turnoff Week

Table 1 (see p.118) depicts the theoretical framework for the Turnoff Week intervention, indicating which behaviour change theories were used to guide its development. The specific theories are described in more detail in the literature review section.

Interventions mapping framework. Bartholomew, Parcel, and Kok (1998) created an interventions mapping framework. This framework allows evidence-based theories to be overtly applied to intervention models and facilitates intervention measurement (Bartholomew et al., 1998). Interventions Mapping identifies five stages: 1. determining the program's proximal objectives, 2. choosing and utilizing theory-based intervention strategies, 3. creating and planning a program/intervention, 4. specifying intervention uptake and implementation plans, and 5. formulating an evaluation method for the program (Bartholomew et al., 1998). Table 2 (see p.119) demonstrates the proximal program objectives, which relate to the behaviour change models indicated in the literature review. The design and adoption, implementation and program evaluation plans are reflected later in the methodology section.

Chapter Two: Background

Overview. The purpose of conducting a scan of the literature was to gain insight on interventions, findings and existing frameworks on the topics of sedentary behaviours, screen time, behaviour change theories, parent-child influence and spread of effects to guide the research questions and intervention and study design strategies. Due to the relatively novel concept the researcher was interested in exploring (child influence on parental physical activity), the researcher felt it was prudent to focus on obtaining a broad understanding of the numerous relevant considerations rather than critically analyzing a specific subset of the reviewed literature.

Specifically, the objectives of the literature scan were to:

1. Establish whether there was a need to increase physical activity among Canadians
2. Uncover whether there was a need to decrease sedentary behaviours among Canadians
3. Determine whether school-based interventions were a viable strategy to cause health behaviour change
4. Decide if there was sufficient evidence to believe that children could influence their parents' health behaviours
5. Establish if spreads of effects in health behaviour change interventions were plausible

The literature scan process was emergent; as concepts and frameworks became evident in one piece of literature, this led to subsequent searches of the literature to gain a deeper understanding of a particular concept. To scan the literature, the researcher used PubMed and Google Scholar to identify journal articles or grey literature (such as government websites) and then obtained the journal articles through Lakehead University's online library. Search key

words included: physical activity, screen time, health behaviour change, school-based health interventions, school-based physical activity interventions, school-based screen-time interventions, influence of children on parents, spread of effects, treatment effects and indirect treatment effects.

The Turnoff Week Challenge was guided by the evidence pertaining to the efficacy of school-based physical activity and education interventions and the common components of successful school-based interventions, which will constitute the first part of chapter two. Furthermore, a literature review regarding the involvement of parents in school-based health interventions informed the researcher of the most successful mechanisms through which to involve parents as well as indicated the advantages parental involvement in interventions offers children. As the Turnoff Week Challenge aimed to simultaneously decrease screen time while also increasing physical activity, a literature review of interventions to reduce sedentary behaviour and screen time was performed to gain insight as to how sedentary behaviours and screen time activity interact with physical activity behaviours.

The four behavioural theories that guided the development of the Turnoff Week Challenge were social cognitive theory (Bandura, 1977), the theory of planned behaviour (Ajzen, 1991), ecological models of health behaviour (Sallis, Owen, & Fisher, 2008) and the value expectancy model (Segar, Eccles, & Richardson, 2011). The empirical data for the application of these theories to physical activity interventions was analyzed to elucidate which key constructs to manipulate, particularly in the homework assignments. Finally, the literature scan is concluded with a discussion of two behavioural tenets that laid the foundation for the theory behind the Turnoff Week Challenge; studies and theories that demonstrate how children affect

their parents' behaviour and the pathways through which spread of effects in health interventions occurs.

2.1. School-based physical activity and education interventions

School-based physical activity interventions hold promise to increase physical activity in students. The following studies represent a sample of effective in-school physical activity interventions to date. These studies were selected for review as they reflect the diverse benefits that can be realized by these types of interventions.

A study of 955 fourth and fifth grade students sought to determine whether a physical education program would be successful in increasing student physical activity in and outside of school hours (Sallis, McKenzie, Alcaraz, Kolody, Faucette, & Hovell, 1997). Sallis et al. (1997) arrived at two key findings: experimental group students were physically active an additional 15-22 minutes a week and even two years later, experimental group female students demonstrated superior abdominal and cardiovascular fitness (Sallis et al., 1997). Yet, the program did not affect physical activity outside of school hours (Sallis et al., 1997). Sallis et al. (1997) concluded that physical education classes only increase physical activity during school hours, name during physical education classes.

The Active Programme Promoting Lifestyle Education in School (APPLES) was a multi-faceted school-based intervention intended to reduce factors that increase the likelihood of obesity in children (Sahota, Rudolf, Dixey, Hill, Barth, & Cade, 2001). APPLES was meant for students aged seven to eleven year-old students and aimed to improve the students' dietary and physical activity behaviours (Sahota et al., 2001) The program components consisted of improving the nutritional content of meals offered by the school, strengthening the physical education component of the curriculum and providing teacher training on how to support

children in eating well and being more physically active (Sahota et al., 2001). To test the APPLES program, 700 students were randomly assigned to an intervention or control group. In comparison to the control group, the intervention group students were found to eat more vegetables, have better knowledge about pro-health behaviours and self-report more positive behaviour change (Sahota et al., 2001). Given that the intervention was relatively new, it was premature to speculate on the intervention's long term potential to reduce risk factors for obesity (Sahota et al., 2001). However, the researchers noted that the intervention might be more effective if families, specifically parents, were targeted and involved (Sahota et al., 2001).

The Cardiovascular Health in Children Study (CHIC) assessed the effectiveness of two different methods intended to reduce the risk of cardiovascular disease in children (Harrell, McMurray, Gansky, Bangdiwala, & Bradley, 1999). Using a randomized controlled field trial of grade three and four students (n=2109), the two methods were assessed by the following outcomes: total serum cholesterol, blood pressure, obesity, exercise endurance, and self-reports of physical activity, smoking habits and heart health knowledge (Harrell et al., 1999). Children were randomized by school into one of three conditions: a classroom-based intervention, risk-based intervention or control group (Harrell et al., 1999). The classroom-based approach used the American Heart Association Lower and Upper Elementary School Site Program Kits twice week to educate children on healthy eating, resisting pressure to smoke and physically activity, as well as participating in 20 minutes of physical activity three times a week (Harrell et al., 1999). The risk-based approach included the same dose of physical activity and offered a separate education intervention (nutrition, physical activity, anti-smoking). Children in this approach received the intervention(s) that best addressed their individual risk (Harrell et al., 1999). The researchers found that compared to the other two intervention groups the classroom-

based intervention children had advanced knowledge of heart health, decreased cholesterol and body fat measurements and enhanced cardiovascular conditioning (Harrell et al., 1999). The risk-based intervention children demonstrated greater increases in physical activity compared to both classroom-based and control groups and a decrease in BMI scores (Harrell et al., 1999).

Gortmaker et al. (1999) studied the impact of Eat Well and Keep Moving, a school-based intervention intended to improve dietary and physical activity habits among children in grades four and five (n=479) using intervention and matched control schools. Gortmaker et al. (1999) found that children in the intervention schools consumed less calories from fat and as logged less hours of television and video watching than students in the control schools (Gortmaker et al., 1999).

Finally, Dobbins, De Corby, Robeson, Husson and Tirilis (2009) conducted a systematic review to analyze how well school-based interventions enhanced physical activity in 26 studies. Based on the reviewed studies, Dobbins et al. (2009) concluded that school-based physical activity interventions had positive effects on the duration of physical activity, VO₂ max scores, blood cholesterol scores and reducing television watching. However, results from the studies revealed no effect on recreational physical activity rates, blood pressure rates, BMI scores or resting heart rates (Dobbins et al., 2009). Dobbins et al. (2009) recommended ongoing physical activity promotion in schools in light of the positive effects noted in the review.

Although school-based physical activity interventions have some limitations, such as their ability to affect leisure time physical activity rates, they have shown to positively impact a broad spectrum of health related outcomes. Considering the substantial potential for positive health related outcomes and minimal risk or harm, these interventions represent a viable way to reach children and increase their physical activity.

2.2. Involvement of Parents in Interventions

Engaging parents in school-based health education and promotion initiatives has shown some promise in generating a positive change in behaviour among children. Perry, Luepker, Murray, Kurth, Mullis, Crockett, & Jacobs (1988) were some of the first researchers to study the role of parental involvement in health behaviour change programs delivered in schools. Perry et al. (1988) compared an in-school intervention (Hearty Heart program) to an in-home intervention (Home Team program) to decrease dietary fat and sodium consumption intake among third graders over five weeks. Thirty one schools (n=2,250 students) were randomly assigned to one of four conditions: the in-school Hearty Heart program, the in-home Home Team program, either programs in sequence or a control group. The in-home intervention required the participation of parents to complete the educational components. Perry et al. (1988) found that students in the in-home program were able to reduce their total fat intake significantly more than the in-school or control group. The in-home program students reduced their calorie intake from fat by 2% a five week period (Perry et al., 1988). The authors concluded the results suggested the importance of parental involvement for health behaviour changes (Perry et al., 1988).

Haerens, Deforche, Maes, Stevens, Cardon, and De Bourdeaudhuij (2006) examined how parental participation in a personal computer-tailored feedback intervention, which intended to increase weekly physical education by 4.7 extra hours, positively impacted BMI scores in nearly 3000 13 year-old students. Among girls, BMI scores increased significantly less in the intervention group with parental participation compared with the control group or the intervention group without parental participation (Haerens et al., 2006). Kain, Uauy, Albala, Vio and Cerda (2004) reported similar results from a study of more than 3,500 11 year-old students.

In this study, students participated with the involvement of their parents in a six month intervention to improve nutritional habits and increase physical activity (Kain et al., 2004).

Students in the intervention group did not change from their original baseline BMI scores, but BMI scores in the control group increased (Kain et al., 2004).

Additionally, a longitudinal study of 672 sixth graders (followed until they reached ninth grade) engaged parents in a school-based program to reduce initiation of drug use (Dishion, Kavanagh, Schneiger, Nelson & Kaufman, 2002). Students in the intervention group were additionally classified as being at higher risk or average risk for substance use (Dishion et al., 2002). Three years following the intervention (at grade nine), the intervention group demonstrated less substance use (18.6% for average risk and 26.3% for higher risk) than students in the control group (28.9% for average risk and 42.1% for higher risk) (Dishion et al., 2002). The reduction in the initiation of drug use from this program indicated promising outcomes for the use of school-based interventions with family-involvement in achieving health behaviour change in students (Dishion et al., 2002).

Katz, O'Connell, Njike, Yeh, and Nawaz (2008) completed a systematic review of school-based interventions designed to prevent and manage obesity in students aged 3-18 years (n=64). Not only did the physical activity and nutrition interventions reduce body weight in experimental students, the involvement of parents or family in the interventions were found to also influence weight loss in the students (Katz et al., 2008).

Parental involvement in school-based health behaviour interventions, including physical activity interventions, offers a significant advantage over those without intervention. In studies where there has been parental involvement the results have consistently reported superior health

outcomes for children, and therefore future school-based health behaviour interventions might benefit from parental involvement.

2.3. Sedentary Behaviours

Historically, public health has mainly focused on physical activity to improve conditions associated with inactivity; however, sedentary behaviours represent a separate and unique health risk (Colley et al., 2011a; Colley et al., 2011b). Therefore, more emphasis should be placed on decreasing sedentary behaviours in tandem with efforts to increase physical activity (Tremblay et al., 2011b)

A Canadian study, tracking the movements of over 4,500 children and adults to measure sedentary time using accelerometers found that adults and children spend large portions of their days being sedentary (Colley et al., 2011a; Colley et al., 2011b). Adults spent nearly 70% of their waking hours being sedentary (Colley et al., 2011a), while children and adolescents aged 6 to 19 years spent more than 60% of their waking hours being physically inactive (Colley et al., 2011b).

An interesting phenomenon that can help increase physical activity and decrease sedentary behaviours is called the Premack principle. The Premack principle indicates that when an individual can only participate in a behaviour/activity that they want to engage in if they first perform a less desired behaviour, that the less desired behaviour will be engaged in more frequently (Premack, 1959). For example, a child can play with his or her toys (desired activity), if they first complete their homework (less desired activity). Utilizing this principle has increased physical activity and reduced sedentary behaviour in children (Faith et al., 2001; Goldfield et al., 2006). Goldfield et al. (2006) used the Premack principle in their study of 30 overweight 8 to 12 year-old children. Children were randomly assigned to an intervention or

control group, with both groups wearing accelerometers daily for eight weeks (Goldfield et al., 2006). Children in the intervention group were rewarded with one hour of screen time for every 400 units of physical activity they tracked on their pedometers (Goldfield et al., 2006). In this study, the Premack principle was applied by making the less desirable behaviour (being physically active) necessary in order to engage in the desired activity (screen time) (Goldfield et al., 2006). The intervention group had a nearly 50% greater increase in daily physical activity, spent more time being moderately or vigorously physically active and spent almost two hours less daily on screen time (Goldfield et al., 2006). Goldfield et al. (2006) concluded that making engagement in sedentary behaviour reliant on physical activity is an effective method to increase physical activity.

Goldfield et al. (2007) studied the effects of increasing physical activity and reducing sedentary behaviour on positive self-perceptions. Eight to twelve year old overweight children participated in an intervention to increase physical activity (measured by accelerometers) and decrease sedentary behaviour (measured by self-reported TV viewing) and then reported perceptions about their physical abilities and overall sense of self-worth (Goldfield et al., 2007). The researchers found that when children increased their physical activity, they felt more positive about their physical fitness, were happier with their body image, and felt overall more positive about themselves (Goldfield et al., 2007). Additionally, when children limited their sedentary behaviours, they felt more positively about their physical fitness and overall self-worth (Goldfield et al., 2007). All of these findings occurred independent of changes in BMI (Goldfield et al., 2007). The authors suggested that reducing TV viewing time may increase feelings of self-control and self-esteem, and improve perceptions of physical and global self-worth by increasing physical activity (Goldfield et al., 2007).

Robinson (1999) studied 192 third and fourth-grade students to measure the effects of decreasing sedentary behaviour on frequency of participation in physical activity, weight and nutritional intake (Robinson, 1999). Children in the intervention group received six months in class education to limit television, videotape, and video game use (Robinson, 1999). Compared with the control students, children in the intervention group had statistically significant relative decreases in measures of body fat, such as BMI and waist-to-hip ratio (Robinson, 1999). Furthermore, the intervention group had statistically significant decreases in time spent watching television or eating in front of the TV. Robinson (1999) concluded that high amounts of sedentary behaviour leads to being overweight, providing empirical support for the need to decrease sedentary behaviours in tandem with efforts to increase physical activity (Robinson, 1999).

Despite the evidence that underscores the importance of decreasing sedentary behaviour in conjunction with increasing physical activity, there are also numerous studies that have failed to find a relationship between physical activity, sedentary behaviour and obesity in interventions intended to increase physical activity or decrease sedentary behaviour (Campbell, Waters, O'Meara, Kelly, & Summerbell, 2002). For example, a review of prospective observational longitudinal studies (n=20) of the link between physical activity, sedentary behaviours and becoming overweight and /or obese found conflicting outcomes (Must & Tybor, 2005). Although most studies indicated that physical activity led to decreases in weight and that sedentary behaviour increased weight, some did not find a relationship or only found a relationship if certain moderating factors were present. In some instances, gender and the presence or absence of overweight parents affected whether a significant relationship was found in studies involving children (Must & Tybor, 2005).

In 2011, Tremblay et al. (2011c) released a systematic review on the relationship between sedentary behaviour and health in children aged 5-17 years. The authors sought to determine whether sedentary behaviours were independently associated with negative effects on physical and psychological health controlling for physical activity levels (Tremblay et al., 2011c). Tremblay et al. (2011c) reviewed 230 studies that analyzed the relationship between sedentary behaviour and health outcomes (Tremblay et al., 2011c). Tremblay et al. (2011c) found that the presence of negative health effects rose in proportion to the increase of time spent being sedentary. Allowing children greater than two hours of TV watching on a daily basis was associated with being less physically fit, having lower self esteem, poorer academic performance and an unhealthy BMI (Tremblay et al., 2011c). As part of this systematic review, a meta-analysis of the randomized controlled studies intended to reduce sedentary time and reduce body mass index (BMI) ratings found that an decrease in average BMI scores was evident as an outcome of the interventions (Tremblay et al., 2011c). Based on these findings, Tremblay et al. (2011c) asserted that there is significant evidence that limiting any type of sedentary time in children and youth is associated with reducing health risks, in particular decreases in BMI scores (Tremblay et al., 2011c).

Katzmarzyk (2010) reviewed the literature on sedentary behaviour and health risks as it pertained to Canadian adults; the risk of cardiovascular disease was found to be proportional to increases in time spent sitting. Shields and Tremblay (2008) found similar results based on their analyses of data from the 2007 Canadian Community Health Survey (CCHS). Screen time (television watching and recreational computer use) was positively correlated with obesity, time spent on inactive hobbies and deficient dietary habits (Shields & Tremblay, 2008).

Reducing sedentary behaviours, as an independent risk factor for obesity and as a behaviour that augments the debilitating effects of low physical activity, should be considered simultaneously with efforts to increase physical activity. As results, efforts to decrease BMI scores and the negative health repercussions associated with being overweight or obese can be maximized.

2.4. Screen Time

Nearly a third of Canadian adults watch more than two hours of TV a day and 15% spend more than 11 hours a week on the computer, outside of job requirements (Shields & Tremblay, 2008). By 2006, three quarters of Canadian households had a computer at home, which may explain why computer use comprises half of daily screen time adults aged 20-24 and a quarter of the screen time middle-aged adults (45 to 54) engage in (Shields & Tremblay, 2008).

Similar patterns of high screen time were also seen among Canadian children (Mark, Boyce & Janssen, 2006). Over sixty percent of children in grades six to 10 watch more than two hours of TV daily specifically and over seventy-five percent accumulate more than two hours a day of screen time when recreational computer use is included (Mark et al., 2006).

Numerous studies have been completed on the relationship between reduced screen time and BMI scores in children and adults. For example, Epstein, Roemmich, Robinson, Paluch, Winiewicz, Fuerch and Robinson (2008) conducted a randomized control trial to examine the impact of decreasing TV and computer use on BMI in children aged four to seven years (n=70). Compared to the control group, the intervention group, watched less TV and spent less time on the computer, had lower BMI scores and consumed fewer calories (Epstein et al., 2008). Changes in screen time were associated with changes in caloric intake but not with physical

activity levels. Reducing screen time can help prevent or reverse obesity in children, although this may be attributed more to its effects on reducing caloric intake (Epstein et al., 2008).

To determine the long-term effects of watching TV as a child on BMI scores as an adult Landuis, Poulton, Welch and Hancox (2008) analyzed prospective cohort data of 927 participants who were enrolled from 3 years of age and followed throughout the study until 32 years. High amounts of television watching time as a child caused an individual to be twice as likely to be obese as an adult, while high viewing times as an adult caused an individual to be two and a half times as likely to be an obese adult (Landuis et al., 2008). Furthermore, for every additional average hour of TV watched daily as a child, there was a 7-58% higher risk of being obese as an adult, even after controlling for adult television viewing (Landuis et al., 2008). These findings demonstrate the clear relationship between increased TV watching time as a child or adult and a higher risk of being an obese adult (Landuis et al., 2008).

In another prospective cohort study, 980 children entered the study at three years of age and were followed until 26 years of age to track time spent watching TV with BMI scores as an adult (Hancox, Milne & Poulton, 2004). Participants that spent a greater amount of time watching TV during weeknights from when they were five to 15 years old typically presented with higher BMI scores at 26 years of age. Additionally, almost 20% of the amount of overweight adult scores at 26 years of age could be explained by watching greater than two hours of TV daily (Hancox et al., 2004).

Lanningham-Foster and colleagues (2006) suggested that screen time could be less problematic if the type of screen time engaged in required physical activity. Studying the energy expenditure of children aged 8 to 12 years, they found that walking on the treadmill while watching TV increased energy expenditure by nearly 100% compared to watching TV while

sedentary. Video games requiring physical activity expended up to 108-172% more energy depending on the game. Lanningham-Foster et al. (2006) concluded that simply adapting the type of screen time to require more physical activity might be a useful tool in obesity interventions.

Studies examining sedentary behaviour and obesity among teenagers and adults have arrived at similar results. For example, Boone, Gordon-Larsen, Adair and Popkin (2007) conducted a cohort study that followed more than 9000 participants from teenagers to adulthood, examining the joint effect of sedentary behaviours (specifically screen time) and physical activity on obesity. Greater time spent on screen time as a teenager and as a young adult was associated with a significantly greater likelihood of being obese (Boone et al., 2007). In males, obese individuals were two times less likely to engage in weekly moderate to vigorous physical activity. In females, engaging in more moderate to vigorous physical activity and decreasing screen time made them more than one and a half times less likely to be obese (Boone et al., 2007). Boone et al. (2007) concluded that reducing screen time use is a realistic and effective mechanism to reducing the risk of being obese as an adult.

Hu, Li, Colditz, Willett, and Manson (2003) used prospective cohort data from 50,227 women aged 30 to 55 to determine how TV viewing time affected the prevalence of obesity. The results showed that for every additional two hours daily spent watching television, participants had a 23% increase in obesity (95% CI 17-30%) (Hu et al., 2003)

Parsons, Manor, and Power (2008) used longitudinal data (n= 11,971), following participants from birth to 45 years of age to assess whether the TV viewing time as a teenager (16 years) or as an adult (23 years) affected BMI scores at 45 years of age. Parsons et al. (2008) discovered that teenagers that watched TV more often also experienced a faster weight gain

between 16 and 45 years of age. These findings may explain why Raynor, Phelan, Hill, and Wing (2006) found that individuals are significantly better able to maintain a healthy weight if they watch less TV.

Screen time represents a particular threat to sedentary behaviours and inadequate physical activity. Its increasing prevalence, in addition to numerous studies that consistently find screen time associated with reduced physical activity and being overweight or obese, indicates the importance of its consideration in interventions seeking to increase physical activity.

Lanningham-Foster et al.'s (2006) research shows interesting promise for the application of screen time to enhance physical activity if the attributes of the screen time behaviour itself are changed (for example, video games necessitating physical activity). As technology evolves and screen time becomes even more prevalent, Lanningham-Foster et al.'s (2006) research may pave the way for understanding how to use screen time to leverage increased physical activity

2.5. Screen-Free Week

Screen-Free Week, originally named TV-Turnoff Week, was initiated by the Campaign for a Commercial-Free Childhood (CCFC, 2012). It is held for one week each year, typically held in the spring, in which communities (parents, children, schools) are encouraged to forgo screen time for more intellectually and physically stimulating pastimes (CCFC, 2012). It is intended to be an opportunity for children and parents to rediscover leisure time activities that do not include screen time (CCFC, 2012). The premise is simply to turn off screens for seven days and participate in alternative activities that are assumed to be more engaging and beneficial for a child's development (CCFC, 2012). At the time of this project, the researcher was unable to locate any studies that specifically examined the ability of school-based screen-free weeks to increase physical activity and reduce sedentary behaviours in children.

2.6. Social Cognitive Theory

Social Cognitive Theory (SCT) is a behavioural change theory that explains how a person's cognition (thinking and reasoning) affects their process of changing their behaviours (Dzewaltowski, 1994). Social Cognitive Theory, first known as social learning theory, was developed by Albert Bandura (Bandura, 1977) to demonstrate how individuals learn within a social environment. It was renamed Social Cognitive Theory (SCT) to better portray how cognitive processing abilities and biases impact what an individual learns from observing and communicating with others (McAlister, Perry, & Parcel, 2008). Reciprocal determinism is a key tenet of SCT; it indicates that behaviour is driven by interpersonal, intrapersonal and environmental factors (McAlister et al., 2008). Reciprocal determinism, when applied to physical activity, explains how a person's beliefs about their ability to be physically active (as influenced by their processing of social and behavioural factors) impact their frequency of physical activity (Dzewaltowski, 1994). Three cognitive processes are crucial to this SCT: self-efficacy, outcomes expectations and goal setting (McAlister et al., 2008).

Self-efficacy refers to how confident an individual is that they can use their abilities (physical or psychological) to be more physically active, which in turn helps achieve another goal (increased fitness, weight loss etc.) (Dzewaltowski, 1994). Although fear of the negative repercussions of an individual's unhealthy habits (for example, developing diabetes from poor diet) may initially motivate a person to change their behaviour, the presence of self-efficacy is imperative to actually instigate change (Bandura, 1998). Individuals need to believe they can be successful in changing their behaviours to truly be motivated to do so (Bandura, 1998). Self-efficacy is a skill that can be strengthened by overcoming adversity, observing others achieve success, positive self-talk and minimizing self-doubt (Bandura, 1998).

Outcome expectations reflect the consequences a person anticipates will occur as a result of being physically active (positive or negative) and could be social, physical or behavioural in nature (Dzewaltowski, 1994). Individuals can also hold outcome expectations regarding the social reaction (approval or disapproval) they believe their behaviour would result in, subsequently affecting whether or in what manner the behaviour change takes place (Bandura, 2004). Outcome expectations can also be focused inward, leading the individual to expect how their behaviours will influence how they feel about their physical health (Bandura, 2004). As the more tangible benefits of physical activity tend to require a longer period of time to be realized (ie. weight loss), self-regulation is pivotal in order to sacrifice the short-term desire to be less active for the long-term benefits of being more physically active. (Dzewaltowski, 1994).

Finally, developing physical activity goals is important to help the individual feel inspired to work towards their desire end state behaviour (Dzewaltowski, 1994). An individual's goals reflect their beliefs and values and encourage them to improve their behaviours to achieve what they value (Bandura, 2004). Long-term and short-term goals work in tandem; while long-term goals indicate the destination, short-term goals act as milestones on the way to achieving that final vision (Bandura, 2004).

It is the synergy between these three constructs that produces the ideal behaviour change. In a study in which individuals participated in a cycle ergometer task requiring them to cycle and worked towards a challenging cycling-related goal, Dzewaltowski (1994) found that those that were high in all three cognitive processes activated (self-efficacy in their ability to achieve their goal, displeasure with past performance and a desire to work towards challenging goals) were 80% more motivated than those that only had one construct activated.

A systematic review (n=27) of the ability of SCT to predict exercise behaviours found that self-efficacy was significantly associated with exercise behaviour in all studies (Keller, Fleury, Gregor-Holt & Thompson, 1999). The following studies exemplify the contexts and methods through which social cognitive theory constructs affect and predict physical activity.

Stevens (2006) analyzed whether changes in the constructs of self-efficacy, self-regulation, social support and outcome expectancy-values could predict changes in or mediate the frequency of moderate or vigorous physical activity in teenagers. Over a nine week period, the intervention group completed lessons that focused on a different SCT construct each week (self-efficacy, self-regulation, outcome expectancy values and social support) in order to help students develop an exercise plan. Stevens (2006) found that the intervention explained a greater degree of changes in moderate physical activity at two of the intervention schools than the comparison school but did not explain a significant amount of change in the third intervention school. Additionally, students in the intervention group, who were physically inactive prior to the study became more moderately physically active and all intervention students had larger increases in their SCT scores at the end of the study. Self-regulation and social support mediated the changes in moderate physical activity (Stevens, 2006).

Ayotte (2007) investigated the impact of self-efficacy and spousal self-on physical activity participation in middle and older aged adult married couples, as well as the ability of SCT to predict frequency of physical activity. Social cognitive theory explained a significant amount of the variance in frequency of physical activity. An interesting relationship among self-efficacy, self-regulatory behaviours and physical activity was observed. Self-efficacy was indirectly associated to physical activity via outcome expectations and perceived barriers. In turn, self-efficacy was related to self-regulatory behaviours and finally self-regulatory

behaviours were related to physical activity (Ayotte, 2007). Based on these findings, SCT can be successfully used as a theoretical framework for physical activity interventions (Ayotte, 2007).

Dzewaltowski, Noble, and Shaw (1990) compared the theory of reasoned action plan and planned behaviour to SCT to determine which theory best predicted physical activity frequency over four weeks. Dzewaltowski et al. (1990) found that SCT components significantly predicted physical activity and were also stronger predictors of physical activity than those from the other two theories.

Given the promising results associated with the use of social cognitive theory in physical activity interventions to date, it was selected as one of the theories to guide the Turnoff Week Challenge interventions framework. The Turnoff Week Challenge utilized all three components of social cognitive theory in the homework assignments by including motivating language to encourage self-efficacy, encouraging reflection on outcome expectations and a goal setting exercise.

2.7. Ecological Models of Health Behaviour

Ecological models of health behaviour are built upon the premise that environmental, policy, social and psychological contexts influence an individual's behaviour (Sallis, Owen, & Fisher, 2008). Ecological models postulate that behaviours are influenced by numerous factors, including interpersonal relationships, organizations they work in, communities they live in, policies that impact them and the physical environment (Sallis et al., 2008). There are four pillars of ecological models of health behaviour: multiple influences exist for specific health behaviours; influences on behaviours interact with other types of influence; ecological models should be behaviour-specific; and multi-faceted, multi-dimensional interventions are the most effective in producing behaviour change (Sallis et al., 2008). Their comprehensive natures have

the potential to guide and contribute to population-level health behaviour interventions (Sallis et al., 2008).

A systematic review of interventions to improve the nutritional and physical activity habits of children 6-18 years of age (n=27) found that ecological approaches were more effective in producing positive physical, nutrition and BMI outcomes than education-only interventions (De Bourdeaudhui et al., 2011). These ecological approaches shared the following characteristics: traditional educational components in class, environmental components (ie. modifying school meals), changing the physical environment to encourage activity, and engaging social influencers through meetings with parents and community members (De Bourdeaudhui et al., 2011). De Bourdeaudhui et al. (2011) concluded that there was moderate evidence that multi-component interventions that combine educational and environmental considerations decreased the prevalence of obesity in adolescent girls.

Sallis and Glanz (2009) performed a literature review of studies that analyzed how components of the built environment affected obesity rates. Environmental influences, such as access and proximity to recreational facilities were significantly associated with the risk of being overweight or obese (Sallis & Glanz, 2009). Furthermore, schools that provided environments more conducive to being physically active (such as more equipment or chances to be active) had significantly more students that were active after lunch or school (Sallis & Glanz, 2009).

However, most of the studies of physical activity environments have been cross-sectional; this raises a question of direction, do physically-active friendly environments encourage people to be more active, or do already active people simply choose physically active environments (Handy, Cao, & Mokhtarian. 2006). Other studies have addressed this concern, by using natural experiments or observations. For example, Handy, Cao and Mokhtarian (2008)

found that when people moved, they became more or less physically active in proportion to how easy it was to walk for transportation in their new neighbourhood.

Finally, The Study on Environmental and Individual Determinants of Physical Activity (SEID project) examined how the social and physical environment, in combination with the unique characteristics of the individual determined physical activity (Giles-Corti & Donovan, 2002). SEID surveyed adults aged 18-59 years (n=1803) to gather information on what factors influenced their physical activity levels. SEID found that individual and social environment factors were more influential on physical activity than the actual physical environment itself. The authors concluded that while elements of the physical environment are required to increase physical activity, strategies that impact individual and social environmental factors must also be employed (Giles-Corti & Donovan, 2002).

Ecological models of health behaviour reiterate the importance of and benefits of taking a broader, more inclusive perspective of all the environmental and contextual determinants that impact physical activity behaviours beyond those within the scope of the individual's control. The Turnoff Week Challenge applied ecological models of health behaviour by combining a micro level focus in the intervention group (individual parent and student behaviour change) while also influencing the social environment (the classroom environment and the family setting) by exposing classrooms and families to discussing the benefits of decreased screen time.

2.8. Value Expectancy Model

Eccles et al.'s Value Expectancy Model (VEM) (Segar, Eccles, Richardson, 2011) illustrates how an individual's daily goals and decision making processes are comprised of their individual priorities, as well as social and cultural norms. Individuals then develop and strive to achieve physical activity goals that are moulded by these values and norms (Eccles, 1994).

Additionally, the tenet of attainment value in VEM explains that the importance an individual places on achieving a goal will significantly predict whether they actively work towards achieving it (Bagozzi, Bergami, & Leone, 2003).

Several studies have applied the tenets of the value-expectancy model to physical activity. Chiang, Byrd, and Molin (2011) used VEM to determine how third to fifth graders (n=220) decided to be physically active or inactive. The researchers used questionnaires completed by both the children and their parents that provided insight to the children's values, beliefs and perceived cost of participating in physical activity. Chiang et al. (2011) found that the children's perceived cost presented as a unique driver in their decision making process. In fact, of the three domains of competence, value and perceived costs, children only differed on their, perceived costs of participating in physical activity (Chiang et al., 2011).

Xiang, McBride and Bruene (2004) studied 119 fourth grade students and examined the relationship between value-expectancy motivation and its impact on performance (one mile run) and long-term intentions (to continue running). Xiang et al. (2004) found that that intrinsic value and attainment value positively were significant predictors of students' plans to continue running in the future. Additionally, how well a child anticipated they would perform (expectancy beliefs) was a significant predictor of improved one mile run times.

Gao (2008) also examined the relationship between value-expectancy motivation to how cardiovascular fit a student was as well as how much they enjoyed physical activity in 307 sixth to eighth grade students. Gao (2008) found that children that believed they would do well on a cardiovascular fitness test (expectancy beliefs) performed significantly better than those that did not. Additionally, children that had higher levels of expectancy belief, attainment value and intrinsic motivation enjoyed physical activity more than those that did not.

The Value Expectancy Model was selected as a driving theory behind the Turnoff Week Challenge due to the empirical evidence supporting its application in physical activity interventions and for its emphasis on ensuring that participants truly value the goal they are working towards. In the absence of a goal that is valued, efforts to create the prerequisite skills and conditions to achieve that goal will likely be somewhat redundant. The Turnoff Week Challenge utilized the bidirectional social influence and pressures from student to parent/guardian and the reflection on the importance of the goal (attainment value) to facilitate behaviour change.

2.9. Theory of Planned Behaviour

The theory of planned behaviour, developed by Icek Ajzen (Ajzen, 1991), involves the synergy of behavioural intentions and perceived behavioural control (Armitage, 2005). As it applies to physical activity, the more people are motivated to engage in physical activity and believe they can be physically active, the more likely they are to engage in the behaviour (Ajzen, 1991). Behavioural intentions are dictated by three constructs; perceived behavioural control, the subjective norms and values of the social context, and attitudes towards physical activity (Armitage, 2005). Individuals are more likely to be physically active if they have positive attitudes about physical activity, feel confident about their abilities to be physically active and if the social environment supports participation (Armitage, 2005).

Armitage (2005) tested how well the theory of planned behaviour predicted the intent to be active and actual physical activity participation over 12 weeks (n=94). The behavioural intent to be physically active was primarily driven by the constructs of attitude, subjective norm and perceived behavioural control (49% of the variance) and was independently predicted by subjective norm and perceived behavioural control. Actual physical activity behaviour was

somewhat influenced by perceived behavioural control and behavioural intention (22% of the variance) and was only independently predicted by perceived behavioural control (Armitage, 2005) This study was particularly impactful as it proved for the first time that the theory of planned behavior significantly predicted not only the intent to exercise, but actual physical activity behaviours (Armitage, 2005).

Courneya, Plotnikoff, Hotz and Birkett (2001) used the theory of planned behaviour constructs to predict what influenced changes in exercise stage transitions in randomly selected adults (n=683), with measures at baseline, six months and one year. Several key findings were reported; first, moving beyond the pre-contemplation stage was highly predicted by the individual's measures of intention, attitude and perceptions of subjective norms; second, positive or negative movement from the preparation stage by six months was significantly predicted by their baseline intention and attitude; and third, positive or negative movement from action to maintenance was predicted by intention, attitude and social support (Courneya et al., 2001). Based on these findings, the authors concluded that the theory of planned behavior clarifies the primary social cognitive constructs that drive exercise stage transitions (Courneya et al., 2001).

Furthermore, a meta-analysis of 72 studies that applied the theory of planned behaviour to exercise found several important findings (Hagger, Chatzisarantis, & Biddle, 2002). First, an individual's intention to exercise was best predicted by their attitude and perceived behavioural control (Hagger et al., 2002). Second, actual exercise behaviour was significantly predicted by perceived behavioural control (Hagger et al, 2002). Finally, an individual's past behaviour significantly predicted their behaviour, intention, attitude, subjective norm, perceived behavioural control and self-efficacy (Hagger et al, 2002).

The theory of planned behaviour's tenets of behavioural control, subjective norms and attitude towards a behaviour have been shown to be reliable and significant predictors of actual physical activity behaviour. For this reason, The Turnoff Week Challenge utilized the theory of planned behaviour in the implementation of the homework activities. These activities encouraged children and parents to become physically active, emphasized positive attitudes towards exercise and enhanced perceived behavioural control. Subjective norms to be physically active were enhanced by using the classroom setting (as all participants were explained the study and were to use their Challenge Tracker Form in the classroom setting) to be aware of and encouraged to exercise, as well as from child to parent.

2.10. Bidirectional Model of Parent-Child Influence in Health Behaviours

It has long been assumed that because children learn physical activity habits and behaviours at a very young age from their parents, that interventions should target parents' role modeling capacities (Sallis & Nader, 1988). Parents have been seen as being able to influence their children's physical activity through role modeling, parental support, encouragement, involvement and facilitation for opportunities to make healthy choices (Welk, Wood, & Morss, 2003).

However, while research does support a relationship between the health behaviours of parents and their children, the relationship might be less causal and less straightforward than initially thought. A meta-analysis systematically analyzing studies from 1980 and 2009 found a weak association between the nutritional habits of parents and their children, suggesting that children's eating patterns are influenced by many elements of which parental influence is just one factor (Wang, Beydoun, Li, Liu & Morena, 2010). The study suggests that other factors

such as school policies, social influences and the broader food environment should also be considered (Wang et al., 2010).

Parents can influence the type and frequency of physical activity their children participate in through direct and indirect measures. Parents have a direct influence on their child's physical activity by providing opportunities to be physically active (for example, taking them to a park) (Kohl & Hobbs, 1998). Indirectly, parents influence their children's physical activity by being a physically active role model (Kohl & Hobbs, 1998). Children with physically active parents are nearly six times more likely to be physically active than their peers without that role modelling (Moore, Lombardi, White, Campbell, Oliveria, & Ellison, 1991). However, Folgelholm, Nuutinen, Pasanen, Myohanen, and Saatela (1999) found that a parent being physically inactive is more influential on their child's physical activity levels than if they are fairly physically active. In light of this, parents may be better positioned to reduce the physical inactivity of their children than to encourage them to be extremely active (Folgelholm et al., 1999).

Despite the disagreement on how the family influences a child's physical activity levels, there appears to be sufficient evidence to suggest that the family does play a role in altering its children's levels of physical activity. For example, Springer, Kelder and Hoelscher (2006) found that family encouragement was positively related to moderate-to-vigorous physical activity in sixth grade girls (n=718) and that high levels of family participation were correlated with less screen time. Additionally, parents participating in physical activity with their children directly influenced their children's physical activity; in fact, when family physical activity was high, children spent less time being sedentary (Springer et al., 2006). Specifically, family participation was more important and influential than parents simply encouraging their children to be physically active (Springer et al., 2006). This suggests that the family environment is an

important source of influence in teenagers' physical activity and screen time behaviours (Springer et al., 2006).

The mechanism by which parental physical activity predicts child physical activity is somewhat unclear, which may be why some studies have countered that parental influence is actually a poor indicator of child physical activity (May, Hensley, & Finn, 2010). However, these studies may not have taken into consideration Weiss and Ebbeck's (1996) model for understanding physical activity motivation in children. The model reflects that physical activity in children is shaped by a confluence of factors, both internal (such as perceived abilities and enjoyment) as well as external (such as the social environment and parental influence) (Weiss & Ebbeck, 1996). Therefore, because parental influence does not exist in isolation from other influences, it is plausible that parental influence only significantly predicts physical activity in children when it is complemented by the presence of other positive influences (Weiss & Ebbeck, 1996).

Until recently, influence in parent-child relationships has been assumed to be unidirectional: parents mould their children (Ambert, 2001). However, the way in which children and parents jointly affect each other is less studied (Ambert, 2001). The majority of studies on parent-child relationships are oriented from the perspective that children are the future outcome of the parenting they receive (Ambert, 2001). This depiction of children is problematic as it ignores the significance of environmental and reciprocal elements of parent-child relationships and inherently discounts the potential for children to also influence their parents (Ambert, 2001).

Bidirectional models of parent-child influence underscore the influence of children on their parents' behaviour; instead of viewing parent-child relationships as a linear relationship,

they should be viewed as a circular relationship in which both parties affect and are affected by each other (Del Mol & Buysse, 2008). Marketing to children is a great example of the ability of children to affect their parents' behaviour. Children are targeted by commercials to encourage them to eat certain foods or play video games (Arnas, 2006). For every two hours of television aimed at children, on average 35 minutes is comprised of commercials (Arnas, 2006). Nearly 50% of television ads are for food and the majority of them are for candy, snack foods, and sugary children's cereals (Arnas, 2006). Not surprisingly, almost half of the children that view those ads ask their parents to purchase the featured products (Arnas, 2006).

In a study analyzing the impact of children on their parents during grocery shopping trips, parents conceded to their children's food requests nearly half the time, more than half of which were requests for snacks and junk food (O'Dougherty, Story, & Stang, 2006). In fact, children are now viewed as autonomous decision makers (Ambert, 2001). This demonstrates the potential of children to impact their parents' food purchases. It would also seem that children affects parent's dietary habits. In one example, Laroche, Hofer, and Davis (2007) found that adults who lived with children eat more fat than those that do not. Additionally, adults with children living in the home are more likely to drink milk and eat snack foods and processed meats than those without children (Laroche et al., 2007). The authors suggested that children may influence adult's nutrition intake (Laroche et al., 2007).

Social power theory (Wolfe, 1959) suggests that social power is a mechanism that individuals can use to influence others. Children can use social power to influence their parents by using expertise power (knowledge), reward power (good behaviour), referent power (adopting parental preferences to bond to them), legitimate power (the ability to independently make a decision) and coercive power (using bad behaviour to get the results they want). These types of

power can be used actively or passively (Wolfe, 1959). Active influence occurs when a child directly controls their influence to accomplish a goal, using mechanisms such as pleading or bargaining (Williams & Burns, 2000). Passive social influence occurs when parents consider their children's unstated preferences and act accordingly (for example, buying a certain type of cereal because they know their children prefer it) (Roedder-John, 1999).

Social exchange theory dictates that people will behave in two ways: they will use a type of influence based on its benefits and risks and they will continue to engage in a behaviour until it is no longer rewarding (Turner, 1982). Children quickly learn how to act in specific circumstances to get the results they want (Turner, 1982). This occurs through the use of decision histories, which means that a child uses behaviours they have used previously to influence an outcome in the current situation (Turner, 1982). Additionally, the more a child desires an outcome (preference intensity), the more they will attempt to influence it (Corfman & Lehman, 1987). Social exchange theory asserts that influence can only occur as reciprocal exchange of power between two or more individuals to achieve an outcome (Coleman, 1973). This tenet lends support to the concept that influence in the child-parent relationship occurs in a bidirectional model via social power (Coleman, 1973).

In a study that examined how children aged 8-11 influenced their mothers (n=987 pairs) in a toy purchasing situation, Flurry and Burns (2003) observed that children apply expert, referent and reward based active social power to cause positive influence or try to achieve a certain outcome, and use coercive power to cause negative influence or try to prevent a certain outcome. Also, this study supported the premise that decision making influence is a bidirectional and reciprocal event, in which children determine the strength of their influence in respect to their parents' assessment of the strength of their influence and vice versa (Flurry & Burns, 2003).

While parents' influence on their children's level of physical activity has been a well studied and much accepted phenomenon, little attention has been given to whether and how children might influence their parents' level of physical activity. As such, few studies exist that measure this relationship directly, but the significant literature documenting children's influence on their parents' behaviour in other domains suggests the probability that children might also affect their parents' level of physical activity.

2.11. The Concept of "Spread of Effects" in Health Promotion Programs

Spread of effects in health promotion programs occurs when an intervention inadvertently affects a population not originally targeted by the intervention (often a subset of the targeted population, such as other family members) (Angelucci & Di Maro, 2010). For example when the intervention affects the social contexts the non-targeted population exist in, resulting in a passive spread of the effects of the intervention (Angelucci & Di Maro, 2010).

The spread of effects of health policies and behaviours on family members has been sparsely examined (Berniell et al., 2010). However, there are a few studies worth noting, which range from positive results, uncertain results and no significant results. For example, Bhattacharya, Currie, and Haider (2006) analyzed the effects of the School Breakfast Program, which intended to improve the nutrition habits of children; they found that the program inadvertently improved the nutrition of adult family members the children lived with. Additionally, a controlled study carried out among parents of children in 14 primary schools to discover whether an anti-smoking project benefited their parents, showed that children subsequently shared the project information with their parents (Wilcox, Gillies, Wilcox, & Reid, 1981). However the researchers were unable to conclusively isolate the impact of their intervention on parental smoking behaviours from other factors (Wilcox et al., 1981).

Conversely, some research that has analyzed the impact of health behaviour policies directed toward children did not find a spread of effects on family members (Jacoby, 2002). This could be because a spread of effects for health behaviour related policies can be difficult to measure; sometimes, the spread of the policies manifests through non-behaviour changes, such as freeing up financial resources and benefiting family members that way (Berniell et al., 2010).

A study by Berniell et al. (2010) used longitudinal data from 1999 to 2005 (n=11,339 observations) to compare the impact of in-school health behaviour interventions on the behaviour of adults who had elementary school children that either did or did not receive the intervention (Berniell et al., 2010). Their study, which examined how school health education impacted parents' physical activity, found that these interventions had a positive impact on parents' frequency of light physical activity (Berniell et al., 2010). The authors concluded that this demonstrated a reciprocal interaction between children and parents of healthy family behaviours (Berniell et al., 2010).

Chaudhuri (2005) found that a mother and child health program not only benefited mothers and their children, but also senior women living in the same household. Chaudhuri (2005) posited that this spread of effects may have occurred because it freed up more income to be spent on other health maintaining services and that the healthier targeted women and children provide create a healthier environment for family members

Alderman, Hentschel, and Sabates (2003) analyzed how a program designed to educate women on nutritional practices, indirectly impacted children of neighbouring homes. They found that regardless of whether the child's mother participated in the program, that the program had a positive effect on all neighbouring children (Alderman et al., 2003).

Angeleucci and De Giorig (2006) analyzed how PROGRESSA, a continuing health education initiative, impacted other members of the community. PROGRESSA gives scholarships to third to ninth graders as well as bimonthly transfers to women. Using changes in food and non-food consumption to detect spread of effects in non-targeted groups, Angelucci and De Giorig (2006) found that households that did not receive the intervention but resided in the same village as those that did increased their food and non-food consumption, indicating that the non-targeted also benefited from the intervention (Angelucci & De Giorig, 2006). The authors proposed several mechanisms by which this may have occurred. The intervention group had more income that allowed their children to discontinue working and attend school; therefore, there was less competition in the job market and greater income opportunity for the non-targeted group (Angelucci & De Giorig, 2006). Additionally, the treated villages had more money to spend on goods and services, therefore benefiting local vendors, credit and insurance services for the entire village (Angelucci & De Giorgi, 2006).

These findings point to the importance of evaluating the unintended effects of public health programs and policies on non-targeted individuals. The spread of effects of public health programs within the household represent a significant opportunity for health public health policies and health promotion programs (Chaudhuri, 2005). Indeed, van de Walle and Nead (1995) encouraged researchers and policy makers to examine the importance of considering the unintended benefits of public programs during evaluation to adequately capture all of the benefits of the public financial investment are realized.

Berniell et al. (2010) proposed that parents might be affected by the health education their children receive at school through two mechanisms. First, children share what they learn with their parents which in turn may influence the parents' knowledge about positive health

behaviours. Second, children who adopt what they learn from the interventions may ask their parents to participate in healthy behaviours with them, such as being active or eating more nutritious food (Berniell et al., 2010).

2.12. Summary

Based on the literature scan, there appears to be sufficient evidence to support the need to increase physical activity and decrease sedentary behaviours among Canadians. Additionally, school-based interventions appeared to be an effective and accessible way to cause positive health behaviour change among school-aged children. While the literature on the ability of children to influence their parents' health behaviours and spread of effects in health behaviour change interventions was limited, the researcher determined there was enough established potential in these areas to pursue them as part of the research study.

The researcher subsequently chose a school-based intervention designed to increase physical activity and reduce sedentary behaviours as the platform for investigating whether children could influence their parents' physical activity. The screen-free week concept was adapted because it was a popular, already established intervention that educators, families and children may recognize. The knowledge gained from the health behaviour change theories was used to inform the design of the study materials as well as the study design more broadly (ie. using opportunities for sharing goal setting to both promote behaviour change and a possible spread of effects).

Chapter Three: Research Question

While spread of effects in health behaviour interventions have been observed, they are not fully understood and require further research. Given 1) the occurrence of spread of effects, 2) the use of parental involvement in interventions as a method to enhance outcomes in their children, 3) the major influence of schools on children's education on healthy lifestyles and health behaviours, (Berniell et al., 2010), and 4) the evidence supporting children's influence on their parents' behaviours, it is plausible that children may be able to influence their parents' level of physical activity in a school-based intervention. School-based health promotion interventions that include parental involvement may then provide the possibility of influencing parental behaviour by two mechanisms: passive diffusion of the intervention and the ability of children to influence their parents' behaviour (Berniell et al., 2010).

The following research question is posed: could parental involvement in a school-based physical activity education intervention with their children influence the parent's physical activity behaviours and intentions?

Chapter Four Methodology

4.1. Overview of Study Design

Mixed methods research. This study utilized a mixed methods research (MMR) design. Creswell and Plano Clark (2011) described how MMR entails drawing upon the benefits of both quantitative and qualitative data to answer a research question, with the assumption that using both approaches to complement each other will more adequately answer the research question than either method could alone. Morse and Niehaus (2009) stated that MMR should be used when the research problem is very broad and multi-faceted to be answered only qualitatively or quantitatively. Tashakkori and Creswell (2007) further explained that a MMR approach should be selected when the study involves qualitative and quantitative elements that can be analyzed individually, yet also as a whole to develop a more thorough understanding of the problem. In this study, the addition of a qualitative strand (phone interviews) to the randomized control trial (RCT) allowed for a richer understanding of a novel concept. Using Creswell and Plano Clark's (2011) mixed methods research designs typology, the study is classified as using a sequential explanatory design in which a qualitative component is part of a larger randomized control trial. The word sequential refers to the fact that the two strands are collected completely separately from each other (Cresswell & Plano Clark, 2011); in this study, the qualitative data was collected after all of the quantitative data had been collected. This design specifies that while the qualitative data complements the RCT by explaining or elaborating the quantitative findings (Creswell & Plano Clark, 2011).

Researchers testing health promotion interventions have recognized the utility of MMR as an approach to answer the complex phenomena involved in behaviour change processes.

Mixed methods approaches to measuring physical activity are important as quantitative and qualitative measurements can provide only partial insight as to whether an intervention was effective and what factors impacted its effectiveness. For example, Baheiraei, Mirgafourvand, Mohammadi, Nedjat, Chanrandabi, Rajabi and Majdzadeh (2011) used both a quantitative and qualitative strand to determine how to modify future interventions designed to support and provide health promotion education to women in their birthing years. A purposive sample was drawn from a questionnaire to identify extreme cases of health-promoting behaviours; this subset then participated in follow up focus groups and individual interviews (Baheiraei et al., 2011). These qualitative accounts of personal experiences allowed for the extract of rich themes to inform the unique needs of women of reproductive age for future health promotion programs (Baheiraei et al., 2011).

Thøgersen-Ntoumani and Fox (2005) also used an MMR approach to categorize the physical activity and mental health of corporate employees. A questionnaire that measured mental and physical health was used to classify respondents as belonging to one of four clusters (Thøgersen-Ntoumani & Fox, 2005). By using semi-structured interviews from cases of each cluster, a more comprehensive understanding was gained on the differences between respondents in each cluster (Thøgersen-Ntoumani & Fox, 2005). By understanding the factors that influence physical activity and wellbeing among different typologies, a more comprehensive understanding of how to create and implement cost-effective wellness workplace interventions was gained (Thøgersen-Ntoumani & Fox, 2005). The authors stated that their results exemplify the utility of selecting an MMR approach to identify potential target populations for further study and for focused interventions (Thøgersen-Ntoumani & Fox, 2005). Furthermore, Henderson, Jones, Hornby-Turner and Pollard (2011) utilized a mixed methods approach in comparing

ethnic differences in physical activity levels among White British and British Pakistani children. A MMR allowed the researchers to both quantify the differences in physical activity, but to also probe in parent interviews what attitudes and familial influences might exist that affect these differences (Henderson et al., 2011). The authors stated that using a MMR approach was pivotal to go beyond more than just measuring the differences in physical activity, but also truly understanding the source of the differences among the groups and therefore producing the insight required to create effective interventions to increase physical activity (Henderson, et al, 2011).

Intervention (randomized control trial). The intervention utilized in the randomized control trial modelled the Campaign for a Commercial-Free Childhood's (2012) Screen-Free Week. The CCFC challenges participants to forgo time spent in front of a television, computer screen or video game for more physically active and mentally engaging activities. The Region of Waterloo Public Health (Ontario, Canada) historically offered a challenge tracker form in addition to prizes to interested schools in the Waterloo region each year during Screen-Free week. Turnoff Week encouraged increased physical activity and reduced screen time in grade five classrooms (in some cases grade 4/5 or grade 5/6 split classes). Turnoff Week, which spanned over a one week period, was completed by both the control and experimental groups. Only one parent/guardian was permitted to participate in conjunction with their child.

The premise behind using Turnoff Week was to provide a platform through which to conduct the true experimental portion of the study (parent/guardian exposure to physical activity education). It was felt that using a challenge-based activity would be the most appealing to children and the most likely to generate enthusiasm and adherence, therefore improving the potential for a spread of effects to occur as they shared their knowledge and energy with their parents/guardians.

The independent variable (IV) was the group assignment and the dependent variable (DV) was the level of physical activity, as measured by the online surveys. Each classroom (or school, if more than one class per school wished to participate) was randomly assigned to the treatment or control group using random number generation in Microsoft Excel. Participation occurred as a child-parent pair. Both conditions participated in the Turnoff Week Challenge in which children aimed to decrease sedentary time and increase physical activity throughout the week.

Pairs in the control group filled out an online survey the Friday before Turnoff Week and one full week after the last day of Turnoff Week (there was a separate survey for the student and parent/guardian) and the students completed the Turnoff Week Challenge Tracker Form in class.

Pairs in the experimental group filled out the same online surveys at the same intervals and the student also completed the Turnoff Week Challenge Tracker Form. The only difference between the control and experimental group was that each participating parent in the experimental group and their student were to complete two assignments of homework together online (see Appendices G and H). The two online homework assignments were intended to facilitate the opportunity for a spread of effects. These homework assignments dealt with goal setting and reflecting on the importance and benefits of physical activity as a parent-child pair. As the homework assignments were intended to facilitate parental involvement in the intervention; they were not evaluated and did not affect the student's grades. For scoring purposes, they were simply evaluated as completed or not completed.

Qualitative interviews. Supplemental qualitative data, obtained through telephone interviews with parents/guardians were conducted with interested participants to provide complementary data to enhance and expand upon the findings of the intervention.

Parents/guardians had the opportunity to express interest in being contacted for a phone interview by the researcher at time of consenting to the randomized control trial. The interested parents were contacted by the researcher via e-mail, to confirm whether they were still interested, and if so, to arrange a telephone interview at a time that worked for them. The interviews followed a script of questions that intended to illuminate parental/guardian perceptions as to how children might affect their level of physical activity and to provide insight into the dynamics of parents and children being physically active together. Participants were also debriefed as to the true intent of the study and were allowed to ask any questions or concerns regarding the hypothesis. No participants expressed any concerns about the use of deception. These interviews took approximately 10-15 minutes and were recorded by hand.

4.2. Qualitative Research

Qualitative research is informed by the experiences and perspectives of its participants in order to formulate theories that explain social phenomena (Corbin & Straus, 2008). Qualitative researchers hold constructivist viewpoints; this means that they believe that participants describe their experiences to the researchers and themselves, and in turn the researcher builds theories based on these experiences (Corbin & Straus, 2008). Qualitative researchers acknowledge that events and occurrences are complex and are derived from an array of influences and elements that interact in complicated ways; because of this, experiences must be understood within the larger context that they occur (Corbin & Straus, 2008). Researchers are drawn to qualitative approaches for the opportunity to see phenomenon and experiences from the participants' perspectives to further the body of knowledge on the matter (Corbin & Straus, 2008).

Qualitative analyses require a certain amount of training; over time, a researcher gains a natural understanding of the data and becomes subjective and objective to the data at the same

time (Corbin & Straus, 2008). As with most skills, excelling in qualitative analyses is something that can only be achieved through practice (Corbin & Straus, 2009). This study utilizes thematic network analysis (Stirling-Attride, 2001), a form of generic qualitative research (Merriam, 1998); generic qualitative research intends to “discover and understand a phenomenon, a process, or the perspectives and worldviews of the people involved” (p.11).

Caelli, Ray and Mill (2003) propose four areas in order to fulfill the criteria of researcher credibility: a) explicitly articulate the researcher’s theoretical perspective, b) ensure agreement and consistency between methodology and methods, c) actively seek to enhance rigour, and d) articulate the analytical lens through which the data is analyzed. The theoretical positioning of the researcher is that, given the complexity of human interactions and relationships, it is possible that children influence their parents’ level of physical activity, especially given the other established ways in which they influence parental behaviour. The researcher’s motive was to explore alternative routes through which to influence adult and children’s level of physical activity in light of the mixed results of interventions aimed to improve physical activity and reduce sedentary behaviour and obesity.

The decision to further explore this possible connection through qualitative research is an indication of congruence between methodology and methods. The researcher believed that it was plausible that these complex relationships and mechanisms of reciprocal influence would not be adequately captured through quantitative research alone, and thus, selected semi-structured interviews to allow participants to enrich the understanding of the researcher. The researcher also held the belief that many parents might be unaware of how their children influence their physical activity. Therefore, the researcher placed more general questions that allowed insight into the parent-child relationship at the beginning of the interview and left the direct question of

‘do you feel your child has an influence on your level of physical activity?’ for the very end to allow participants the chance to fully explore their own story. It was felt that semi-structured, open-ended questions would allow participants to have the most reflection.

In order to improve credibility and rigor of data, the researcher employed verification by respondents (Baxter & Eyles, 1997) by asking participants during the telephone interviews to clarify key statements and repeated back key quotes to participants to verify accuracy in the quote and the inferred meaning behind the quote. Summarizing the key points presented at the end of each interview and asking participants to verify the summaries helped to ensure methodological rigour (Kvale, 2007).

The researcher acknowledges that constructing an understanding of parent-child relationships based on the self-reports and experiences of individuals and applying it more broadly to a larger population requires caution as it is not known the degree to which these findings are generalizable. It is the researcher’s intent that by extending the findings of themes and drawing linkages and inferences to the context (parent-child bidirectional influence of physical activity) (Caelli, Ray, & Mill, 2003), that these findings can be tested in future researcher in other contexts to determine their generalizability.

4.3. Participants

The study occurred in Waterloo Region in Ontario, Canada. The Waterloo Region consists of three urban municipalities and four rural townships. With a combined population of more than 553, 000 makes it one of the fastest growing areas in Ontario (Region of Waterloo, 2010). The Waterloo Region District School Board (WRDSB) is one of the largest district school boards in Ontario and has 103 elementary schools (Waterloo Region District School Board, 2012).

Eight schools participated, with a breakdown of four schools with grade 5 students, three schools with grade 4/5 students and one school with a grade 5/6 split. Schools were allowed to invite more than one classroom per school; each school was simply assigned to the same condition. Children participated with one parent to form a “child-parent pair” and it was required the same parent be involved for all aspects of the study. In total, fourteen classrooms participated (however several classrooms had as little as one to two students participate). Participants consisted of 27 parent and child pairs (5 boys, 22 girls, 24 mothers, 3 fathers) in the primary study and 17 parents in the telephone interviews (two fathers and fifteen mothers). Regrettably, additional demographic information on participants was not reflected and this remains a limitation of the study.

4.4. Study Materials

Turnoff week challenge tracker form. For each day, Monday to Sunday of Turnoff Week, students checked off the statement that best described their day (see Appendix A): I was 100% screen free today; I spent 60 minutes or less using screens today; I spent more than 60 minutes using screens today; I spent 30 minutes or less being physically active today; I spent 30-60 minutes being physically active today; and I spent more than 60 minutes being physically active today. The purpose of this form and the related activities (increasing physical activity and reducing sedentary behaviours) was to provide an enticing mechanism through which to attract students and their parents (in the form of a challenge) and was not intended to be evaluated.

Online Surveys. Using FluidSurveys.com (an online survey tool that allows for extensive personalization of the desired tool and is downloadable into SPSS software) and the e-mail addresses gathered from parents/guardians in the consent form, both groups received an

email containing a pre-test survey and post-test survey to measure behaviour change in physical activity and sedentary behaviours.

Separate surveys for both the adults and children were chosen as children experience cognitive immaturity that makes self-report of physical activity difficult in the young (Medical Research Council, 2011). Furthermore, children's activity is unique in that it is characterized by short bouts rather than more sustained periods of activity (Medical Research Council, 2011). Both surveys took approximately 3 minutes to complete.

Rapid Assessment of Physical Activity Questionnaire. The online survey that the parents/guardians completed was the Rapid Assessment of Physical Activity Questionnaire (RAPA) (see Appendix B). It is an easy to use, brief survey that successfully captures the frequency and type of physical activity adults participate in on a regular basis. It has scored high on levels of validity and reliability (Topolski, LoGerfo, Patrick, Williams, Walwick, & Patrick, 2006). Topolski et al.(2006), compared RAPA to two other self-report physical activity measures, using the Community Healthy Activities Model Program for Seniors (CHAMPS) as the comparison; CHAMPS was chosen as it has been shown to be valid, sensitive and reliable when compared to an objective measure of physical activity (Topolski et al., 2006). RAPA, compared to the other two measures, was the most positively correlated with CHAMPS ($r=0.54$), and demonstrated the same or better on positive (77%) and negative (75%) predictive value, as well as higher sensitivity (81%) (Topolski et al., 2006).

RAPA consists of nine questions that ask participants whether or not they agree with a statement (yes/no reply) about physical activity, such as "I rarely or never do any physical activities" and I do 20 minutes or more a day of vigorous physical activities, 3 or more days a

week” Definitions of light, moderate and vigorous physical activity are provided in the directions.

Physical Activity Questionnaire for Older Children (PAQ-C). The online survey that the students completed was the Physical Activity Questionnaire for Older Children (PAQ-C) (see Appendix C). This is an easy to use and clear survey that assesses children’s activity at home and at school (Appendix C).

It has high internal consistency (standardized Cronbach alpha scores ranging from .72 to .76) and is quite commonly used for students grade 4 to 8 (Janz, Lutuchy, Wenthe, & Levy, 2008). PAQ-C consists of 10 questions (answered by checking the appropriate box) that require children to reflect on their physical activity in the last week outside of school, and at school during recess and lunch hours.

Homework assignments. The two homework assignments (see Appendices D and E) were designed by the researcher utilizing key concepts from social cognitive theory, the theory of planned behaviour and the value expectancy model, such as goal setting and increasing self-efficacy. The assignments were designed to require a small amount of time and require both the student and the parent to actively engage in the assignment. These assignments were reviewed by the researcher’s thesis advisor and any modifications to enhance the questions yet maintain brevity were made. The use of homework assignments in the experimental group was intended to, not only facilitate parental involvement that might benefit the students’ behaviour change, but to also draw from the theories of planned behaviour, social cognitive theory, value expectancy model and ecological models of health behaviour to encourage behaviour change in the parents (see Table 1). The two assignments utilized reflection of the perceived benefits of exercise, goal setting and planning to encourage regular exercise and addressed barriers to exercising regularly

by providing possible solutions. By completing the homework assignments with their children, these activities were intended to facilitate the possibility that the child's enthusiasm and motivation for exercise could have a positive impact on the parent's behaviour and thus provide the possibility of a spread of effects.

4.5. Procedure

Recruitment and sampling. Following approval from Lakehead University's Research Ethics Board, the Waterloo Region District School Board was approached for school board approval. Contact was first made with the Board's research officer (responsible for determining if submitted research projects upheld ethical standards and were of benefit to the school board) to clarify the necessary forms and procedures in order to submit a study proposal for consideration. The participation of six (with a minimum of four) grade five classrooms was requested to participate in the study. The researcher was notified that the proposal had been accepted and consent was granted to contact the schools. The research board had no formal process to follow for recruiting individual schools. The researcher took the list of all the potential elementary schools within the region and randomly assigned them a number. Numbers were then randomly selected using a computer program. The selected number was then matched to its assigned school. Following selection, the researcher made a first point of contact with school principals by phone or e-mail and followed up accordingly with the following package of resources: teacher-principal cover letter (Appendix F) and consent form (Appendix G); parent cover letter (Appendix H), consent forms (Appendices I-J), deception debriefing form (Appendix K) and phone interview questions (Appendix L); and a copy of the study materials: Turnoff Week Challenge Tracker (Appendix A), and the homework assignments (Appendices D-E). If the principal declined participation or contact could not be established after a week and a half,

another school was selected and contacted. Due to the many split grade classes in the Waterloo Region, grade 4/5 or grade 5/6 classes were permitted to participate. This request was made by several principals that consented to participate as they were enthusiastic about offering the challenge to as many of their eligible students as possible. Schools with more than one classroom participating were assigned to the same condition. In total, eight schools agreed to participate.

The researcher arranged a time with each school to speak to the students to present the study to them. These visits lasted approximately 10 minutes in which the researcher explained the study in a language level and style appropriate for the students. The researcher developed a rapport with the children by asking them questions about their screen time and physical activity, moving on to whether they were ‘up for a challenge’. For example, the researcher employed an interactive style to engage students by starting with asking them questions such as, “who here is physical active after school?”, “how many of you spend more than an hour watching TV or on the computer every day?”, “why might people like me want to hold a research study? What does research help us do?”. The researcher told the students that the study measured family physical activity habits. In plain language appropriate for young children, the research explained clearly the three aspects of the study: the overall concept of the Turnoff Week challenge (being more active and spending less time in front of screens), filling out the surveys before and after the week and the possibility of two online homework assignments depending on their group assignment. Students were also told that all participants would be put in a draw to win physical activity related prizes. The researcher had selected prizes, such as skipping ropes and basketballs that would reinforce the positive message of the study to be more physically active. They were informed of the benefits of participating (to advance research knowledge, to help discover how

to improve physical activity levels among Canadians) and that there are no known risks. They were told that they could withdraw at any time for any reason, they could choose to complete only some aspects of the challenge, that the results from their tasks were confidential and would not affect their grades or student records.

The researcher also explained the forms that they needed their parents to sign if they wanted to participate as well as the deadline to return them to their teacher. To ensure comprehension, the researcher used a 'teach-back' method to ask students what the benefits of the study were, what the study involved and what students needed to do if they wanted to participate. At this time, cover letters and informed consent forms (see Appendices B, D and E) were distributed to all the eligible students. Students were instructed to return home with these materials, discuss the study with their parents and obtain a signature from their parent-guardian. A cover letter, two informed consent forms (one for the primary study and one for the phone interviews) were distributed. Both forms requested consent from the participating parent/guardian and their respective child). The researcher reminded the students of the due date for the consent forms (which students brought home to their parents/guardians and then returned them to their teacher) and made arrangements with the schools to pick up the completed consent forms and drop off the appropriate number of Challenge Tracker Forms.

The researcher presented the study and encouraged over 300 eligible students to participate by visiting each school and verbally presenting the study to students. Unfortunately, only 43 student-parent/guardian pairs agreed to participate initially in the primary study and 17 parents/guardians further agreed to participate in the follow-up phone interview. Of the 43 that originally agreed to participate, 28 completed at least one or more measure and one pair requested that their data be withdrawn after being debriefed on the study's true purpose, leaving

27 pairs in total. Any pair that did not complete the first measure was e-mailed a reminder message with a one day extension to encourage them to complete the measure.

Following completion of the study, debriefing forms (see Appendix F) were sent via e-mail and/or delivered via hard copy to the child's teacher, depending on the parent/guardians' preference. The researcher collected all the debriefing forms and dropped off the randomly selected prize winners' thank you gifts at each school. The prizes for students consisted of physical activity related equipment: basketballs, volleyballs, skipping ropes and frisbees. Two draws were also held for parents a thank you for participation: a gift certificate for massage therapy and a trigger point foam roller.

Quantitative Data Collection

The Challenge Tracker Form was administered to the students upon the researcher's second visit to the classrooms. At this time, consent forms were picked up and the corresponding amount of Challenge Tracker Forms were left for the students. Additional forms were left for students that declined to participate in the entire study, but wanted to participate in the challenge aspect (in order to ensure students did not feel left out). Instructions on how to complete the form were given on the researcher's initial visit to the school where the entire study was explained; however the form itself included instructions. The form was to be filled out daily in class, requiring one or two minutes to complete. The tracker form was not used in any data analysis and the students were allowed to keep it.

Child-student pairs were e-mailed the surveys via FluidSurveys.com. The first e-mail with the first set of surveys (one for the student and one for the parent) were sent to the participants the Friday prior to Turnoff Week, required to be completed by midnight on the Sunday before Turnoff Week. This first e-mail included the pairs' unique ID code with which to

complete their surveys. These homework assignments were emailed to the experimental group on the first day of Turnoff Week, also completed using FluidSurveys.com and with the pairs' unique ID code. They took 5-10 minutes each to complete and were to be completed by midnight on the last day of the challenge. The experimental group participants were advised that the homework assignments needed to be completed by the end of Turnoff Week in the first email that they received. One week following the last day of Turnoff Week, participants were e-mailed the final set of surveys (identical to the first set of surveys) and were given to the following Wednesday to complete them.

Qualitative Data Collection.

Telephone interviews. Seventeen telephone interviews took place over four weeks following Turnoff Week at a time that was convenient for the participants (parents/guardians). Participants (n=20) that indicated an interest on the telephone interview consent form were e-mailed ahead of time to set up a date and time for the researcher to call as well as to confirm the best phone number to reach them. In the instance that the research called at the agreed upon time and date and it was no longer convenient for the participant, the interview was rescheduled for a later date. The telephone interviews were conducted after the data collection of the Turnoff Week challenge and after participants had received the study debriefing forms. Therefore, when participants signed the debriefing form they were also consenting to the use of their phone interview data in light of the deception used.

The qualitative data from the telephone interviews were intended to contextualize the quantitative results from the intervention, providing additional insight into the parent-child relationship of influence, the phenomena of spread of effects in physical activity education interventions, mechanisms through which children may affect their parents/guardians' physical

activity level and the possible future role parents might play regarding the physical activity health education that children receive in-school. The intent of the interview questions was two-fold; first, they sought to investigate themes that had been explored previously in the literature and secondly, they sought to ask questions about themes that had received little or none attention in the literature to date. The questions were developed in consultation with the researcher's thesis advisor and the questions and interview script were refined with input from other thesis committee members.

The questions began with a preamble to explain the purpose of the telephone interviews and to remind participants that they could withdraw or refuse to answer questions at any time. Rapport and ice breaking questions were used to ensure the participants felt comfortable speaking with the researcher and to prime them to reflect on the Turnoff Week experience. The researcher followed the interview telephone script (see Appendix L) to the best degree possible but allowed for temporary divergences when it became clear the participant wanted to communicate additional information or ask questions. The respondent's answers were recorded on blank script sheets. Throughout the interviews, participants were asked to clarify key statement and notified when a phrase was made that the research wished to quote and the researcher read that quote to the participant to confirm its accuracy. Immediately following the interviews, the researcher transcribed these to a word document copy. The phone interviews took approximately 10 to 15 minutes to complete.

Two icebreaking questions and five main questions were asked of the interviewees with participants having the opportunity to ask additional questions or make additional comments at any time. As key quotes were presented in the interviews, the researcher employed verification

by respondents (Baxter & Eyles, 1997) by asking participants during the telephone interviews to clarify key statements and repeated back key quotes to participants.

The researcher asked parents about the value they placed on physical activity in their life to help inform whether joint parent-child interventions would be likely to be seen as desirable and beneficial to parents in the future. The literature reviewed had established the efficacy of parental involvement in school-based physical activity interventions but the researcher felt that more information regarding parents' preferred role in these types of interventions was necessary to inform the creation of future interventions. The reviewed studies had also indicated that parents affect their children's level of physical activity but the researcher wanted more qualitative data to explain how this happens, particularly from the parents' perspective, to develop a more complete understanding of a reciprocal parent-child relationship.

Due to the novel nature of the primary research question, whether children affect their parents' level of physical activity, several plausible but previously unexplored concepts were used to develop the following interview questions. Probing participants about a time they were recently physically active with their child was intended to shed light on the types of physical activity parents and children participate jointly in, the frequency with which these activities occur, the perceived enjoyment of these activities and the motivation behind these activities. By inquiring as to the frequency or types of conversations parents currently have with their children regarding school-based physical activity education, the researcher was able to gain insight into how future interventions could be manipulated to enhance the likelihood of a spread of effects. Finally, the direct question of whether parents perceived their children to be affecting their level of physical activity was designed to generate information on the degree to which parents are

conscious of their children's influence, the mechanisms through which children might influence their parents and why parents permitted any influencing actions.

The telephone interviews concluded with the researcher summarizing the key points presented at the end of each interview (Kvale, 2007).

4.6. Data Analysis

Rapid assessment of physical activity and physical activity questionnaire for older children. Both RAPA and PAQ-C responses were scored according to their prescribed scoring system (see Appendices J and K). The raw data for each individual's pre- and post- test survey was downloaded from FluidSurveys.com into Microsoft Office Excel. Following the existing scoring system for both the RAPA and PAQ-C respectively, the formula function in Excel was used to derive a single score for each participant's pre- and post- measure by inserting a formula as per the scoring systems. The two scores for each participant were manually entered into SPSS software for analysis.

Given that the research question was whether any change in the two groups were different, an independent t-test was run to determine if the difference between the two groups was significant. Additional tests that were run included a 2x2 ChiSquare test of independence to determine if there were significant differences in dropout rates in parents between the two groups and a 2x2 between subjects ANOVA to determine the interaction of pre-intervention physical activity levels and dropout rates for both parents and students

Telephone interviews. A thematic network analysis was used to explore the responses of the interviewees and generate concepts that may help explain how children influence their parents' levels of physical activity and through what mechanism spread of intervention effects may occur. Thematic network analyses organize and represent qualitative data into a web-like

map that illustrates prominent themes from the text to facilitate inferences and interpret patterns (Stirling-Attride, 2001). There are three levels of themes present in the network analysis: 1) basic theme (statement of beliefs that contribute to a common idea and contribute to the significance of a super-ordinate theme, 2) organizing theme (middle order theme that consists of clusters of basic themes to summarize principal assumptions and enhance the meaning of a broader theme and 3) global theme (highest level themes that drive the interpretation of the data as a whole) (Stirling-Attride, 2001). To develop a thematic network analysis, the researcher must 1) develop codes and codes the text, 2) identify themes from the coded text, 3) construct the network by starting with basic themes up to the global themes, 4) describe and explore the thematic networks and 5) interpret patterns (Stirling-Attride, 2001).

There are numerous methods and criteria to use to develop codes, they are, however, usually influenced by the theoretical interests guiding the research questions as well as the salient issues that arise in the text (Stirling-Attride, 2001). The researcher first read all of the interviews to become fully engaged in the data (Pope, Ziebold, & Mays, 2000). A thorough review and understanding of all of the data ensures that the subsequent coding identifies themes without losing perspective of their context (Bradley, Curry, & Devers, 2007). Coding the data allowed the researcher to give labels to portions of the documents to identify key concepts while still rooting them in the context from which they were derived (Miles & Huberman, 1994). The researcher used a deductive approach, starting with an organizing framework for the codes, using key topic areas from the interview guide, which represented different areas of theoretical interest (Miles & Huberman, 1994). These initial codes consisted of conceptual codes, which identified key concept domains and the defining features of these concept domains (Bradley, Curry, & Devers, 2007).

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Themes, which represent reoccurring and unifying ideas, evolve from the conceptual codes (Bradley, Curry, & Devers, 2007). Basic level theme development occurred by extracting frequently reported ideas or opinions under each code. The basic level themes were clustered into organizing themes by virtue of their shared, larger issues. For example, when participants were asked about the significance of physical activity in their lifestyles (a code), participants listed many different types of exercise, therefore leading to the basic theme that a variety of physical activities are participated in. Following the identification of all the basic level themes, the researcher reflected on what elements were shared among all the themes in order to create an organizing theme. For instance, under the code of parental influence on participants' child's level of physical activity, two basic themes emerged. The first was that participants felt strongly

they had an influence on their child's level of physical activity and secondly that there were a variety of indirect and direct types of influence that parents exerted. The researcher considered that participants felt their exerted an influence in combination with the methods and techniques of indirect and direct influence they reported using, to arrive at the organizing theme that that parents influence children's physical activity was derived. The global theme was deduced by summarizing the main assertions and arguments from the organizing themes. The global theme acts as the primary claim that the text reflects (Stirling-Attride, 2001). The organizing themes were then reviewed in relation to each other to discover how each theme contributed to a larger, organizing idea. The researcher used each theme to generate a 'story' that reflected the nuance of each organizing theme and culminated into a final, overarching conclusion.

Chapter Five: Results

5.1. Primary Study

Of the 27 participants that completed one or more measures, 15 completed all four measures: parent baseline score (PA1), parent post-intervention score (PA2), student baseline score (ST1) and student post-intervention score (ST2). One-tailed independent t-tests were conducted on participants who completed the before and after measure. For parents, this sample ($N=18$) consisted of 6 control participants (33.3%) and 12 treatment participants (66.6%). For students, this sample ($N=16$), consisted of 5 control participants (31.25%) and 11 treatment participants (68.75%).

The mean scores for each measure are presented in Table 3. Results of the parent survey were scored as sedentary (1), under-active (2), under-active regular-light activities (3), under-active regular (4) or (5) and active (6) or (7) (see Appendix J) Results of the student survey were scored on a scale of (1) to (5), with a score of 1 indicating low physical activity and a score of (5) indicating high physical activity (see Appendix K).

Table 3

Mean Scores of Parent Survey 1, Parent Survey 2, Student Survey 1 and Student Survey 2

Group	PA1	PA2	ST1	ST2
Control	M= 7.00, SD= 2.68 N= 6	M=6.67, SD=2.94 N= 6	M=3.33, SD= .546 N= 5	M=2.97, SD= .315 N=5
Treatment	M= 5.25, SD=1.81 N= 12	M=6.42, SD=2.23 N= 12	M=2.38, SD= .608 N= 11	M=2.58, SD= .537 N=11

To determine changes in physical activity from pre to post intervention in each treatment group, and for parents and students respectively, two, two-way ANOVAs (group by pre-post) were conducted. The interaction term is the direct test of whether the amount of physical activity increased significantly more than the control group. For parents in the experimental group, the interaction term was not statistically significant, $F(1, 16) = 2.82, p = .112$, indicating that parents did not significantly increase their amount of physical activity (Figure 1). For students in the experimental group, the interaction term approached significance, $F(1, 14) = 3.21, p = .095$ (Figure 2). While the results were not statistically significant, it may be worth noting that for both parents and students, the difference in changes was in the anticipated direction of greater increase in activity for those in the treatment condition.

Separate paired t-tests were conducted for each group to determine if the small sample size in the control condition was hiding the effects of the treatment in the treatment group. The increase in activity in the student treatment group was not significant, $t(10) = 1.13, p = .142$ (one-tailed). For the parents, the increase in activity in the treatment group was significant, $t(11) = 2.03, p = .033$ (one tailed), consistent with the spread of effect hypothesis. Caution must be used with interpretation of this finding given that there was not a significant interaction. The student sample showed an unanticipated significant, main effect of group, $F(1, 14) = 7.43, p = 0.16$. The control group (mean = 3.16) showed higher levels of activity than the treatment group (mean = 2.49). This indicates that there were differences in the groups prior to the intervention. Figure 1 and 2 shows that, in fact, the largest difference between the two groups is at pre-test. To explore the possible explanation for this difference of a confounding of fitness level with dropout, a 2X2 ANOVA was run to analyze differences in pre-test activity levels (ST1) among students who dropped out and who did not drop out. The interaction was significant, $F(1, 20) =$

6.13, $p = .022$, revealing different dropout patterns for the experimental and control groups. In the experimental group, students were more likely to drop out if they had high levels of baseline fitness scores. In the control group, students were more likely to drop out if they had low levels of baseline fitness (Figure 3). The same analysis was run for parents and the exact same pattern was evident, although the interaction was not significant for parents (Figure 4). These findings provide an explanation for the significant main effect of group for students. The reason students (Figure 2) and parents (Figure 1) in the control group showed higher fitness scores than the experimental group at baseline was because of these differential dropout rates.

5.2. Telephone Interviews

Overview. The telephone interviews with parents and guardians (N=17) were pivotal in providing rich qualitative data to illuminate possible mechanisms through which children affect their parent's physical activity behaviours, especially in light of the difficulty the researcher faced with participant recruitment, attrition and incomplete data in the primary study. The basic themes demonstrate the variations within each organizing theme and illuminate several perspectives that contribute to the organizing theme (shared overarching concepts) to which they belong. The following section is arranged by the primary topic areas that were presented as well as the basic themes and organizing themes for each topic. The primary themes were: the significance of physical activity in their lifestyle (organizing theme: physical activity barriers), being physically active with their children (organizing theme: parent-child physical activity is enjoyable), discussions between parents and children about in-school physical activity education (organizing theme: conversations facilitate information exchange), perceptions about the ideal role of parental involvement in in-school physical activity health education (organizing theme: joint homework assignments facilitate parental involvement), parental influence on their child's

level of physical activity (organizing theme: parents influence children's physical activity) and child's influence on parent's level of physical activity (organizing theme: children influence parental physical activity). These are also summarized in Table 4 (Summary of Phone Interview Themes and Quotes) at the end of this section and in Figure 5 (Thematic Network Analysis: Bidirectional Parent-Child Influence on Physical Activity). Participants were assigned pseudonyms in order to preserve their anonymity (as stated in the consent letters) when reporting direct quotes.

The significance of physical activity in participants' lifestyle. Five basic themes within the organizing theme, "The significance of physical activity in participants' lifestyle," were observed. The first basic theme was that participants generally described themselves as being currently physically active, with the exception of two interviewees. The second basic theme was the variety of activities participants engaged in, as parents reported participating in structured exercises classes, running, sports and using active transportation (biking or walking) as often as possible. The third basic theme, a positive attitude towards physical activity was reflected in that several participants mentioned that even despite medical conditions, it was important to them to stay physically active; Jill explained that "it's important to me to stay physically active within my physical means". Additionally, participants stated that that they enjoyed physical activity and also commented on the significant psychological benefits it provides them as busy parents and employees; "it keeps me sane," Mia explained, "you get in the zone and just recharge on so many levels." The fourth basic theme was the desire to become more physically active. The fifth basic theme was work schedules and energy levels preventing participants from increasing their physical activity, as almost all participants attributing their physical inactivity to scheduling issues and other time commitments. Melanie commented, "I

would like to be more active but due to my work schedule and low energy levels, I prefer to sit down and relax when I'm not working or taking the kids to activities". Jen agreed that, "sometimes I don't have time [to be physically active] until 9:00pm and by then I'm really tired." These five basic themes culminated to develop the organizing theme that parents experienced barriers to being more physically active.

Being physically active with their children. Two basic themes within, "Being physically active with their children" were evident in the topic of parents being physically active with their children. The first basic theme was that all of the participants had been physically active recently with their child. Activities included walking, biking, Wii Fit games, swimming, hiking and cross country skiing. Active transportation, such as walking to school and biking to the park, walking the family dog and recreational sports played at home (such as basketball) were the activities most frequently engaged in. The second basic theme was that these joint activities were described as being initiated equally by the child and the parent. These basic themes built to the organizing theme that being physically active with their children was an enjoyable, bonding experience. Sarah stated that her and her son started walking to the park when he was young and needed supervision, "...but we continue it for companionship; it's a routine and he actually enjoys when I walk with him." Beth explained that when her children ask to bike or walk to the park, she counters with saying, "why don't we take the long way to the park? This way I get more physical activity in, too. It's more fun for me that way and increases the time we get to spend together being physically active." Beth even gave an example of being so used to walking to the school to pick her children up from school that,

(...) one day I walked to the school in the pouring rain. When I got there, my kids exclaimed ‘why didn’t you use the car?’ It’s such a habit to walk to and from school with them that I completely forgot about the car!”

These basic themes developed into the organizing theme that parent-child physical activity is enjoyable. Parents-guardians participated in both active transportation and structured physical activities with their children because they wanted to bond with their children, spend time together and because it was genuinely enjoyable to be active with their children.

Discussions between parents and children about in-school physical activity education. The first basic theme within, “Discussions between parents and children about in-school physical activity education” that became evident was the inconsistency in the frequency of discussions between parents and children regarding physical activity education provided in school. For example, half of the participants stated having regular conversations with their children about the physical activity education they are learning in school, while the other half stated that those conversations were infrequent or non-existent. Bob stated that he, “never asks [his] daughter and she never brings it up. I’m more interested in modeling active lifestyle choices.” However, Trish commented that “we talk about the importance of physical activity especially after Turnoff Week”.

The second basic theme was that conversations that did occur regarding physical activity education in school focused more on gym class than on broader physical activity education, such as the benefits of physical activity, the amount required, etc. Conversations about gym class focused more on frustrations the children experienced. For example, Kate explained that,

“They do more team building physical activity games versus skill-based games. My son is more active on his recesses than through the formal physical activity program. Even

though my son is exceptionally active, he doesn't get a good mark in gym class because they emphasize teamwork skills over actual fitness levels or skills.”

Similarly, Sarah confirmed that,

“My son feels frustrated about the skills they are learning in school. They are doing remedial, basic work and he's more advanced than that. It doesn't interest or engage him. He also gets frustrated when his teacher isn't consistent, for example there was an activity where she said they had to run the whole time and when other students stopped running, she didn't enforce that. “

Other conversations about gym class had to do with sport-specific skills being taught or accomplishments achieved in gym class.

The third basic theme identified was that parents described conversations regarding physical activity education as being jointly initiated from both parties. Most of the parents asked their children some version of the question, “What is one thing you learned in school today?” daily which often initiates these conversations; however most parents agreed that their child will share initiating the conversation if they are proud of an accomplishment, have questions about what they have learned or are frustrated with school.

The fourth basic theme noted in the interviews was that parents and guardians felt the primary motivation for children to initiate these conversations was to share and ask for clarification.

“They don't talk a lot about the importance of physical activity in school, they teach mostly about nutrition,” Beth explained, “for example, she will come home with questions about her nutrition homework and ask, ‘This is what we learned in school, is that true?’ It can be tough when I don't agree with what they are teaching exactly.”

Amanda echoed these sentiments, explaining how once,

My daughter was learning about nutrition labels in school and came home to ask me why we weren't buying a certain kind of potato, which I explained was because of the MSG. I was able to use this opportunity to teach her about healthy choices as a result of what she learned in school.

Natasha commented that "my son has learned it's important to be active, but doesn't have any specific knowledge as to how often to exercise or why, besides that it's 'healthy'"

The final basic theme that materialized was that parents are generally pleased to discover the information their children are learning in school are the same messages they are reinforcing at home. Heather exemplified this by expanding on what her daughter learned in school and talking about the significance of what she learned in school, "we talk about the concepts she learns and apply them to our family context. I'll say, 'See? This is why I don't let you eat potato chips every day.'" Jill commented that, "the information is personally useful to me insofar that it starts conversations with my daughter and provides teaching opportunities. Also, it confirms that what she, my daughter, is learning at home is correct."

These five basic themes built to the organizing theme that conversations facilitate information exchange.

Perceptions about the ideal role of parental involvement in in-school physical activity health education. The first basic theme evident within, "Perceptions about the ideal role of parenting involvement in in-school physical activity health education" was that physical health education being taught in-school and at home should be complementary. The majority of parents agreed that the main role of parents should be to complement at home the physical activity education that their children learn in school. The direction in which this should happen

varied. For example, while some parents made comments similar to “Jill’s that, “in-school education should reinforce what kids are learning at home” and “education should start at home and be enhanced by the school system” (Amanda) others such as Pam stated that, “parents should support at home what’s being taught in school”. Natasha made the comment that, “I am a believer in leading by example but love it when he brings home things from school and we can discuss it together. I like that he gets that time for independent learning at school.”

The second basic theme that arose was the receptiveness of parents/guardians to physical activity related homework assignments to be completed jointly with their child. The majority of parents stated they were receptive to the idea of joint homework pieces delivered through the curriculum, such as the ones used in this study. Derek commented that,

The homework pieces opened up new ideas for us to be active together and it helped us think of new activities to do together. I think doing these types of homework activities are much more likely to increase compliance then just telling people to be more active...these actually make you stop and think about how active your family is or isn't and give you strategies to be more active.

Sarah concurred, “to have projects parents and kids can do together would keep families connected as to the status of their child’s physical activity level.” Jen added that, “I think that’s really important, the more we talk about it, the more he thinks it’s a priority”.

The third basic theme was that homework assignments were viewed as “provid[ing] a more meaningful way to facilitate conversations about being more physically active together” (Beth). Ideally, these homework pieces would occur no more than four or five times a year as parents felt they could be time intensive. Another idea several participants mentioned was workshops several times a year where children and parents could be involved in learning about

physical activity together in an interactive setting. The fourth basic theme provides the counter perspective to the third in that some participants held negative perceptions about the intent of and practicality of homework assignments. Those that did not like the idea of homework activities or workshops felt so because, “it’s a good idea for other families that are less active, I can see value in that, but we are already active so I don’t see how it would help us” (Heather) and that, “homework activities or workshops are nice in theory but there would be parental resistance from a time perspective” (Laura). Additionally, Nora preferred that, “homework would be on mathematics or other subjects”. Bob felt strongly that they wouldn’t appreciate the,

Coercive nature of those kinds of activities, telling us when and how we are supposed to teach our children about the importance of physical activity. Schools should be teaching kids skills and knowledge but it’s the parents’ role to teach values and beliefs. How we raise them is our decision.

The fifth basic theme surfaced organically, as parents were not asked specific questions regarding the nature of physical activity programming within the school environment, several parents communicated negative perceptions about the nature of physical activity programming within the schools. Sarah commented that “schools are not doing a good job of physical activity” and that “health-related education “shouldn’t scold or belittle parents”, offering the example of children learning in school that tea and coffee can be addictive and having to explain to her son why she drinks coffee, making her look bad in front of her own child.

These five basic themes laid the foundation for the organizing theme that joint homework assignments facilitate parental involvement.

Parental influence on participants’ child’s level of physical activity. Two basic themes emerged from within, “Parental influence on participants’ child’s level of physical

activity". The first was that all participants felt strongly that they had an influence on their child's level of physical activity. The second basic theme was the variety of indirect and direct types of influence that parents exerted. Methods of influence ranged from encouragement, monitoring TV use ("I will turn off the TV and urge her to go do something physically active"-Jill), family discussions about the importance of physical activity ("we talk about physical activity and health as a family often. I don't make them do anything but we discuss the options etc. More often than not, my son will choose to be active"-Sarah), and enrolling them in physically active extra-curricular activities, mandatory enrolment in certain activities (ie. swimming lessons), family rules surrounding time and length of permitted screen time (for example, one family allows recreational TV watching only on weekends). Of those participants that frequently turned off the TV and encouraged their children to go do something active, most of them said they will also go and do the activity with their child to help encourage them and to role model good behaviours. Several participants also commented that the overall environment their child is raised in influences their level of physical activity, with Kate stating that "we don't provide the opportunities for our kids to be inactive" and another referred to rules about TV-use that prevent excess sedentary behaviours. Kate also explained the role of the community in facilitating her son's level of physical activity, explaining that, "our community plays a big role in his activity levels...all the kids here play out on the street until late at night and all the parents are okay with that and encourage it...so it helps reinforce what we are teaching him and gives him friends to be active with". From these two basic themes, the organizing theme that that parents influence children's physical activity was derived.

Child's influence on parent's level of physical activity. Within, "Child's influence on parent's level of physical activity," the first basic theme was that children influence parent's

levels of physical activity by asking their parents to engage in an activity with them. All but one participant felt that their children influence their level of physical activity; as one participant put it, “having kids makes you more active” (Beth). This is primarily achieved by the children asking their parents to do an activity with them and their parents agreeing to participate. Parents that agreed to participate in their child’s request did so because they wanted to support their child’s interest in physical activity; as Beth said, “we value physical activity and time together as a family so we follow their initiative”. Laura even explained that, “even though I’m sore today from yesterday’s boot camp, too sore to really exercise, I will probably still go swimming with her today because I know she’ll ask me to”. Derek cited a domino effect, where participating in physical activity with her daughter leads to more of that over time, “for example, she’ll be excited about going for a bike ride and that will spur us on to go with her and do more activities like that with her because she’s asking for them and we both enjoy them.”

The second basic theme was that it is possible that until asked directly, most parents may not be consciously aware of the level of influence their child has on their level of physical activity, for as Heather mentioned, “[they have an influence on me] to a degree. We do a lot of family activities together. I guess you could say that the desire to get them active does influence the types and frequency of activities we choose, if you want to look at it that way.” After some consideration, Sarah acknowledged that, “so often adults learn from their kids, so it makes sense we could learn to be more active from them”.

The third basic theme is that parents feel their children have a positive effect on their own levels of physical activity. Kate gave an example of joining a, “moms and kids boot camp”. She explained that,

I wouldn't have joined normally, but my friends were doing it with their kids and my son wanted to do it. We have a lot of fun. It's a friendly competitive environment and something active we can do together and both benefit from.

Kate also later remarked that, "there are not many opportunities out there to be active with your kids". The comment was also made by one participant that their children had exposed them to new physical activities that they ended up enjoying and participating in regularly; "I totally agree kids influence parents' level of physical activity...my son exposed my husband to snowboarding and now they do it together all the time." Sarah explained her son positively affects her physical activity level, "because it's a more enjoyable way for me to get active and kill two birds with one stone". Susan stated that "to get him moving I know I must also get moving to lead by example" and while Natasha acknowledged that "I know to keep up with him I need to stay fit". Engaging in physical activity with their children was seen as an enjoyable and rewarding experience by all participants. Consequently, the organizing theme is that children influence parental physical activity (for children and parents that participated in the study).

Global theme. The global theme was derived from the influence of the six organizing themes. The organizing themes were examined as a whole to identify common elements among the themes that contributed to an underpinning concept that emerged from the text. The assertion of each organizing theme was compared to the remaining organizing themes to illuminate relationships, linkages, and commonality. The organizing themes established that parents experience barriers (such as time restraints) to becoming more physically active such as time. Given that parent-child physical activity was viewed as enjoyable, shifting the focus to participating in physical activity together might overcome the restraints of time that parents experience in attempting to increase their physical activity on top of their work and family

responsibilities. Furthermore, since both parents and children can affect each other's level of physical activity, devising opportunities for them to do so could improve physical activity outcomes in both parents and children. Considering that joint homework assignments facilitate parental involvement in a child's physical activity and that conversations facilitate information exchange, an emphasis on opportunities for parents and children to share knowledge and be active together may further leverage that bidirectional influence. Therefore, the global theme followed that opportunities for joint parent-child physical activity could enhance physical activity outcomes.

Chapter Six: Discussion

The purpose of this study was to explore whether children's physical activity levels could have a spread of effects to their parent's physical activity levels and therefore increase their parent's level of physical activity. This was achieved by the primary study design which manipulated parental involvement in their child's physical activity via joint homework activities related to physical activity, as well as follow-up phone interviews to gain greater insight into possible relationships of reciprocal influence between children and their parents in respect to physical activity levels.

The findings of this thesis indicated that children may affect their parents' level of physical activity. The primary analysis revealed that, while not statistically significant, parents in the experimental group demonstrated greater levels of physical activity after the intervention than those in the control group. The dropout patterns from the primary study suggest that parents and students with lower levels of baseline physical activity scores were more likely to drop out of the experimental group and parents and students were more likely to drop out of the control group if they had high levels of baseline physical activity scores.

The telephone interviews revealed that parents do feel their children affect their level of physical activity as well as the types of activities in which they participate. This was primarily achieved by children requesting that their parents participate in an activity with them and parents agreeing to because they wanted to support their child's initiative to be more active and because they find those activities enjoyable. The majority of parents felt positively towards the idea of children bringing home physical activity homework assignments that required parental participation several times a year as a way to be involved with and to support their child's learning. Only half of the parents reported having conversations with their child about what they

learned in school related to physical activity. The majority of parents wished to be more physically active but cited time and scheduling issues as a barrier.

6.1. Primary Analysis

The observation that parents in the experimental group demonstrated greater levels of physical activity may suggest that a spread of effects occurred. The small sample size may have impacted the fact that the findings were not statistically significant. However, the responses from the phone interviews that acknowledge that their children affect their level of physical activity provided support that a spread of effects may have indeed occurred.

Parents and students in the experimental group were more likely to drop out of the study if they had low levels of physical activity prior to the intervention. Craig, Cameron, Russell, and Beaulieu (2001) identified the primary reasons Canadian adults and children remained physically inactive. Inactive Canadian adults identified feeling as though they did not have the necessary skills or abilities to become more physically active as barriers to increasing their physical activity (Craig et al, 2001). Adults also cited reasons such as: feeling self-conscious, lack of child friendly facilities, unable to get to recreation facilities, cost of activities, and inconvenience of program offering times (Craig et al., 2001).

Canadian children had similar reasons for remaining physically inactive. When parents were asked why their kids were inactive, they responded that their children felt they were not skilled or fit enough; parents did not have enough information on affordable, convenient and local programs for their kids, insufficient opportunities to engage in activity as a family and a lack of social support (Craig et al., 2001). It is plausible that participants that entered the intervention with already low physical activity had not overcome these types of barriers to

becoming more physically active (or they would have had a higher level of baseline physical activity) needed additional support not provided in the challenge in order to prevent dropout.

Turnoff Week likely ran for an insufficient amount of time in which to address these perceived barriers and concerns for parents and students. Participants would have benefited from more time to prepare to be physically active and to adequately address the perceived barriers to becoming more active. Additionally, less physically active adults and children may have stayed in the study if the materials had addressed the above barriers by emphasizing active transportation and cost-free activities, providing resources on free local programs (especially family-oriented programs to relieve the concern of kid-friendly activities), promoted activities that could be easily incorporated into daily life and completed at home, and provided suggestions for improving social support (Craig et al., 2001). To this end, Turnoff Week focused primarily on behaviour change at the individual level and local environment (classroom and family setting) but was unable to address more systemic barriers that adults and children face in becoming more physically active.

Parents and students with higher levels of baseline fitness measures were more likely to drop out of the control group than parents or students with lower levels of baseline fitness measures. Rogers (1983)'s Protection Motivation Theory (PMT) may shed light on why participants who are already physically active were more likely to drop out of Turnoff Week. PMT states that protection motivation encompasses the processes an individual undergoes that direct, mould and maintain their activity; specifically, the individual performs two types of self-appraisal (Maddux & Rogers, 1983). The first is a threat appraisal, in which an individual weighs how much they fear an undesirable state with how vulnerable they perceive themselves to be to it (for example, disease) (Maddux & Rogers, 1983). The greater they perceive the threat to

be, the more motivated they will be to engage in behaviour to protect themselves from that state, (Maddux & Rogers, 1983). The second appraisal is a coping appraisal, in which the individual determines how well they believe they can respond to the threat with the cost of responding (Maddux & Rogers, 1983). Individuals that perceive the response cost to be low and their ability to respond to the threat as high, are more likely to engage in a response to cope with the threat (Maddux & Rogers, 1983). Participants who were more physically active may have been more likely to drop out of the control group because they did not perceive themselves to be vulnerable to the negative consequences of a sedentary lifestyle (Maddux & Rogers, 1983). Additionally, the cost response of continuing to participate in the study, which may have been viewed as offering little extra value because they were not engaging in the interactive goal planning and reflective homework activities the experimental group was, might have been viewed as greater than the benefit of staying engaged in the study.

Gollwitzer (1993) presented a volition intentions theory that also might be useful for explaining why currently physically active participants were more likely to drop out of the control group. Volition intentions theory states that motivation itself is insufficient to cause behaviour change (Gollwitzer, 1993). Instead, individuals need to pass through two stages to move from motivation to behaviour change. The first stage challenges an individual's motivation; a cost-benefit analysis of performing the behaviour is completed; if the benefits outweigh the costs, the individual develops intent to perform the behaviour (Gollwitzer, 1993). The second stage requires volition; an individual creates tactics to ensure their intention will transpire into action (Gollwitzer, 1993). Therefore, volitional intention theories explain that individuals typically perform behaviours that they have developed the motivation and strategies to act on (Gollwitzer, 1993). Physically active parents and students entering the Turnoff Week

Challenge may have been insufficiently motivated to perform the behaviour of even greater levels of physical activity and less sedentary time as the costs of which may have outweighed the benefits and represented diminishing returns. Even if they were motivated, they did not benefit from the homework assignments that the experimental group did, and thus the opportunity to create strategies and plans to enact that motivation.

Protection Motivation Theory, in addition to volitional intention theories, offers a more complete explanation as to why motivating already active people to stay in a physical activity intervention requires different considerations than inactive participants. Milne, Orbell and Sheeran (2000) used both PMT and a volitional implementation intention intervention to influence physical activity behaviour (n= 248) in their longitudinal study. The use of both theories substantially regulated physical activity behaviour (Milne et al., 2000). The authors concluded that health behaviour change interventions should focus on increasing both motivation and volition in participants (Milne et al., 2000).

Turnoff Week, due to the short nature of the intervention, was also unable to accommodate the various stages of change participants might have been in with regards to becoming more physically active. The Transtheoretical Model (TTM) presents a staged model to explain how individuals prepare to change their behaviour (Prochaska & Velicer, 1997). The TTM has found to be useful in assessing how prepared a person is to become more physically active as well as the decision making processes to become more physically active that occur at each stage (Rhodes & Pfaeffli, 2010). The TTM consists of four foundational elements: 1) stage of change 2) self-efficacy 3) decisional balance to engage or not engage in the behaviour and 4) the process of changing behaviour (Prochaska & Velicer, 1997). While Turnoff Week strived to influence self-efficacy, it did little to address the other three constructs. The five stages of

change in TTM are 1) pre-contemplation (consideration but not intention to change behaviours), 2) contemplation (intention to change within six months), 3) preparation (small, infrequent changes), 4) action (demonstrating the behaviour for less than six months), and 5) maintenance (sustained behaviour change for six months or greater (Prochaska & Velicer, 1997). TTM acknowledges that progress through the stages is not linear; an individual may move forwards and backwards through the stages several times before being able to sustain the end goal behaviour (Prochaska & Velicer, 1997). Furthermore, TTM recognizes that individuals have different stage-specific needs; as such, strategies to ensure their progress need to be stage-specific (Prochaska & Velicer, 1997). TTM implies that a broad, general approach to increasing physical activity in a group of participants might have reduced effectiveness if the individuals are at different stages of change. Therefore, physical activity interventions based on TTM necessitate that flexibility and customization to the unique needs of the individual be made available to participants in order to improve adoption of increased physical activity.

6.2. Telephone Interviews

Six organizing themes emerged from the telephone interviews with parents: 1) physical activity barriers; 2) parent-child physical activity is enjoyable; 3) conversations facilitate information exchange 4) joint homework assignments facilitate parental involvement 5) parents influence children's physical activity and 6) children influence parental physical activity. These organizing themes led to the global theme opportunities for joint parent-child physical activity could enhance physical activity outcomes. It became evident that parents and children have the ability to influence each other's level of physical activity. Parents influence their children through direct methods (such as turning off the TV and enforcing physical activity) and indirect methods (through encouragement and conversations about the importance of physical activity).

Children primarily influence their parents by simply asking them to participate in an activity with them and parents agreed to in order to support them. Underlying this bidirectional influence was the parents' genuine desire to support and improve the health of their children and the enjoyment of being physically active together. The value parents place on improving the health of their children and spending time together being physically active could be leveraged as a mechanism to overcome the barriers of time parents experience in being physically active on top of their daily responsibilities. Being physically active with their children could positively influence both parties, create an enjoyable experience and save time for parents.

Furthermore, the advantages of jointly participating in activities together are also realized in joint homework assignments and conversations surrounding the importance of physical activity. These activities and conversations were found to stimulate knowledge exchange surrounding physical activity behaviours which could complement bidirectional parent-child influence. By shifting the focus to targeting parents and children separately in physical activity interventions to targeting them as family units, interventions may benefit from taking advantage of the naturally occurring way in which they affect each other's physical activity.

The interest parents expressed in participating in joint homework assignments with their children as part of the curriculum several times a year suggests that enhancing the current curriculum to include these types of activities could be beneficial to children and parents. In the primary analysis students and parents in the experimental group that completed the homework assignments demonstrated greater positive changes in physical activity scores post-intervention. In the phone interviews, parents commented that these homework assignments were teaching opportunities and enjoyed the opportunity to discuss and reinforce behaviours with their children that these assignments offered. Conversely, because parents acknowledged that their children

affect their levels of physical activity by requesting parents to participate in an activity with them, these sorts of assignments could offer a launching pad to facilitate more parent-child physical activity and consequently enhance parents' levels of physical activity. In line with the phone interviews, these homework assignments would need to be realistic, not too time intensive and spread out periodically throughout the school year. As only half of the participants reported having conversations with their children about what they are learning in school related to physical activity, these homework assignments offer a viable mechanism to encourage discussion and teaching opportunities for parents, as well as create an opportunity for parents to learn themselves. Lippevelde et al.'s (2011) focus group research in four countries to gain insight into the determinants of and perspectives of parental participation in school-based obesity prevention interventions reinforce the desirability of joint homework assignments. Ninety-two parents of ten to twelve year-old children participated. Lippevelde et al. (2011) found that parents preferred to be engaged in school-based interventions in interactive ways, such as participating in physical activity and sport together or attending nutrition workshops. At home or in-school joint activities need to be inexpensive, flexible and convenient, focused on the children and activity based (Lippevelde et al., 2011).

Shifting the focus away from targeting parents exclusively and towards emphasizing the importance of increasing participating in physical activity collectively as a family could be beneficial for parents and children. The telephone interviews with parents emphasized that parents are likely to participate in physical activity with their child as a means of supporting their interests and as an enjoyable way to spend time together. As time and energy to participate in physical activity outside of parental duties were cited as the primary barriers to increasing physical activity, shifting the public health focus to family-based physical activity programs

could alleviate those barriers. By reducing barriers to becoming more physically active and taking advantage of the influence children have on their parent's level of physical activity simply by requesting their participation, designing and marketing family oriented fitness programs and strategies to be especially attractive to children could influence uptake of physical activity interventions.

Epstein, Valoski, Wing, and McCurley (1994) also found empirical support that jointly engaging children and parents to be more physically active improves health outcomes. In a longitudinal study, children and at least one parent were randomly (children n=158, mothers, n=152, fathers, n=152) assigned to one of three groups: parents and child were both targeted for weight loss, only the child was targeted for weight loss, or no specific target. Epstein et al. (1994) found that the BMI scores of participants in the child and parent group decreased significantly more than scores in no specific target group after five and ten years respectively and significantly greater decreases than the child-only targeted group after five years. The authors concluded that these findings emphasize that treating both parents and children within the family is a more effective way to reduce BMI scores in adults and children (Epstein et al., 1994). Not only might more family-oriented physical activity programming reduce barriers for parents increasing their physical activity and provide an enjoyable bonding opportunity with their children, but shifting programs to target both children and parents might result in better outcomes in terms of increasing physical activity and decreasing BMI scores.

6.3. Validity/Trustworthiness of Qualitative Findings

To ensure reliability in qualitative research (the quality of the findings that influence the degree to which they can generate understanding), a consideration of the trustworthiness of the findings is crucial (Golafshani, 2003). There are strengths in the methods used to obtain and

analyze the qualitative data that improve the trustworthiness and validity of findings. The researcher used multiple participants as a method of data triangulation (Patton, 2002). The use of multiple participants enhances the generalizability of the findings by avoiding over-emphasizing any one participant's experiences and introspection (Patton, 2002). Furthermore, using the telephone to conduct the interviews, instead of in person, may have helped to reduce response bias (Marcus & Crane, 1986). For example, participants of in person interviews may be affected by the facial expressions or gestures of the research or simply want to give answers they feel are expected of them (Marcus & Crane, 1986). Additionally, the detachedness and pseudo anonymity of a telephone interview may encourage participants to be more honest in their responses (Sturges & Hanrahan, 2004). Finally, the researcher attempted to eliminate researcher bias in the presentation of the results by presenting numerous direct quotes from the original data in the form of quotes directly preceding the subsequent interpretation (Mays & Pope, 1995) to allow the researcher's inference of the raw data to be as clear as possible

However, several strategies that were not employed might have increased the validity and trustworthiness of the findings. Using respondent validation by having the participants review their entire responses would have contributed to the quality of the data by ensuring the researcher accurately recorded and comprehended the intent and meaning behind their responses (Pope Zeibland & Mays, 2000). The researcher sensed, based on the effort and persistence it took to arrange a time with participants for the phone interview that participants would not have been receptive to another point of contact, especially in light of the numerous e-mails sent to them through the primary study. Additionally, presenting the initial findings to the study participants may have enriched the quality of the findings by allowing study participants' reactions to the analysis to be interwoven into the final study findings (Mays & Pope, 2000). Other possible

methods that could have increased the reliability of the findings were audiorecording the interviews and using qualitative data analysis software to ensure a systematic analysis of the data (Seale & Silverman, 1997). Unfortunately, the researcher had not received training in using qualitative data analysis software.

6.4. Participant Recruitment and Attrition

The researcher faced two challenges: participant recruitment and attrition. Participant recruitment was challenging as it involved two levels of participation; both the parent and child had to be willing to participate. Although many children seemed interested and enthusiastic upon the researcher's visit to the classroom, it was common for them to ask whether all participants would receive a prize. In this case, this study likely appealed more to children that were intrinsically motivated by the proposition of a personal challenge and less to children that were motivated more by the reward of prizes (because of the absence of a guaranteed prize). In some instances, upon being informed that they would be put into a draw for prizes, but that participating would not guarantee them a prize, children indicated they would not participate. It is doubtful that, given the established influence of children on their parents, that disinterested children communicated a desire to participate to parents and/or influenced their parents positively to participate. It is also plausible that some families participated in the Turnoff Week Challenge unofficially, and were disinterested in participating in the surveys or phone interviews. Some teachers confirmed that some children were challenging themselves to be screen-free even though they had not received a consent form from their parents to participate in the formal study. It is also possible that children were excited about participating but that their parents chose not to participate. This may have been due to the focus of the study itself (reducing screen time and increasing physical activity) or simply a disinterest in making the commitment required for

participation. It would be worthwhile to investigate in the future which factors made a child-parent pair more or less likely to participate in a study similar to this one.

Parent and student attrition during the primary study could have largely been a reflection of the number of points of participation required. If the study had been reduced in the number of participation actions required (for example, one homework assignment instead of two) and the span over which the participation was required (for example, a one-day measurement), it would have probably seemed more attractive and less daunting to current or prospective participants. Compounded with the lack of extrinsic incentive (the study was not a mandatory part of the curriculum, nor did it guarantee a reward), the amount of effort required to participate could have been seen as greater than the rewards of participation.

It is interesting to note that nearly all of parents/guardians that indicated they would be interested in participating in a telephone interview, as long as they completed at least one of the initial measurements, followed through with being willing to arrange for and complete a telephone interview with the researcher. All of the parents/guardians that participated in a phone interview were enthusiastic and interested in giving their perspectives. This may indicate a preferred mode of study involvement for parents - allowing participants opportunities to relate perspectives and discuss concepts in-depth as opposed to being limited to completing closed-ended surveys. The telephone interview was a one-time data collection session and unlike the primary analysis, allowed parents/guardians to speak passionately about their own experiences, beliefs and children. It is conceivable that the parents/guardians that agreed to participate in the phone interview were already highly engaged with their children and therefore more likely to be influenced by their children's physical activity and interested in participating in physically active

activities with them. If this was the case, the findings from the phone interviews could have been over-exaggerated.

6.5. Limitations

Difficulties in recruitment, small sample size and participation attrition were the primary barriers faced by the researcher. Small sample size reduces the researcher's confidence in the accuracy or generalizability of the results as a small sample size can have insufficient power to conclude that the results did not occur by chance alone. Furthermore, larger sample sizes can illuminate differences more clearly among individual participants and therefore enrich the subsequent analysis of the results. Larger, greater scale interventions with more time and financial resources to recruit and provide incentives for participation would likely overcome this in the future. The failure to collect demographic information on participants was also a limitation of the study as it prevented generalizability or the ability to identify trends and relationships associated with age or socioeconomic status, for example. Finally, due to self-selected participation, the composition of the sample is a limitation; few fathers and sons participated in the study, so it is uncertain whether the findings can be generalized to parent-children relationships on the whole, or whether a spread of effects is more characteristic in relationships where at least one member is female.

Additionally, identifying more efficient recruitment techniques (such as a more direct way to reach parents) and reducing the amount of necessary measures to complete would assist a future iteration of Turnoff Week to be exceptionally more successful. Finally, it should be noted that one day during Turnoff Week was a snow-day in the Waterloo Region, which may have posed an unexpected barrier to encouraging participants to reduce screen time and increase physical activity.

A final interesting limitation is that the spread of effects observed only extends to reported physical activity, not necessarily actual physical activity. A future study that assessed whether a spread of effects occurred in objective measures of physical activity would provide greater insight into the phenomenon.

6.6. Delimitations

This study can only be generalized to children in grades four to six. Additionally, socioeconomic class was not controlled for, given the difficulty in recruitment and the exploratory framework of this initial study. However, Waterloo Region has many rural schools in which children come from farm homes and/or have a religious or cultural way of life that promotes physical activity and discourages electronic use (for example, there are large Mennonite communities). Schools in these communities were specifically not included for possible recruitment as the already active way of life and in some cases absence of screen products would have posed a large confounding factor to determining the efficacy of the intervention.

6.7. Strengths

The primary strength of this study was its exploration of a still rather novel concept of “spread of effects” within a health promotion context. By adopting a mixed methods approach and using survey data supplemented with telephone interviews, information that either a purely quantitative or qualitative methodology study would not have captured was illuminated. Furthermore, the conclusions drawn from the methodology could contribute to current theories and inform future theories of how children influence their parents’ physical activity behaviour and established the importance of exploring this theoretical framework further in future studies.

6.8. Conclusion

The findings of this thesis supported the concept that children do influence their parents' level and frequency of physical activity. Children primarily influenced their parents' level of physical activity by requesting that they engage in physical activity with them and parents report enjoying participating in these activities with their children. The primary study also supported the idea that school-based physical activity interventions that involve parents may have a positive impact on the parents' level of physical activity. However, it should be reiterated that due to the nature of participation in the study (self-selection), there is likely to be bias in the presented results. For example, the mean scores of self-reported physical activity among parents were quite high. This may suggest that already fairly physically active parents agreed to participate in the study. This represents a significant caution in interpreting and generalizing the results among all parents and guardians.

Of the previously discussed theoretical frameworks, two appear most relevant in understanding the findings of this study: the Value Expectancy Model and ecological models of health behaviours. The Value Expectancy Model emphasizes the necessity of attainment value (Bagozzi et al., 2003); students and parents with insufficient value of the behaviour of increasing physical activity would not necessarily have been enticed to participate in the study. Without attainment value, the skills of goal setting or self-efficacy may not be relevant as people do not typically set goals and strive to improve confidence in achieving them for behaviours or actions they don't value (Bandura, 2004). Furthermore, those that placed little value in the importance of completing all aspects of the study may have been unlikely to be motivated to do so (Bagozzi et al., 2003). An absence of attainment value may have been compounded by other significant

influences, such as the participants' priorities, cultural norms and the participation (or lack thereof) of their peers (Eccles et al., 2011).

The importance placed on physical activity is also a result of the social environment, as per ecological models of health behaviours (Sallis et al., 2008). While the researcher attempted to influence the school environment, the literature supports the need to also truly affect the interpersonal, organizational, community, policy and physical environment in order to truly impact physical activity behaviour (Sallis et al., 2008). For example, spearheading this as a school-wide initiative by integrating it into the curriculum might enhance the uptake from this type of intervention. Greater endorsement from the schools and the community at large may have significantly assisted in improving recruitment and alleviating attrition issues.

6.9. Future Directions

Based on the results of this study, there is a need for future research and public health professionals to explore the merits and outcomes of shifting the emphasis of public health programs from targeting children and adults separately to targeting children and parents as a family. Implementing family-based programming could offer an enjoyable and realistic solution to increasing the physical activity of parents (and perhaps obesity rates) that overcomes the perceived barriers of time and other commitments. The implementation of such programs should involve a greater stage-specific analysis of each individual's or family's readiness to change in order to be as effective as possible. Future interventions should control for socioeconomic class, be targeted at a wider range of school grades and should attempt to test which theoretical models of health behaviour best explain the factors impacting children influencing their parents' level of physical activity in order to leverage those factors in future iterations of such programs.

The Ontario school board should also investigate enhancing the current physical activity curriculum with homework assignments every quarter that require parental involvement. These assignments must not be too time or resource intensive and should create an opportunity for parents and children to participate in physical activity together and learn more about how to set goals and implement strategies to become more active as a family.

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Table 1

Turnoff Week Theoretical Framework

Activity	Activity overview	Behaviour change theory (if applicable)	Specific constructs
Parent or guardian and child pairing, within the context of a social environment (school)	Students participate with one parent or guardian Participation happens in school	Ecological Model of Health Behaviour	Intervention happens at several levels: individual, family and school level
Turnoff Week Challenge	Refrain from using any form of screen (television, computer, hand held game devices) except for homework related activities	Theory of Planned Behaviour	Perceived behavioural control Subjective norms (awareness of peers' participation)
Turnoff Week Challenge Tracker Form	For 7 days, record (using a checkmark in the appropriate column) to track daily screen time and also amount of physical activity accumulated	Theory of Planned Behaviour	Perceived behavioural control
Homework Activity 1: The Importance of Physical Activity		Social Cognitive Theory	Goal setting (preamble, overarching throughout) Outcome expectations (preamble, question 4 and question 8) Self-efficacy (preamble, question 2, 3, 6, 7)
Homework Activity 2: Let's get Physically Active!		Value Expectancy Model	Attainment value (preamble, question 5)
		Theory of Planned Behaviour	Perceived behavioural control (preamble) Subjective norms (preamble, question 5) Positive attitudes (preamble, question 2, 4)

Table 2¹*Program Objectives*

Target Population	Determinants					
	Behavioural, Environmental and Learning Change Objectives	Self-Efficacy	Outcome Expectations	Goal- Setting	Attainment Value	Time
Parents/guardians in experimental group	Behavioural: Increase PA score from pre- to post -measure Environmental: Social environment encourages increased PA and reduced ST behaviours in the family unit. Learning: Increase knowledge of importance of PA as well as value it.	Feels confident they can achieve or work towards achieving 150 minutes of PA/ week.	Expects increasing PA will provide physical and emotional benefits.	Develops SMART goals to increase PA over the upcoming week (homework activity one).	Values the goal of working towards achieving 150 minutes of PA/week.	Perceives there is adequate time for 150 minutes of PA/week.
All students	Behavioural: Increase PA score in post-measure from pre-measure. Environmental: Increased PA and decreased ST behaviours within the classroom. Learning: Will learn that reducing ST behaviours is a realistic and achievable goal.	Feels confident they can achieve or work towards reducing ST and increasing PA.	Expects that increasing PA will provide physical and emotional benefits, as well as be fun and enjoyable.	Experimental group only: Develops SMART goals to increase physical activity over the upcoming week (homework activity one)	Experimental group only: Values the goal of working towards achieving 60 minutes of physical activity a day and reducing screen time behaviours.	Experimental group only Perceives there is adequate time to be physically active for 60 minutes a day.

¹PA= Physical activity; ST= Screen time; SMART= Specific, measurable, attainable, realistic, time-oriented

Table 4

Summary of Phone Interview Themes and Quotes

Organizing Theme	Basic Themes	Participant Quotes
Physical activity barriers	<ul style="list-style-type: none"> • Parents were generally physically active • Participate in a variety of types of exercise and physical activities • Positive attitude towards physical activity • Parents want to be more physically active • Work schedules and low energy are a barrier to being more physically active 	<ul style="list-style-type: none"> • “I try to walk and be active daily. However, I know I could exercise in higher strenuous activity and more often. Time seems to be the biggest barrier.”
Parent-child physical activity is enjoyable	<ul style="list-style-type: none"> • All of the participants had been physically active recently with their child • Activities were initiated equally by the child or the parent 	<ul style="list-style-type: none"> • “Why don’t we take the long way to the park? This way I get more physical activity in, too. It’s more fun for me that way and increases the time we get to spend together being physically active.”
Conversations facilitate information exchange	<ul style="list-style-type: none"> • Conversations between parents and children regarding physical activity education are inconsistent in frequency • Conversations about physical activity education focus on gym class rather than education of importance of physical activity • Conversations are initiated equally from both parties • Children initiate conversations to share information and ask for clarification 	<ul style="list-style-type: none"> • “My daughter was learning about nutrition labels in school and came home to ask me why we weren’t buying a certain kind of potato, which I explained was because of the MSG. I was able to use this opportunity to teach her about healthy choices as a result of what she learned in school.”
	<ul style="list-style-type: none"> • Parents are pleased that 	

children are learning health-related messages in school that are similar to the ones they teach at home

Joint homework assignments facilitate parental involvement

- Physical activity health education taught at home and school should be complementary
 - Receptive to joint homework activities
 - Homework activities provide a meaningful way to facilitate conversations about being more physically active together
 - Some negative perceptions about the intent of and practicality of homework assignments
 - There are some negative perceptions about the nature of physical activity programming within the schools
- “The homework pieces opened up new ideas for us to be active together and it helped us think of new activities to do together. I think doing these types of homework activities are much more likely to increase compliance than just telling people to be more active...these actually make you stop and think about how active your family is or isn't and give you strategies to be more active”

Parents influence children's physical activity

- Parents feel they have an influence on their child's level of physical activity
 - Variety of indirect and direct types of influence that parents exert
- “My son prefers to sit and read, draw, or use a computer. Most of the time I have to force him to get up and move. I have to plan activities for him such as swim lessons, recently a personal trainer who comes in the home to do exercises with him or taking him outside to ride bike or scooter.”

Children influence parental physical activity

- Children influence parent's levels of physical activity by asking their parents to engage in an activity with them
- Parents might not be consciously aware of the influence of their children on their level of physical activity
- Parents feel their children positively affect their level of physical activity
- Engaging in physical activity with their children was seen as an enjoyable and rewarding experience by all participants
- "For sure...my daughter will say 'can we go swimming?' so we do because she wants to do that and we want to support her"

Figure 1. Mean Scores on PA1 and PA2 by Group Assignment

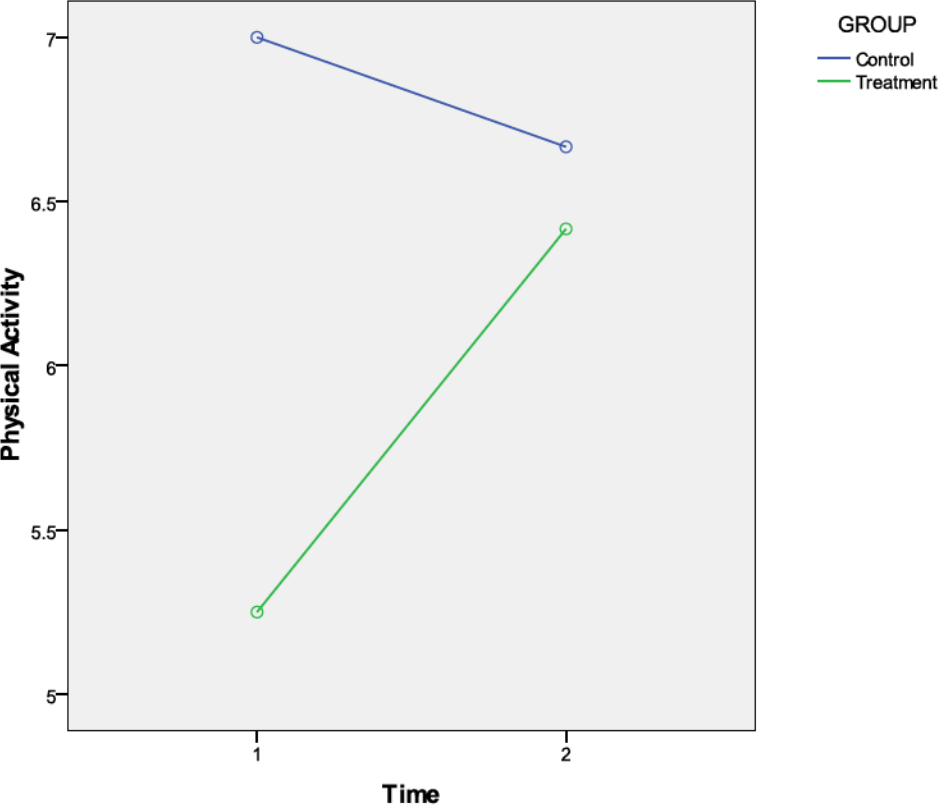


Figure 2. Mean Scores on ST1 and ST2 by Group Assignment

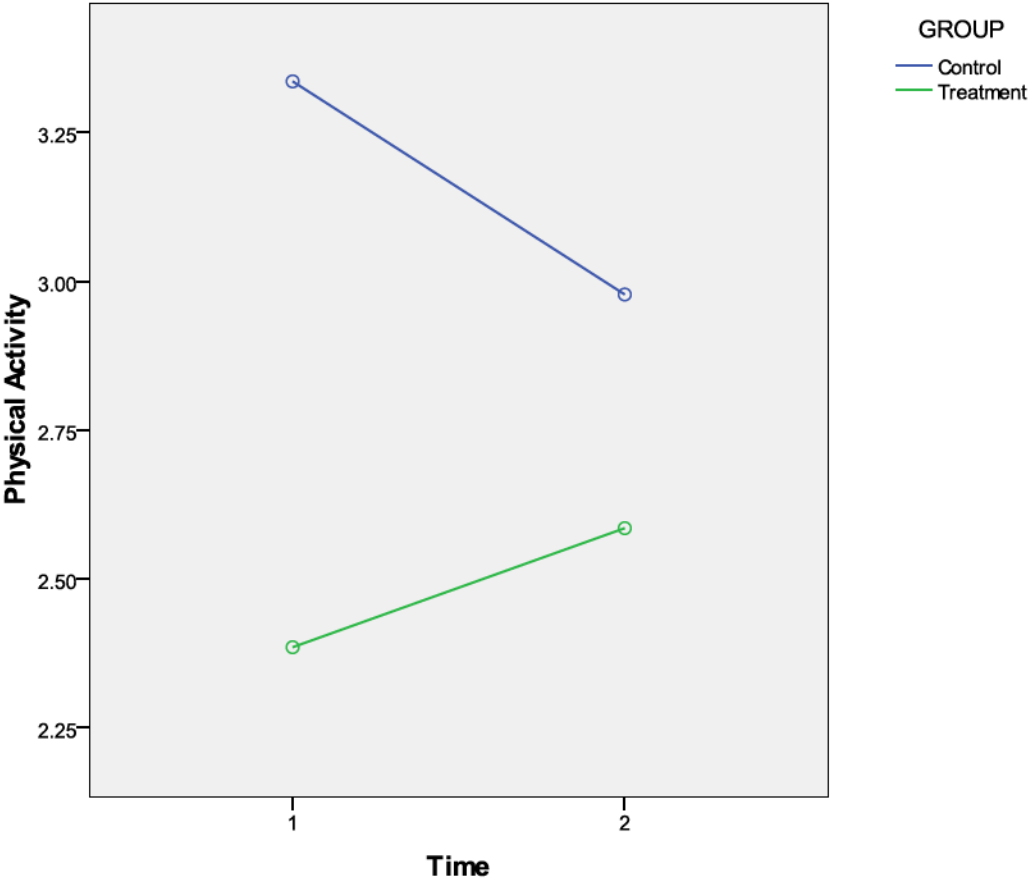


Figure 3. The Interaction of Pre-test Student Mean Scores and Dropout Rates by Group

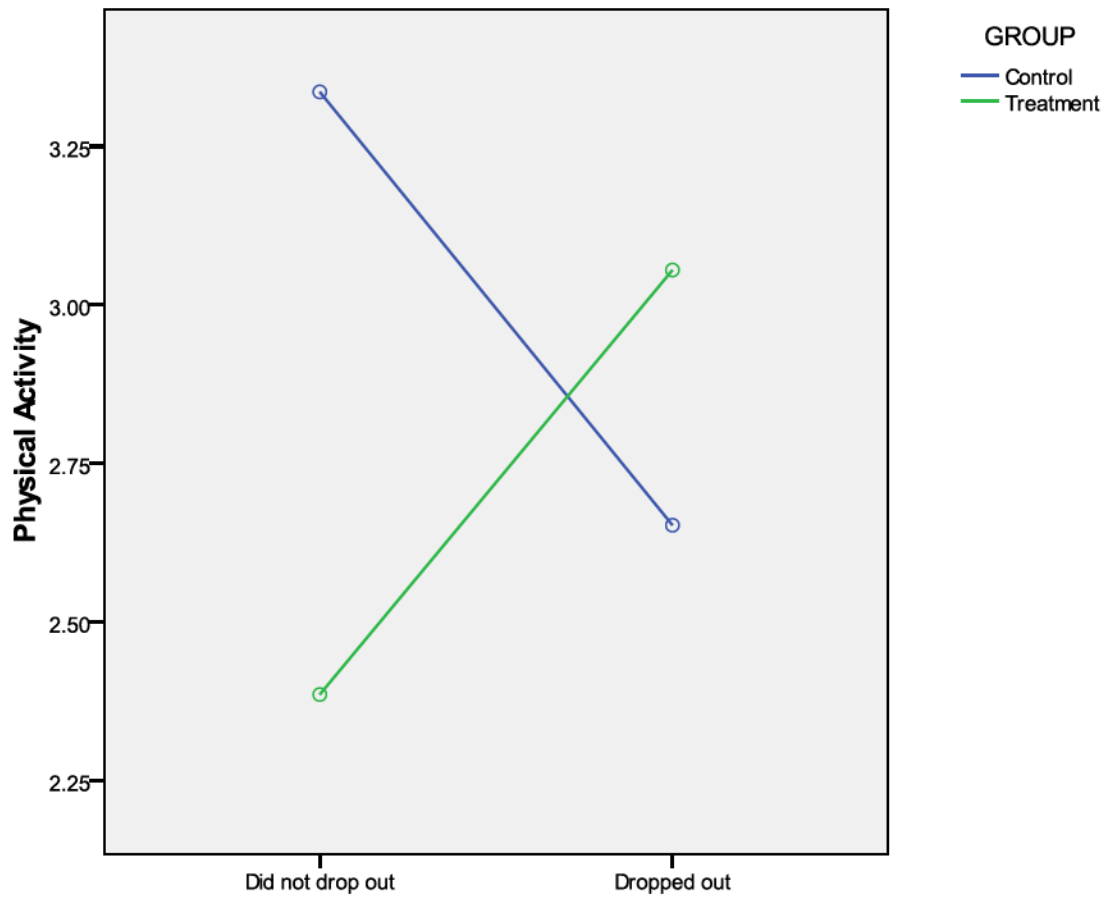


Figure 4. The Interaction of Pre-test Parent Mean Scores and Dropout Rates by Group Assignment

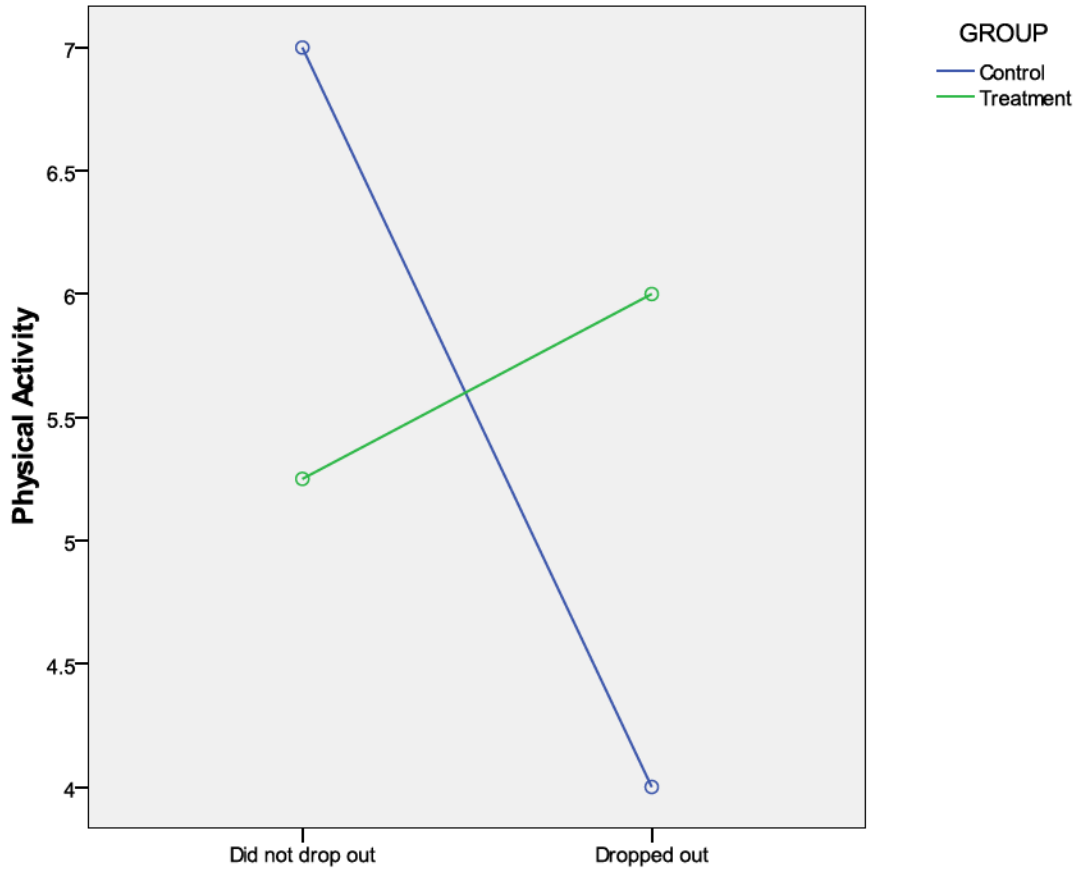
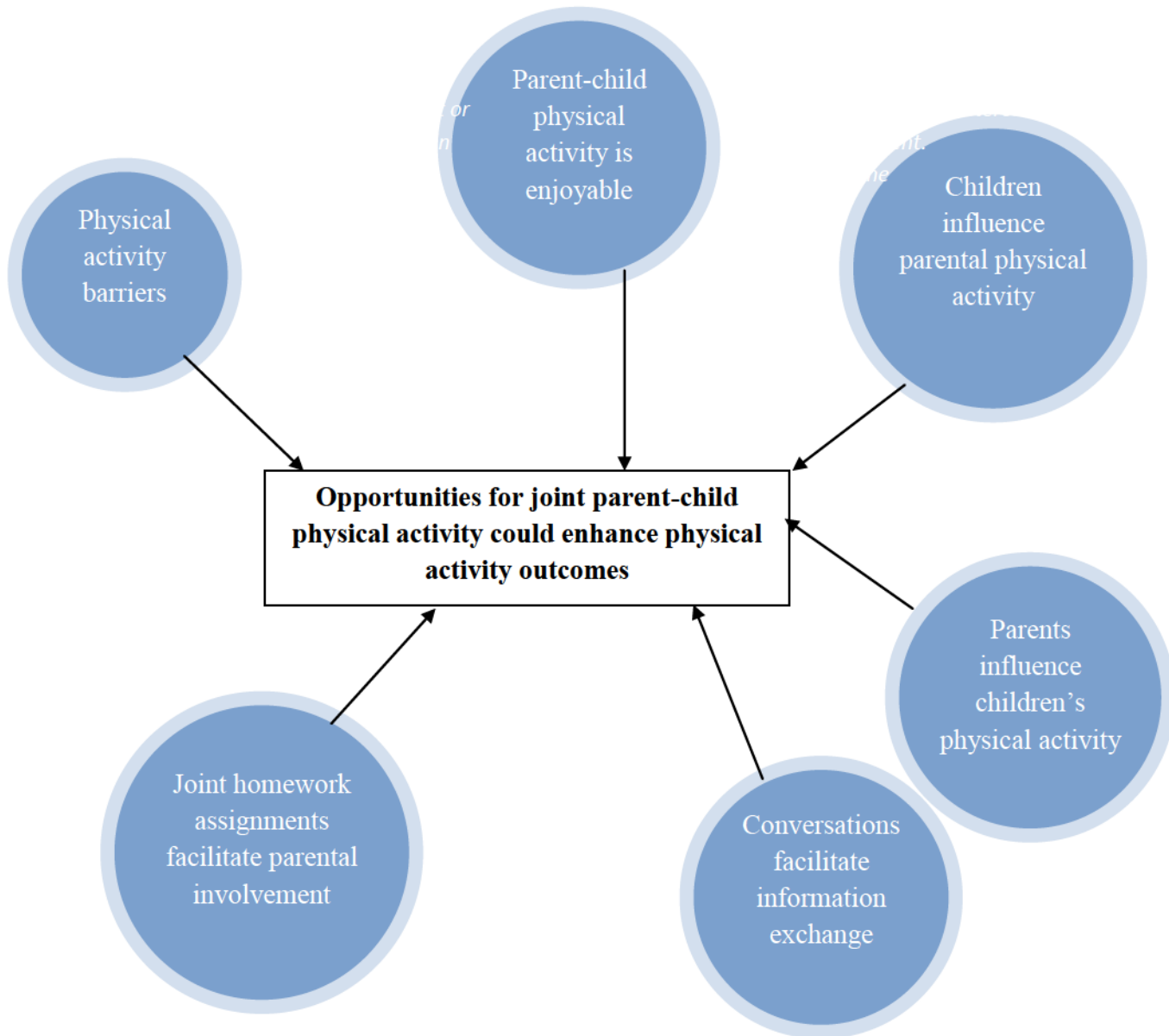


Figure 5. Thematic Network Analysis: Bidirectional Parent-Child Influence on Physical Activity (*Organizing themes and global theme*)



Appendix A

Turnoff Week Challenge Tracker Form

Turnoff Week Challenge Tracker Form

Congratulations! You're about to participate in a fun and exciting challenge that will help become more physically active and reduce your screen time.

How to Play:

Try your best to be screen-free for one week. While it's okay to use your computer for any homework you might have this week, you need to avoid using your computer for games or internet surfing, watching TV and/or playing any form of video games. Don't include any time spent on the computer or watching TV for school-related activities towards your daily screen time total. Aim to be physically active (such as walking, helping out with chores or playing tag) OR participate in structured exercise (such as playing your favourite sport) for at least 60 minutes each day...but even more is better! Use the Turnoff Week Challenge Tracker Form daily and be sure to fill out the form as honestly and accurately as possible. Return this completed form to your teacher on Monday after the Turnoff Week Challenge even if you were not 100% screen-free.



Participant Information

Name: _____

Male: Female:

Grade: _____

School: _____

Teacher's Name: _____



Are You up for the Challenge?



Turnoff Week Challenge Tracker Form

For each day this week please check off the statements that best describes your day

Example

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
I was 100% screen free today							
I spent 60 minutes or less using screens today							
I spent more than 60 minutes using screens today							
I spent 30 minutes or less being physically active today							
I spent 30-60 minutes being physically active today							
I spent more than 60 minutes being physically active today							

Note: In the original image, checkmarks are present in the 'Mon' column for the first two rows, and a checkmark is present in the 'Mon' column for the fourth row.

Appendix B

Rapid Assessment of Physical Activity (RAPA)- Parent Survey (pre- and post- Turnoff Week)

Physical Activities are activities where you move and increase your heart rate above its resting rate, whether you do them for pleasure, work, or transportation.

The following questions ask about the amount and intensity of physical activity you usually do. The intensity of the activity is related to the amount of energy you use to do these activities.

Examples of physical activity intensity levels:

Light activities

- Your heart beats slightly faster than normal
- You can talk and sing
- Ie. Walking, stretching, vacuuming or light yard work

Moderate activities

- Your heart beats faster than normal
- You can talk but not sing
- Ie. Fast walking, aerobics class, strength training, swimming gently

Vigorous activities

- Your heart rate increases a lot
- You can't talk or your talking is broken up by large breaths
- Ie. Stair machine, jogging or running, tennis, racquetball, pickleball or badminton

How physically active are you? (Check one answer on each line)

	Does this accurately describe you?	
	Yes	No
I rarely or never do any physical activities.	<input type="checkbox"/>	<input type="checkbox"/>
I do some light or moderate physical activities, but not every week.	<input type="checkbox"/>	<input type="checkbox"/>
I do some light physical activity every week.	<input type="checkbox"/>	<input type="checkbox"/>
I do moderate physical activities every week, but less than 30 minutes a day or 5 days a week.	<input type="checkbox"/>	<input type="checkbox"/>
I do vigorous physical activities every week, but less than 20 minutes a day or 3 days a week.	<input type="checkbox"/>	<input type="checkbox"/>
I do 30 minutes or more a day of moderate physical activities, 5 or more days a week.	<input type="checkbox"/>	<input type="checkbox"/>
I do 20 minutes or more a day of vigorous physical activities, 3 or more days a week.	<input type="checkbox"/>	<input type="checkbox"/>
I do activities to increase muscle strength , such as lifting weights or callisthenics, once a week or more.	<input type="checkbox"/>	<input type="checkbox"/>
I do activities to improve flexibility , such as stretching or yoga, once a week or more.	<input type="checkbox"/>	<input type="checkbox"/>

Appendix C

Physical Activity Questionnaire for Older Children (PAQ-C)- Student Survey

We are trying to find out about your level of physical activity from *the last 7 days* (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember:

1. There are no right and wrong answers — this is not a test.
2. Please answer all the questions as honestly and accurately as you can — this is very important.

Age:

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one column per row.)

Activity	No	1-2	3-4	5-6	7 Times or More
Skipping					
Rowing/canoeing					
In-line skating					
Tag					
Walking for exercise					
Bicycling					
Jogging or running					
Aerobics					
Swimming					
Baseball, softball					
Dance					
Football					
Badminton					
Skateboarding					
Soccer					
Street hockey					
Volleyball					
Floor hockey					
Basketball					
Ice skating					
Cross-country skiing					
Ice hockey/ringette					
Other:					

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (Check one only.)

- I don't do PE
- Hardly Ever.....
- Sometimes.....
- Quite Often.....
- Always.....

3. In the last 7 days, what did you do most of the time *at recess*? (Check one only.)

- Sat down (talking, reading, doing schoolwork)
- Stood around or walked around.....
- Ran or played a little bit.....
- Ran around and played quite a bit.....
- Ran and played hard most of the time.....

4. In the last 7 days, what did you normally do *at lunch* (besides eating lunch)? (Check one only.)

- Sat down (talking, reading, doing schoolwork)
- Stood around or walked around.....
- Ran or played a little bit.....
- Ran around and played quite a bit.....
- Ran and played hard most of the time.....

5. In the last 7 days, on how many days *right after school*, did you do sports, dance, or play games in which you were very active? (Check one only.)

- None
- 1 time last week.....
- 2 or 3 times last week.....
- 4 or 5 times last week.....
- 6 or 7 times last week.....

6. In the last 7 days, *on how many evenings* did you do sports, dance, or play games in which you were very active? (Check one only.)

- None
- 1 time last week.....
- 2 or 3 times last week.....
- 4 or 5 times last week.....
- 6 or 7 times last week.....

7. On *the last weekend*, how many times did you do sports, dance, or play games in which you were very active? (Check one only.)

- None
 1 time.....
 2 -3 times.....
 4-5 times last week.....
 6 or more times

8. Which *one* of the following describes you best for the last 7 days? Read *all five* statements before deciding on the *one* answer that describes you.

- A. All or more of my free time was spent doing things that involve little physical effort

 B. I sometimes (1-2 times last week) did physical things in my free time (ie. played sports, went running, swimming, bike riding, did aerobics)
 C. I often (3-4 times last week) did physical things in my free time
 D. I quite often (5-6 times last week) did physical things in my free time
 E. I very often (7 or more times last week) did physical things in my free time

9. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

10. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Check one.) Yes No If yes, what prevented you? _____

Appendix D

Experimental Group's First Homework Assignment: The Importance of Physical Activity

Note: this will be delivered and completed online

How Active Are You?

Parent/Guardian and Student should read the following aloud together aloud before continuing:

Physical activity is important for our health! Being more physically active can help you maintain a healthy weight, improve your fitness, improve your sleep and make you feel great. Physical activity guidelines recommend that children should have at least 60 minutes a day of moderate to vigorous physical activity and that adults should be moderately to vigorously physically active for 150 minutes (2.5 hours) each week.

There are many different reasons for wanting to become more physically active: being able to play your favourite sport longer without getting tired, becoming stronger in your daily life or lowering your chance of developing health problems in the future. Just remember: you might not see the benefits of your hard work right away, but don't give up! It might take a few weeks before you notice all the great benefits that being more physically active can offer. Be patient, keep with it, and before you know it, you will be healthier and happier.

You can become more physically active, no matter how tired or busy you are. The trick is to make realistic goals and strategies to help you become more physically active. The best challenging physical activity goals are SMART.

S-specific. Decide on the specific activity or skill you want to achieve. I.e. "I will power-walk to work/school daily" or "I will increase my fitness by being able to do ten pushups."

M-measurable. i.e. "I will exercise three times a week for 30 minutes."

A- attainable. Make sure you have the time, physical ability and resources to reach the goal.

R- realistic. Make sure your goal fits your schedule, preferences and physical ability.

T -timely. Use a deadline to achieve your goal by to help keep you accountable,. ie. "I will be able to run 1 mile without stopping by the end of the month."

Think about how you can become more physically active on a daily basis by brainstorming some ideas with your participating parent (*must be the same parent that has consented to study participation*).

Please enter your unique ID code provided to you in your emailed invitation (this cannot be used to personally identify you).

These four questions are to be answered by the student.

Name three types of physical activity you participate in on a regular basis:

-
-
-

Name three ways you could fit more physical activity into your day on a regular basis:

-
-
-

Think of three goals related to physical activity you can make for the upcoming the week ie. walk to and from school, do 100 jumping jacks everyday or exercise instead of watching tv after school

-
-
-

Name three reasons why being physically active is important:

-
-
-

These four questions are to be answered by the parent.

Name three types of physical activity you participate in on a regular basis:

-
-
-

Name three ways you could fit more physical activity into your day on a regular basis:

-
-
-

**Think of three goals related to physical activity you can make for the upcoming the week
ie. take the stairs at work, walk before or after work, attend a fitness class**

-
-
-

Name three reasons why being physically active is important:

-
-
-

<input type="text"/>	<input type="text" value="b07e0bc1c3751c"/>	<input type="text" value="eyJwYWdlcGF0e"/>	<input type="text" value="0"/>	<input type="text" value="5f2bd339a2559ff"/>
<input type="text" value="http://app.fluidsur"/>	<input type="button" value="Submit"/>			

Appendix E

Experimental Group's Second Homework Assignment: Let's get physically active!

Note: this will be delivered and completed online

Get ready for your physical activity challenge!

Parent/Guardian and Student should read the following together aloud before continuing:

Before you get started, take a minute to think about your favourite type of physical activity and how much fun it can be. Think about why you love it. Is it because it makes you feel good? Is it because you can do it with friends and family? Maybe you love it because it's a fun way to become and stay healthy. There are so many reasons to enjoy being physically active!

You probably have friends and family members who love to be physically active and who know the importance of being physically active on a regular basis. You can also set a good example and be a great role model by also getting physically active. Showing your friends and family how fun and easy it is to be more physically active helps build a healthier community for everyone.

Don't forget that you can reach the goals that you set in the first homework assignment. Just remember how important reaching that goal is to you and use the support and motivation from friends and family to keep working towards it. You can do it!

Please enter your unique ID code provided to you in your emailed invitation (this cannot be used to personally identify you).

Being active is always more fun when friends and family are involved.

For 5 minutes, choose one of the activities below (or come up with your own!) to complete with one of your parents.

Ideas:

- Go for a brisk walk or jog
- Put on your favourite music and dance
- Play catch or shoot hoops
- Go for a bike ride
- Put in a fitness DVD and follow along

After you complete your physical fitness activity together for 5 minutes, please answer the questions below.

The next three questions should be answered by the student. Only one or two sentences per question are necessary.

What activity did you and your parent choose to do and why?

How did just 5 minutes of physical activity make you feel?

Could you and at least one of your parents commit to being physical active together at least once a week? Why or Why not? If yes, what would you do together?

The next two questions should be answered by the parent. Only one or two sentences per answer are necessary.

How did just 5 minutes of physical activity make you feel?

Do you feel it is important to participate in physical activity with your child? Why or why not? How might supporting your child's active lifestyle also benefit you?

Appendix F

Cover Letter for Grade Five Elementary School Teachers and Principals

Dear Potential Participant:

My name is Jess Voll and I am a student in the Master of Public Health program at Lakehead University. I am writing to invite a fifth grade classroom in your school to participate in a research project entitled: *Determining “Spread of Effects” of Physical Activity Interventions from Children to Parents/Guardians*. This study has received approval from the Waterloo Region District School Board Research Committee (attached).

Benefits of the study

I am inviting you to participate because this study has the potential to positively impact the health of your school’s grade five students and could also be an excellent accompaniment to your existing health curriculum. Other benefits to you include:

- taking advantage of a fun and easy to implement health education tool that
- requires almost no classroom time
- reducing “screen time” for your grade 5 students
- contributing to the advancement of knowledge on physical activity by students and their families
- receiving findings and recommendations after the study

Purpose of the study

The purpose of this study is to evaluate whether physical activity education interventions delivered to grade five students could lead to positive changes in physical activity behaviours in their parents’/guardians’ behaviours (“spread of effects”). The study will measure changes in behaviour and intentions as a result of an intervention that calls for unplugging the television, the computer and all video games for a week.

Design of the study

The study involves an intervention based on The Centre for Screen-time Awareness’ Turnoff Week initiative. This initiative encourages students and their families to reduce the time they spend in front of a television, computer and video game screen to become more physically active and health-focused. The study will take place during “Turnoff Week,” **February 27th- March 4, 2012.**

This study is designed to be implemented in a grade five classroom. Each participating grade 5 student and one of their parents or guardians will be randomly assigned to either the treatment or control group. The treatment group will take part in the intervention, the control group will not.

Participating in the study

The following are the requested levels of participation:

Principal and grade 5 teacher(s)

- allow for a visit by the researcher 2 – 3 weeks in advance of February 27th, 2012 to explain the study to your classroom (approximately 10 minutes of classroom time required). At this time the researcher will distribute cover letters and consent forms to be sent home with the children to for their parents/guardians.
- provide daily oral reminders to the participating students to fill out their Turnoff Week Challenge Tracker form daily (should take 1-2 minutes of class time)
- collect signed consent forms (note that the researcher will arrange a time, at your convenience, to pick these up from you)

Therefore, the majority of the true study/intervention are actually the online surveys and homework pieces, *which do not require any involvement whatsoever from the teachers and are done outside of school hours by participating student-parent pairs*. This is the true form of data collection for what the study intends to measure (change in parental behaviours). Therefore, participation actually occurs more on an individual than classroom basis. The primary commitment from the classroom's teacher is to allow the researcher to offer the option to participate to their students. While it is possible that, for example, only 50% of the teacher's students will consent to participate, the study would still proceed with those who have expressed interest and consented.

Parents/guardians

- read the letter that introduces the study
- sign and return consent forms
- complete two short online surveys with their child: one before and one following Turnoff Week (approximately 5 minutes)
- complete two short homework assignments online with the student (experimental group only); approximately 5-10 minutes per homework piece
- participate in an optional telephone survey with the researcher (and be entered into another prize draw).

Students

- participate in a visit from the researcher in advance of February 27th, 2012 to learn about the study and to ask any questions
- complete a Turnoff Week Challenge Tracker form during February 27th- March 4th, 2012
- complete two short online surveys (approximately 5 minutes) with their parent/guardian one week before and one following Turnoff Week,
- complete two short fun homework assignments online with parent/guardian (experimental group only); approximately 5-10 minutes per homework piece
- participate in an optional telephone survey (outside school hours) as above (and be entered into another prize draw).

A copy of the surveys, homework pieces, and the Turnoff Week Challenge Tracker Form are attached. It is anticipated that the online surveys (sent via email) will take approximately 5 minutes to complete and the two pieces of online homework (also sent via e-mail) approximately

5-10 minutes each. The homework pieces will be e-mailed on the first day of the challenge week for parents to complete online with their child (these must be completed by the last day of Turnoff Week). Completing the surveys or homework pieces online should not count towards screen time and that will be emphasized in the e-mails participants receive. Should the homework intervention prove successful, the materials will be offered to all participating schools for future use. Students who do not receive parental consent to participate will still be offered a Turnoff Week Challenge Tracker form so that they do not feel left out.

Additionally, parents will have a voluntary opportunity to participate in a phone interview, which will be completed outside of school time with the researcher. Participation in the phone interview is completely optional and does not affect involvement in the primary study (Turnoff Week). Phone interview participants will also be entered into a draw to win a variety of exciting health and physical activity related prizes.

I am also attaching a copy of the “deception debriefing letter” that will be delivered to parents/guardians after the completion of the study. The letter, which has been approved by the Research Ethics Board of Lakehead University, advises participating parents that the true purpose of the study was concealed from them prior to their participation so as not to skew the results. While the consent form that parents and guardians will receive and sign refers to the study’s purpose as measuring family physical activity habits, in fact the study will measure whether levels of physical activity in the participating parent changed during Turnoff Week. Therefore, if you agree to participate, it is very important that you don’t reveal the study’s true hypothesis to any of the participants. On reading the deception debriefing letter, any participant who wishes can have their data withdrawn from the study.

Risks of participating

There are no known risks for participating in this study.

- Concealment of the true hypothesis will not adversely affect the rights and welfare of the participants and the study could not be practically carried out without the concealment. In fact, it is felt that participating students and parents will benefit from practicing reducing their screen time in favour of increased physical activity.
- Your participation in this study is voluntary; your school, as well as each parent/guardian and student, has the right to refuse to participate in any or all parts of the study or to withdraw from the study at any time.
- Participating parents and children will have the right to decline any questions from the surveys or aspects of the homework. Withdrawing from the study in full or declining to participate in select aspects will not impact the child or parent’s eligibility to receive prizes.

Privacy of the participants

Because the surveys will be distributed online, we will require consenting participants to provide an e-mail address. For those who are interested in participating in the phone interview, they will also need to provide a phone number. The initial email they will receive will include an individual ID code. Participants will use that individual ID code for both surveys and the

homework pieces if applicable. *Under no circumstances will the participants' e-mails or phone numbers be distributed or added to any mailing lists and will not be used for any other reason other than those necessary for the study. Furthermore, personal identifying information will be kept separate from data collected from the survey instruments. All data will be stored in encrypted, password protected files.*

The completed consent forms and surveys will be kept confidential and will be securely stored at Lakehead University for a period of five years after study completion. During the study, they will be securely stored by the researcher (myself) and only the researcher and the researcher's assistant will have access to this data (necessary for impartial data analysis). A report of this study's research results will be available to the public and could be potentially published in an academic journal. The identity of the participating school and individual participants will remain anonymous in the report. A one page summary of the results of the study will be made available to all participants upon completion; a full copy of the completed report will be made available upon request by contacting me at jvoll@lakeheadu.ca or 519-501-0513.

Thank you for considering this request to volunteer for this study. If you are willing to participate, I would appreciate receiving your agreement by email no later than **January 13th, 2012**. I look forward to hearing from you.

Yours truly,

Jess Voll

Thesis Supervisor:

Dr. Ian Newhouse

Director

Centre for Education and Research in Aging and Health

Lakehead University

Phone: (807) 343-8074

E-mail: inewhous@lakeheadu.ca



Research Ethics Board:

Office of Research, Lakehead University

Phone (807) 343-8934

Appendix G

Consent Form for Grade Five Elementary School Teachers and Principals

Principal Investigator: Jess Voll

Contact: 519-501-0513 or email jvoll@lakeheadu.ca

The fifth grade class of _____ agrees to participate in the study entitled: *Determining the “Spread of Effects” of Physical Activity Interventions from Children to Parents/Guardians*. The signature on this form indicates that the cover letter outlining the nature of the study and procedures involved has been reviewed and understood by the classroom teacher and school principal. Specifically:

1. The school agrees to participate.
2. The school is aware they are volunteering and may withdraw from part of or all of the study at any time.
3. The school may ask questions or raise concerns at any time.
4. The school is aware of the benefits of participating in the study
5. The school understands there is no apparent risk associated with participating in the treatment group’s intervention program or from being in the control group and not receiving the treatment.
6. The school agrees to assist with the distribution and collection of materials as outlined in the cover letter as well as allow for a few minutes a day for students to fill out their Turnoff Week Challenge Tracker Forms.
7. The data collected will remain confidential and will be securely stored at Lakehead University for five years following study completion
8. The school understands participants will be asked to provide an e-mail address (and phone number, for those that wish to participate in a phone interview) strictly for the purpose of the study.
9. The school as well as the individual study participants recruited from the school will remain anonymous in the study report.
10. The full intent of the study will not be revealed to the parents/guardians and students until completion of the study. At that time, all participants will receive debriefing letters, have the opportunity to ask questions and be able to withdraw their data from the study if desired.
11. The school will refrain from disclosing the study’s true purpose to participants and will instead defer any study questions to the researcher.
12. A one page summary of the study results will be emailed to you upon project completion and a full copy of the final research report will be available to the school upon request.

The information collected for this project is confidential and protected under the Municipal Freedom of Information and Protection of Privacy Act, 1989. By participating, you do not waive any legal rights.

*This consent form is due no later than **February 3, 2012**. Please return it even if you do not consent to participate*

- I consent to participate and I consent for the researcher to invite children and their parents/guardians from a 5th grade classroom in my school to participate
- I do not consent to participate and I do not consent for the research to invite children and their parents/guardians from a 5th grade classroom in my school to participate

Principal's signature

Classroom teacher's signature

Date

Appendix H

Cover Letter for Parents/Guardians and Children

Dear Potential Participant:

My name is Jess Voll and I am a student in the Master of Public Health program at Lakehead University. I am writing to invite one parent/guardian from your household and your grade five student to participate in a study analyzing family physical activity habits.

Benefits of the study

I am inviting you because this study has the potential to positively impact the health of your son or daughter by encouraging them to be more physically active on a regular basis.

Purpose of the study

The purpose of this study is to evaluate family physical activity habits and encourage students to reduce their weekly screen time by unplugging the television, the computer and all video games for a week.

Design of the study

The study involves an intervention based on The Centre for Screen-time Awareness' Turnoff Week initiative. This initiative encourages students and their families to reduce the time they spend in front of a television, computer and video game screen to become more physically active and health-focused. The study will take place during "Turnoff Week," **February 27th - March 4th, 2012**. Each participating grade 5 student and one of their parents or guardians will be randomly assigned to either one of two groups.

Participating in the study

Parent/guardian

- read this letter that introduces the study;
- sign and return consent forms;
- complete two short online surveys with your child (e-mailed to you): one before Turnoff Week, one following the week (approximately 5 minutes);
- you may or may not be asked to also complete two short homework assignments online with your child (also e-mailed to you);
- consider participating in an optional telephone survey with the researcher

Students

- also complete two short online surveys (e-mailed to you); one before Turnoff Week, one following the week (approximately 5 minutes)
- may or may not be asked to also complete two short homework assignments online with you (also e-mailed to you);
- complete a Turnoff Week Challenge Tracker form throughout the week

The Turnoff Week Challenge Tracker form is a fun way for each student to track their screen time and physical activity during the week and will be completed in class. Even those students who decline participation in the study will still be offered a Turnoff Week Challenge Tracker form so that they don't feel left out.

The online surveys should take approximately 5 minutes and deal with both yours and your child's physical activity. If you are asked to complete them, the online homework pieces will take 5-10 minutes and also deal with learning more about physical activity. These homework pieces will not be graded, nor will they affect your child's marks nor will they appear in any school records. **Only one parent/guardian can participate with their child and it must be the same parent that fills out each survey and/or homework piece.**

You may also participate in a phone interview regarding your family's physical activity habits, lasting approximately 20 minutes. These phone interviews will occur outside of school time with the researcher and **are separate from the primary study described above.** Phone interviews allow for rich insight that is not always possible to collect in surveys. **You may participate in the primary study without participating in a phone interview.**

All participants, even if they withdraw at any time, will be put in a draw to win physical activity related prizes. There will be one draw for participating in the primary study (Turnoff Week) and one draw for participating in the phone interviews.

To participate, **it is necessary to have an e-mail address** as the majority of the study's materials will be delivered electronically. By virtue of receiving this letter, the project has been approved by the Waterloo Region District School Board's Research Committee and your child's teacher and principal have consented to allowing us to invite you to participate in this study.

Debriefing

Research designs often require that the full intent of the study not be explained prior to participation. Although I have described the general nature of the tasks that you will be asked to perform, the full intent of the study will not be explained to you until after the completion of the study. At that time, you will be provided with a full debriefing which will include an explanation of the hypothesis that was tested and other relevant background information pertaining to the study. You will also be given an opportunity to ask any questions you might have about the hypothesis and have the opportunity to have your data withdrawn from the study if you feel that you would not have participated had you known the full intent of the study.

Risks

Please note that taking part in this study is voluntary and that you and your child have the right to refuse to participate in any or all parts of the study or to withdraw from the study at any time. You and your child have the right to decline any questions from the surveys or aspects of the homework pieces. No foreseeable risks or potential harm in participating in the study are anticipated.

Privacy and Confidentiality

Since the surveys and homework pieces are sent by e-mail, we will require consenting participants to provide an e-mail address. If you wish to participate in a phone interview as well, you must provide a phone number to reach you at. The initial email you will receive will include an individual ID code. You will use that individual ID code for both surveys and the homework pieces if applicable. *Under no circumstances will your e-mail or phone number be distributed, added to any mailing lists or used for any other reason necessary for the study. Furthermore, personal identifying information will be kept separate from data collected from the survey instruments.* Your e-mail address, in addition to a phone number if you would like to participate in a phone interview, will be kept in encrypted, password protected files only accessible by the researcher and the researcher's assistant.

The completed consent forms and surveys will be kept confidential and will be securely stored at Lakehead University for a period of five years after study completion. During the study, they will be securely stored by the researcher. Only the researcher and the researcher's assistant will have access to this data (necessary for impartial data analysis). A report of this study's research results will be available to the public and could be potentially published in an academic journal. The identity of the participating schools and individual participants will remain anonymous in the report. To request a copy of the full completed report, please contact me at jvoll@lakeheadu.ca or 519-501-0513. A one page summary will be emailed to all participants following the completion of the project.

Thank you for considering this request to volunteer for this study.

Yours truly,
Jess Voll

Thesis Supervisor:

Dr. Ian Newhouse

Director

Centre for Education and Research in Aging and Health

Lakehead University

Phone: (807) 343-8074

E-mail: inewhous@lakeheadu.ca

**Research Ethics Board:**

Office of Research, Lakehead University

Phone (807) 343-8934

Appendix I

Consent Form for Parents/Guardians and Children: Primary Study (Turnoff Week)

Principal Investigator: Jess Voll
Contact: 519-501-0513 or email jvoll@lakeheadu.ca

I consent for myself, _____ and my child, _____ to
(Please print clearly) (Please print clearly)

participate in this study analyzing family physical activity habits.

The signature on this form indicates that the cover letter outlining the nature of the study and procedures involved has been reviewed by you and that you understand the following:

1. You and your child are volunteering and may withdraw from the study at any time.
2. You may ask questions or raise concerns at any time.
3. There are benefits to participating in this study.
4. There is no apparent risk associated with participating in the treatment or control group.
5. You agree to help ensure you and your child complete the surveys and any homework activities assigned, except in cases where you prefer to withdraw partial or complete participation.
6. You understand that only **one parent may participate and it must be the same parent throughout the study.**
7. Participating in this study will not be kept on the student's record nor will participation in this study affect the student's grades.
8. The data collected will remain confidential and will be securely stored at Lakehead University for five years following study completion.
9. Your e-mail address is necessary for participation in this study. It will be used strictly used only for study purposes.
8. The school as well as the individual study participants recruited from the school will remain anonymous in the study report.
10. That the full intent of the study will not be revealed until completion of the study. At that time, all participants will receive debriefing letters, have the opportunity to ask questions and be able to withdraw their data from the study if desired.
11. A one page summary of the study results will be emailed to you upon project completion and a full copy of the final research report will be available to you upon request.

The information collected for this project is confidential and protected under the Municipal Freedom of Information and Protection of Privacy Act, 1989. By participating, you do not waive any legal rights.

*This consent form is due no later than **February 3, 2012**. Please return it even if you do not consent to participate.*

- I have explained the study with my child, including what they would be required to do and they agree to participate
- I give my child permission to participate and I will participate as well
- I do not give my child permission to participate and I will also not be participating

Name of student (please print)

Parent/Guardian name (please print)

Date: _____

Parent/Guardian signature

If you have consented for you and your child to participate, please provide an e-mail address.

E-mail address (please print clearly)

Appendix J

Consent Form for Parents/Guardians: Telephone Phone Interviews

Principal Investigator: Jess Voll

Contact: 519-501-0513 or email jvoll@lakeheadu.ca

I consent for myself, _____ to participate in a follow-up phone
(Please print clearly)

interview regarding my involvement in this study analyzing family's physical activity habits. The signature on this form indicates that the cover letter outlining the nature of the study and procedures involved has been reviewed by you and that you understand the following:

1. You may withdraw from participating in the phone interview at any time.
2. You may ask questions or raise concerns at any time.
3. There are benefits to participating in this study.
4. There is no apparent risk associated with participating in the phone interview.
5. Participating in this study will not be affect your child's grades or be documented in their student records.
6. The data collected will remain confidential and will be securely stored at Lakehead University for five years following study completion.
7. Your phone number is necessary for participation in this study. It will be strictly used only for study purposes.
8. Your identity will remain anonymous in the study report.
9. A one page summary of the study results will be emailed to you upon project completion, which will include data from completed phone interviews. A full copy of the final research report will be available to you upon request.

The information collected for this project is confidential and protected under the Municipal Freedom of Information and Protection of Privacy Act, 1989. By participating, you do not waive any legal rights. *This consent form is due no later than **February 3, 2012**. Please return it even if you do not consent to participate.*

I wish to also participate with in a follow-up phone interview, arranged at a time of my convenience, with the researcher. Please note that you may change your mind about your participation in the follow-up phone interview at any time.

Yes Phone number (print clearly): _____

No thank you Date: _____

Parent/Guardian name (please print): _____

Parent/Guardian signature _____

Appendix K

Deception Debriefing Letter for Parents/Guardians

Title of the Research Study: Determining “Spread of Effects” of Physical Activity Interventions from Children to Parents/Guardians

Principal Investigator: Jess Voll, phone: 519-501-0513, email:jvoll@lakeheadu.ca

Dear Participant,

Thank you for your recent participation in our study, described to you as a study analyzing family physical activity habits. As explained to you in the cover letter, research designs often require that the full intent of the study not be explained prior to participation. Concealment of the true hypothesis and purpose of the study was imperative in order to ensure that participants behaved as they normally would; research has found that when participants are aware of a study’s hypothesis they will subconsciously alter their natural behaviours to prove the study’s hypothesis.

The true intent of the study was to analyze whether physical activity interventions delivered to grade five students could have a “spread of effect” for parents and guardians. That is, we were interested in finding out whether the education regarding physical activity children received in class would also benefit their parents/guardians, demonstrated by an increase in the parents’ and guardian’s physical activity levels. To achieve this, half of the classrooms were randomly assigned to an experimental condition which involved a parental involvement component in the form of two joint homework pieces. Secondarily, we will also be analyzing the efficacy of the health promotion intervention to determine if it would be useful in other elementary schools in reducing childhood ailments related to physical inactivity. The results of your surveys, that measured your physical activity prior to and following the intervention, will be used to answer whether parental involvement in a physical activity education program delivered to children in-school could also benefit parents/guardians by leading them to increase their physical activity levels too. The same method will be used to determine whether children in the experimental condition increased their level of physical activity as a result of the parental involvement component.

This use of concealment was approved by the Lakehead University Research of Office and the Research Ethics Board.

This research could be potentially important in illuminating how the spread of effects of an intervention can help reach a larger population than directly targeted as well as shed insight on how dynamics between family members impact individual’s physical activity levels. Furthermore, potential benefits from this research include an effective method to improve the physical activity habits of both Canadian adults and children.

A one page summary will be emailed to you upon completion of the project and a final report of the study is available to you upon request. You may also indicate below whether you would

prefer to have your data withdrawn from the study if you feel that you would not have participated had you known the full intent of the study.
 If you have any questions about the study, or about the deception involved, please feel free to ask the principal investigator now, or at a later time. If you have concerns about this study or your rights as a participant in this study, you may contact the Lakehead Office of Research. Thank you again for participating in our study.

Sincerely,
 Jess Voll

Thesis Supervisor:

Dr. Ian Newhouse
 Director
 Centre for Education and Research in Aging and Health
 Lakehead University
 Phone: (807) 343-8074
 E-mail: inewhous@lakeheadu.ca



Research Ethics Board:

Office of Research, Lakehead University
 Phone (807) 343-8934

-
- I have read the above and understand that concealment about the study's true intent and hypothesis was necessary. I give permission for my data and my child's data to be used in the study.
- In light of the concealment, I wish to have my data and my child's data withdrawn from the study.
- I would like to be contacted regarding questions and concerns surrounding the use of concealment in this study.

 Student's Name (please print clearly)

 Date

 Parent/Guardian's Name (please print clearly)

 Parent/Guardian's Signature

 E-mail address used to participate (please print clearly)

Appendix L

Phone Interview Questions

Pre-amble/Introduction

- Re-introduce who I am- name, program of study, purpose of thesis work, research interests
- Thank you again for participating in the study-
 - Have you ever participated in an experimental study before?
 - Did you enjoy being involved in the study?
 - Do you have any feedback on improvements that could be made in the future if this study was replicated? Were you surprised to learn what the study was actually trying to measure and study?
- Explain the purpose of the phone interview
 - Sometimes being able to speak directly with people helps researchers understand why something might have happened not just whether it did or did not
 - Given that a parent-child relationship can be complicated, asking questions can help
 - When looking at future programs for participants, its good to have their feedback

Interview Questions

1. What is the significance of physical activity in your lifestyle?

Probe: Are you active on a daily basis? Is it something you think about often? Is it something you want to do more of-why or why not?

2. Could you tell me about a time that you and your child were physically active together recently?

Probes: What made you do this activity together? What was necessary to do this activity (ie. time, money, location)? How did it make you and your child feel? Did you enjoy it? How often do you do this or similar activities together?

3. What do you think about the type of health education related to physical activity that your child receives at school?

Probe: Should there be more time devoted to it? Should it occur throughout the year or as a specific unit? Should it include a greater physical activity component? Do you think they are learning the right things?

4. Do you ever talk with your child about what they learn at school related to physical activity health?

If yes-probe: If so, what kind of conversations do you have about the information? Do you find that you learn information that is personally useful to you? Do you ever consciously consider the information in the context of your own behaviours?

If no-probe: Why do you think that is? What might encourage them to share information?

5. What do you think the role of parental involvement in physical activity health education children receive in-school should be?

Probe: Do you think there should be more or less parental involvement? How do you think that should be done (i.e homework pieces, after school fitness classes together?)

6.a) Do you feel as though you have an influence on your child's level of physical activity?

Probe: How so? Do you purposely try to influence their physical activity levels?

b) Do you feel that your child has an influence on the types of physical activity you participate in?

Probe: Could you give me some examples of these activities? Do you feel that you learned new information from your child? Do you feel that they impact your behaviours in a positive or negative way?