Are We Just Playing Games?

Examining the Motor Skill and Physical Activity Benefits of Two After-School Programs

by

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Abstract

This project measured the effectiveness of after school physical activity programs which emphasized moderate to vigorous physical activity (MVPA) and motor skill improvement. Children (n=41) from sport-based program and low-organized games-based programs were recruited. MVPA was measured using accelerometry and motor skill proficiency via the Test of Gross Motor Proficiency 2. Although, children in both programs participated in significant MVPA (more than 50% of program time engaged in MVPA), sport-based program participants obtained significantly ($p<0.05$) more MVPA. Children in the games-based program experienced a greater increase in gross motor quotient scores, though not significant ($p>0.05$), but with a moderate effect size ($\eta=0.06$). Overall after school physical activity programs provide positive contributions to daily MVPA. Participants in low-organized games based programs may experience a greater increase in motor skill proficiency. Further research is needed to determine the effects of program type on MVPA and motor skill development.

List of Abbreviations and Symbols Used

$\bar{x}$ **-** Mean or average

η – eta

r - correlation coefficient

ACT - Active by Choice Today

CATCH - Coordinated Approach to Children's Health

CKC - Catch Kid's Club

FMS - Fundamental movement skills are basic motor skills, which precede the development of sport specific skills. They can be subdivided into locomotor, object control, and balance skills. (Stodden et al., 2008).

Get BUSY! - Get Building the Ultimate and Sensational You!

GMQ - Gross Motor Quotient

KP - Keeping Pace

LPA - Light physical activity is any physical activity that requires energy expenditure between 1.6 and 2.9 metabolic equivalents (METs) (Freedson, Melanson & Sirard, 1998).

MET – Metabolic equivalent

MVPA - Moderate to vigorous physical activity is any physical activity that requires an energy expenditure of between 3 and 6 METs. One MET is equivalent to an oxygen consumption of 3.5 $mL \cdot kg^{-1} \cdot s^{-1}$ (Freedson et al., 1998; Powers & Howley, 2007).

PE – Physical Education

SD - Standard deviation.

SOFIT - System for Observing Fitness Instruction Time

SPARK - Sports, Play, and Active Recreation for Kids

TGMD-2 - Test of Gross Motor Development 2.

VPA- Vigorous physical activity is any physical activity that requires energy expenditure greater than 6 METs (Freedson et al., 1998).

YM(YW-)CA – Young Men's (and Young Women's) Christian Association

Glossary

Low-organized games

Games that require minimal directions, promote inclusion of a large group of people through the reducing or removing the elimination of children from the game (i.e. no one is "out"), and typically promote locomotion.

Physical activity

Any form of movement that creates energy expenditure above that of resting metabolic rate (Powers & Howley, 2007).

Sedentary behaviour

Sedentary behaviour requires an energy expenditure of 1-1.5 METs. Sedentary activities should be considered distinct from light physical activity, and are activities where the individual is lying, seated or standing. (Powers & Howley, 2007; Tremblay, Colley, Saunders , Healy & Owen, 2010).

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Chapter One: Introduction

1.1 Introduction

Physical activity participation rates amongst Canadian children are low (Colley et al., 2011), which is preventing them from receiving the known health benefits of physical activity. Bone mineral content, blood pressure, metabolic syndrome, obesity, mental health and social well-being have all been shown to be positively affected in children by regular physical activity (Bailey, McKay, Mirwald, Crocker & Faulkner, 1999; Bell et al., 2007; Kang et al., 2002; MacKelvie, McKay, Khan & Crocker, 2001; Mark & Janssen, 2008a). While there are multiple reasons for non-participation, motor skill competence, or one's ability to perform motor skills such as running, throwing and catching, is gaining recognition for its role in mediating participation in physical activity (Stodden et al., 2008). Creating opportunity for children to participate in physical activity, as well as develop motor skill competence should be of clear importance. The after school time period has been highlighted as an opportunistic time to do this (Active Healthy Kids Canada, 2011). Examining current programs to determine time spent in activity, as well as changes in motor skill competence will provide evidence to guide future program planning, generate guidelines for increasing physical activity during after school programs, and direct future physical activity and motor competence research interventions.

1.2 Research Questions and Hypothesis

Primary Questions:

1. Do children attending a low-organized games based after school care program engage in more MVPA and less sedentary behaviours than children attending a structured sport-based after school care program, and do children attending these

programs engage in more MVPA and less sedentary behaviours than regional and national averages for the after school time period?

2. Do children attending a low-organized games based after school care program have a faster rate of motor skill development than peers attending a structured sport-based after school care program?

Secondary Questions

1. Is there a correlation between motor skill proficiency and time spent in MVPA for children attending physical activity based after school care programs?
2. Is there a difference in the correlation between motor skill proficiency and time spent in MVPA for children attending a low-organized games based after school care program and children attending a structured sport-based after school care program?

Hypothesis

Physical activity levels, as measured by accelerometry are hypothesized to be higher amongst the low instructional games program participants due to the decreased time spent working on skill improvement. Change in motor skill proficiency is hypothesized to be greater amongst the structured-sports based program due to increased time spent on skill development.

Chapter Two: Literature Review

2.1 Physical Activity

Despite a growing public awareness of the health benefits of physical activity, participation levels remain low in all ages of the population, including children (Colley, et al., 2011). Current Canadian physical activity guidelines recommend children participate in 60 minutes of moderate to vigorous physical activity (MVPA) per day with a suggested participation in VPA on at least three days of the week (Tremblay et al., 2011b). Similar guidelines exist in the United States (U.S. Department of Health and Human Services, 2008), United Kingdom (Department of Health, 2011) and Australia (Department of Health and Ageing, 2004). All of these agencies specifically note that guidelines should be viewed as minimums not maximums, and that greater levels of activity result in greater health benefits. According to the 2007-2009 Canadian Health Measures Survey, approximately 4% of girls and 9% of boys engage in enough total physical activity to meet this guideline on at least six days each week (Colley et al., 2011). It should be noted, however, that 53% of boys and 35% of girls obtain at least 60 min of MVPA on three or more days each week (Colley et al., 2011). This is important to note because for some of this population, drastic interventions may not be necessary, and small changes will allow these children to increase their activity level and meet or exceed the guidelines. For the remaining population, much greater changes will need to be made, likely at a graduated level, in order to facilitate increases in activity. These changes should be looked at as necessary in order to ensure the entire population is sufficiently active for optimal growth and development, as well as health and wellness.

There are numerous health benefits to physical activity, both physiological and psychological (Janssen & LeBlanc, 2010; Stensel, Gorely & Biddle, 2008). Regular

participation in weight bearing physical activity, especially high impact activity, has been shown to improve bone mineral content, which may aid in the prevention of osteoporosis later in life (Bailey et al., 1999; MacKelvie et al., 2001). As well, physical activity interventions have shown an improvement in insulin sensitivity independent of changes in body composition (Bell et al., 2007; Kang et al., 2002) thus conferring a lower risk for Type 2 diabetes. Insulin resistance, or a low level of insulin sensitivity, indicate that a person is at high risk for developing Type 2 diabetes (Bell et al., 2007). Finally, participation in regular physical activity has been shown to improve cardiovascular health, with active children being one-third less likely to be hypertensive as their less active peers (Mark & Janssen, 2008a). Other cardiovascular health indicators, including vascular health and maximal oxygen uptake have shown improvements following physical activity interventions (Baquet, van Praagh & Berthoin, 2003; Meyer, Kundt, Lenschow, Schuff-Werner & Kienast, 2006).

The psychological benefits of physical activity for children are not as well-documented (Stensel et al., 2008). While links have been found in cross-sectional studies between physical activity level and reduced depression (Steptoe & Butler, 1996; Tomson, Pangrazi, Friedman & Hutchison, 2003), there is little empirical evidence to support causal relationships. Despite the fact that there has not been an emphasis on randomized control trials or case-control studies physical activity provides a "time-out" from everyday life stressors, which may be a beneficial coping mechanism for individuals suffering from mental illness. A systematic review by Ekeland, Heian and Hagen (2005) showed a moderate reduction in anxiety in youth following exercise interventions; however, the authors cautioned that the studies failed to examine the preservation of these benefits over the long term. Goldfield et al. (2007) conducted a randomized control trial

to examine the effects of increased physical activity self-perception in obese children and found positive correlations between body satisfaction, perceived physical conditioning, and perceived physical self-worth independent of changes in body mass index; however, the study did not find a change in global self-worth, which has been associated with increased physical activity. While additional research should be conducted to further understanding of how and to what extent physical activity benefits children psychologically, there appears to be a link between the two.

2.2 Sedentary Behaviour

Sedentary behaviour has been examined in much less detail than physical activity, especially when it comes to understanding the risks and benefits; however, emerging research highlights sedentary behaviour as an independent factor on the health status of individuals (Tremblay et al., 2010). This has been thought to be particularly important as sedentary behaviours directly compete for time that could be spent in physically active endeavours (Epstein, Paluch, Gordy & Dorn, 2000). Understandably, there is confusion over which sedentary behaviours should be targeted, as some sedentary activities such as reading, play a valuable role in the healthy development of children. Therefore most recommendations highlight reducing time spent utilizing entertainment media, such as watching television, playing sedentary computer games or "surfing" the internet (Marshall & Welk, 2008; Tremblay et al., 2011a). In order to mitigate this, countries such as Canada and Australia released specific guidelines targeted at reducing time spent engaging in sedentary behaviours (Department of Health and Ageing, 2004; Tremblay et al., 2011a). For children aged 6-11, the guidelines recommend no more than two hours per day be spent on recreational screen time (i.e., television, movies, computer game play) (Tremblay et al., 2011a). Additional guidelines to reduce sedentary behaviour

include “limiting sedentary (motorized) transport, extended sitting time, and time spent indoors throughout the day” (Tremblay et al., 2011a, p. 59). According to the 2007-2009 Canadian Health Measures Survey, Canadian children on average exceed this recommendation by four times with time spent in sedentary activities during waking hours, defined as car travel, sitting, reclining or standing, totalling approximately 8.6 hours or 62% of each day (Colley et al., 2011).

To understand the risks of a sedentary lifestyle, one must first understand the distinction between a lack of physical activity and sedentary behaviour, because one can participate in physical activity, but still spend the majority of their day engaged in sedentary activities (Tremblay et al., 2010). Tremblay et al. (2010), highlight that throughout sixteen waking hours, an adult could spend 30 min in MVPA, during a purposeful exercise session meeting the recommended guidelines for physical activity, and spend almost the entire remaining 15.5 hours in sedentary activities, by driving to work, sitting at a desk, and watching TV in the evening. These extended periods of inactivity appear to independently have a negative influence on health (Tremblay et al., 2010). Children may experience a similar scenario, as the majority of children use non-active modes of transport to and from school, sit at desks and in the afternoon and evening utilize screen-forms of entertainment (Active Healthy Kids Canada, 2011).

In children, the health risks of a sedentary lifestyle include obesity, risk of metabolic syndrome, and hypertension (Crespo et al., 2001; Janssen, Katzmarzyk, Boyce, King & Pickett, 2004; Mark & Janssen, 2008b; Pardee, Norman, Lustig, Preud’homme & Schwimmer, 2007). Strong associations between obesity and physical inactivity, as well as between obesity and television watching, have been shown; however, links between obesity and computer usage have not been found to be significant (Crespo et al., 2001;

Janssen et al., 2004). Computer usage could be a confounding factor, as many children and adolescents use computers for educational purposes, so studies should seek to differentiate between educational computer usage and entertainment computer usage. Additionally, break-time during educational computer usage should be examined as there is likely a difference between children who get up and move around during their break times, and children who take "entertainment" breaks, remaining seated and surfing the web. Tremblay et al. (2010) provide an informative spin on this, naming these two groups "prolongers and "breakers", with prolongers remaining seated constantly during their screen-time and breakers often getting up and moving around, even if only momentarily (Tremblay et al., 2010). A dose-response relationship was found between screen-time and metabolic syndrome in adolescents that showed adolescents who spent greater than 3 hours on screen-time activities per day were 2-3 times more likely to have metabolic syndrome than adolescents who spent less than 1 hour per day on similar activities (Mark & Janssen, 2008b). It is important to note that this relationship was found to be independent of physical activity participation (Mark & Janssen, 2008b), which highlights the importance of examining sedentary behaviour as a separate entity to physical activity. Pardee et al. (2007) found that children who watched over 4 hours of television per day and children who watched between 2 and 4 hours of television per day were 3.3 and 2.5 times, respectively, more likely to suffer from hypertension than their peers who watched less than 2 hours of television per day. In adults, links have also been found between sedentary behaviours and cancer, vascular health and psychosocial problems (Tremblay et al., 2010). Research tends to examine health risks in adults first then similar risks in children. In the case of sedentary behaviour, the risks that have been studied in children have mimicked that of adults, so we can assume that increased risks of cancer, deleterious

vascular health and psychosocial problems will also occur in children. If anything it is likely that these risks will be more prevalent in children, as young bodies are developing at a rapid rate, and moving, whether it is at a light intensity or MVPA and VPA, is the best way to support optimal growth and motor development.

2.3 Motor Skill Development and Acquisition

While encouraging children to engage in MVPA is of clear importance, efforts must also be made to promote lifelong physical activity, especially with the known decline of MVPA minutes throughout the lifespan (Sallis, 2000). Stodden et al. (2008) introduced a prediction model to understand how motor skills influence lifelong engagement in physical activity. While social, psychological, biological, environmental and demographic factors are of clear importance in understanding engagement in physical activity (Welk, 1999), fundamental motor skill (FMS) proficiency, or one's ability to perform specific movement skills, is gaining credibility as a potentially important factor (Stodden et al., 2008). Stodden et al.'s (2008) model is backed by research which has shown the correlation between motor skill proficiency and engagement in physical activity (Barnett, van Beurden, Morgan, Brooks, & Beard, 2009a; Wrotniak, Epstein, Dron, Jones & Kondilis, 2006). Some research has disagreed with this association; however, Stodden et al. (2008) found that the distinction between these two bodies of research was that research that used process oriented evaluation of motor skills were more likely to find a correlation, whereas research that used outcome oriented evaluation were more likely to not. Outcome oriented evaluations look at the end result of a movement. That is, did someone hit a target after throwing a ball? Whereas process oriented evaluations look at the action of the movement, such as elbow position and torso rotation during a throw (Payne & Isaacs, 2008; Stodden et al., 2008). While there is no conclusive

evidence, Stodden et al. (2008) postulated that when using an outcome based approach success could be found using an incorrect movement pattern the skill would not provide the foundation for more advanced sports skills.

Additional research has looked at the relationship between FMS proficiency and measures of health-related fitness (Barnett, van Beurden, Morgan, Brooks, & Beard, 2008; D'Hondt et al., 2011; Lubans, Morgan, Cliff, Barnett & Okley, 2010). Overall, positive correlations have been found between FMS proficiency and cardiorespiratory fitness, and inverse correlations between FMS proficiency and weight status (Barnett et al., 2008; D'Hondt et al., 2011; Lubans et al., 2010). These links provide evidence for the importance of motor skill proficiency in establishing lifelong physical activity to the point that health is influenced positively.

Exactly what skills constitute the fundamental movement skills differs within the literature; however, the two sub categories of locomotor skills (e.g., run, hop, leap, gallop, forward jump, skip, slide) and object control skills (e.g., overhand throw, two-hand catch, kick, punt, strike, stationary ball bounce, ball roll) are almost always included, while some sources also include balance skills (e.g., stork stand) (Payne & Isaacs, 2008; Cowley, Hamlin, Grimley, Hargreaves, & Price, 2010; Okley & Booth, 2004; PHE Canada, 2011; Ulrich, 2000; van Beurden, Zask, Barnett, 2002). These movements are considered to be the building blocks of sport skills (Cowley et al., 2010; PHE Canada, 2011). Children who possess strong motor skills have the building blocks to transfer into new activities (PHE Canada, 2011). For example, a child who can effectively perform the overhand throw has the foundation to learn the volleyball serve, javelin throw and baseball pitch (PHE Canada, 2011). Some research suggests that there may be a "proficiency barrier", which people must be minimally capable of in order to participate

in physical activity and sports (Stodden et al., 2008). What is unknown is the best ways to facilitate learning of motor skills and promote physical literacy, especially in children who do not wish to participate in sports.

Motor skill researchers have been working to overcome the original assumption that children naturally develop motor skills, and progress towards competence on their own (Stodden et al., 2008). Multiple research studies have shown that large numbers of children do not perform the FMS at age-level competence (Okely & Booth, 2004; van Beurden et al., 2002). Okely and Booth (2004) tested over 1200 primary school students in New South Wales, Australia, and found that no more than 35% of children had achieved mastery of any single specific FMS tested (hop, skip, side gallop, throw, leap, run, catch, strike, dodge, balance, vertical jump) and that only 50% of children had achieved mastery or near mastery on the balance, the highest of any skill. Similar results were found by van Beurden et al. (2002) in that the skill with the highest level of mastery and near mastery was the balance skill, and less than half of all children achieving master or near mastery on all FMS tested (jump, sprint run, throw, catch, hop, side gallop, balance). Okely and Booth (2004) highlighted that past studies had shown higher levels of motor proficiency amongst children in primary school, and presented the possibility that children today are less proficient that they were 5-10 years ago. While this is unconfirmed, and the use of outcome based testing in the past may be the reason for this gap, the large decline in physical activity engagement could both be causing and be caused by a decrease in FMS proficiency.

When learning new motor skills, motivation is an important factor (Schmidt & Wrisberg, 2004). Practice, a key component to learning, is positively influenced by motivation, as people are likely to attempt the skill more times, and put in a greater

amount of effort (Schmidt & Wrisberg, 2004). Additionally, when motivated, one is more likely to pay attention to errors, and attempt to improve them, which is a crucial step in effective learning (Schmidt & Wrisberg, 2004). Therefore physical activity and physical education programs need to use activities that engage all participants in order to effectively teach skills. Opportunities for meaningful practice of these skills, as well as proper instruction of them need to occur. Striking a balance between children who are sports minded and those who feel they are not athletic is exceptionally important so that no one is left behind.

2.4 School-Based Physical Activity Programs and Interventions

Increasing physical activity and decreasing sedentary behaviours are clearly necessary objectives; however, it is unknown where the best place to achieve this is. School-based interventions were initially very popular, as schools provide an easily accessible target population, and some success has been found within these programs (Erwin, Beighle, Morgan & Nolan, 2011; Goreley et al., 2011; Lawlor et al., 2011; Naylor, MacDonald, Zebedee, Reed & McKay, 2006; Sallis, et al., 1997). Physical education (PE) classes are often considered an ideal forum for interventions, but regular PE classes often promote competitive team sports, which are not inclusive of all students (Stratton, Fairclough & Ridgers, 2008). Because of this, and the limited time allotted to PE time there has been a drive to shift focus outside of the school day, and increase community-based physical activity programs. Despite this, PE programs can provide benefits to children and interventions that take place within the school day can have substantial merit, especially because there are many opportunities to take part in physical activity outside of PE throughout the day (Active Health Kids Canada, 2011). These school-based interventions do provide a foundation of knowledge for which to build

programs and interventions outside of the school day, and therefore are worth exploring. Teaching children and adolescents movement skills and exposing them to a wide variety of sports and physical activities should be of utmost importance within a PE setting but time spent teaching movement skills can detract from time spent in MVPA (Stodden et al., 2008; Stratton et al., 2008), therefore it is important for curriculum to find balance between the two.

School-based physical activity programs vary from small scale classroom-based activity breaks to school-wide educational programs complete with nutritional information and physical activity goals (Erwin et al., 2011; Goreley et al., 2011; Lawlor et al., 2011; Naylor, et al., 2006; Sallis, et al., 1997). Small scale classroom-based programs have been successful in increasing physically activity (Erwin et al., 2011); however, it is difficult to ascertain if this increased time spent in physical activity was actually MVPA as the physical activity was measured by pedometers, which measure steps with no viable indication of intensity or time. The Great Fun2Run, Action Schools! BC, the Child and Adolescent Trial for Cardiovascular Health (CATCH) program, Sports, Play, and Active Recreation for Kids (SPARK) and the Active for Life Year 5 program are all examples of larger scale programs, with each demonstrating moderate success.

The Great Fun2Run program in England, which provided physical activity and nutrition education, as well as physical activity opportunities for students, found increased physical activity participation in the intervention group over the 10-month intervention period, but at follow-up 18-20-months later, these improvements were not sustained (Gorely et al., 2011). Goreley et al. (2011) felt that the intervention was not long enough to generate long-term change in children and that longer programs may create more lasting changes.

Action Schools! British Columbia (AS! BC) created a whole school-based physical activity education program intended to increase physical activity throughout the school-day, not just in the physical education classroom (Naylor et al., 2006). This year-long intervention increased physical activity time by approximately ten minutes per school day (55.2-66.7 minutes/week) (Naylor et al., 2006). While this is a small number, Naylor et al. (2006) highlighted that any increase was positive and contributed to the total minutes spent in MVPA. During the school day if children participated in an additional 10 minutes of MVPA, this accounted for one-sixth of the recommended 60 minutes of MVPA needed per day.

Sallis et al., (1997) conducted a 2-year research project which looked at the benefits of the SPARK program using a physical education specialist as the PE instructor, or a regular classroom teacher, compared to control schools, which conducted PE programs as per usual. The SPARK program consisted of specialized PE lessons, where half the class time (15 minutes) was primarily devoted to activities designed to increase cardiovascular endurance and half to activities designed to improve motor skills through sport activities such as basketball, softball and Frisbee (Sallis et al., 1997). Children in the SPARK program were offered a greater number of PE classes per week than children in the control group, and participated in a greater number of MVPA minutes per week (Sallis et al., 1997). Specialist-led SPARK PE classes accumulated the highest number of MVPA minutes at 40.2 min/week, teacher-led SPARK PE classes had the second highest at 32.7 min/week and control PE classes accumulated only 17.8 min/week (Sallis et al., 1997). No measurement was conducted to determine if the motor skill activities were effective at improving motor skill competence. Overall, the SPARK program had a significant effect on MVPA minutes per week, but did not reach the increases seen in the

AS! BC intervention, likely because the intervention was limited to the PE classroom setting (Naylor et al., 2006; Sallis et al., 1997)

The CATCH program was a three year long school-based intervention, which provided healthy school lunches, modified physical education classes and age-specific health information, as well as some home based learning and activities. Significant reductions in energy intake from fat were seen in the intervention group, as well as significant increases in self-reported vigorous physical activity minutes per day (Luekper et al., 1996). A three-year post-intervention follow-up showed some persistence of these changes into adolescence (Nader, et al., 1999). It should be noted that the difference between the control and intervention groups narrowed, but were still significant into adolescence (Nader et al., 1999). Nader et al. (1999) concluded that intervening during elementary school can have a lasting impact on children that is maintained into adolescence. This is significant as physical activity has been shown to decrease significantly into adolescence (Active Healthy Kids Canada, 2011; Campagna et al., 2005). Data from the CATCH study was self-reported, which could mean that values were inflated, but a self-report bias is likely to be seen in all groups, and would not necessarily discount the differences seen between groups.

Studies continue to examine the effectiveness of school-based interventions, with the Active for Life Year 5 program conducting a cluster randomised-control intervention conducted over one year with a 12-month follow-up (Lawlor et al., 2011). This study primarily hopes to improve engagement in physical activity, reduce time spent in sedentary activities, and increase fruit and vegetable consumption, with secondary aims to reduce screen-time, reduce unhealthy snack food consumption and improve body composition (Lawlor et al., 2011). Overall it appears that school-based interventions

increase time spent engaged in physical activity, but not necessarily MVPA, and only to a small degree (e.g., approximately 8-10 minutes per day). Some interventions have had success in creating sustainable change (Nader et al., 1999), but this is not consistently seen – or measured objectively. While any increase in physical activity is of benefit, teachers cannot be held solely responsible for physical activity minutes accumulated during the day, as they are also responsible for important educational outcomes in other subjects such as mathematics, reading and science and social outcomes, such as fostering positive relationships, behaviour management and aiding children with physical or cognitive disabilities. Additionally, physical education classes cannot be solely called upon to fulfill this activity void, as these classes have an instructional basis, and strive to teach movement skills, which is an important factor in fostering lifelong physical activity that should not be dismissed (Stodden et al., 2008; Stratton et al., 2008). While school interventions do have a role in increasing time spent in MVPA, research needs to look beyond to create more substantial change.

2.5 School-Based Motor Skill Programs and Interventions

A few well-designed school-based interventions have been researched in order to assess their efficacy on developing motor skill proficiency. Programs have shown an increase in motor skill proficiency over long-term interventions, and these increases have been sustained over time (Barnett et al., 2009b; van Beurden et al., 2002; van Beurden et al., 2003; Cowley et al., 2010). The number of interventions that have taken place is minimal with the majority of research coming from the Move it Groove it (MIGI) program, and greater research is needed to see if these interventions are replicable to other research projects.

MIGI is an Australian PE intervention and was undertaken at several elementary

schools that has had some success (Barnett et al., 2009b; van Beurden et al., 2002; van Beurden et al., 2003). The program saw significant changes in motor skill proficiency amongst elementary school children, with a greater percentage of children being able to effectively perform measured motor skills, and these increases were sustained over a six-year period (Barnett et al., 2009b). Additional research has shown similar success with increasing motor skill proficiency and sustaining these changes (Cowley et al., 2010). Clearly, interventions can be influential on improving motor skill proficiency; however, research has yet to determine whether after school programming can play a role in this.

2.6 The After School Time Period

In order to ensure all children are meeting the recommended 60 minutes of MVPA per day, researchers need to look outside of the school day to promote physical activity. During a typical school day children only spend between 6 and 7 of their 14 waking hours at school, which leaves a gap of 7-8 hours that children are not being targeted. Additionally, even if children are meeting the recommended 60 minutes of MVPA per day during the school day, if they are sedentary during the rest of the day, they are still at health risk. Recently, the after school time has become a hot topic for physical activity research. Active Healthy Kids Canada focused their 2011 Physical Activity Report Card on the 3-6pm time period, and called researchers to action to further investigate this period of time (Active Healthy Kids Canada, 2011). In Nova Scotia the Active Kids Healthy Kids out-of-school time programs, which includes after school programs, are highlighted as a program that requires support to provide opportunity for physical activity programs (NS Health Promotion and Protection, 2007).

Research has begun to develop a picture of the after-school time period in order to provide better understanding of how best to target this time period. During the 3-6 pm

time period children are engaged in MVPA for an average of only 14 minutes out of a potential 180 minutes (Colley et al., 2011). Active Healthy Kids Canada (2011) further analyzed this data and found that 33% of this time was spent in light physical and activity and 59% of this time period was spent in sedentary behaviours. Additionally, a special analysis of Keeping Pace: Physical Activity and Healthy Eating Among Children and Youth found that amongst Grade 3 Nova Scotian children, girls participate in 38.70 minutes of MVPA (23.87% of time), 62.07 minutes of sedentary behaviour (38.28%) and 61.37 minutes of light activity (37.85%) and boys participate in 38.50 minutes of MVPA (24.40%), 54.26 minutes of sedentary behaviour (34.39%) and 65.02 minutes of light activity (41.21%), during the after school time period (Keeping Pace, unpublished). As of yet research has not begun to break down precisely how much of this time is engaged in screen activities; however, 73% of parents reported that their children between the ages of 5 and 17 engaged in sedentary activities during the after school period, which included reading, watching television, and playing video or computer games (CFLRI, 2010). Parent data also showed that 65% of Canadian children do homework in the after school time period, which may account for some of the sedentary behaviours (CFLRI, 2010). Other research has shown that Canadian teenagers spend approximately 6 hours per day on screen-related activities outside of school on weekdays (Active Healthy Kids Canada, 2011). Although there is no definitive research on what sedentary behaviours Canadian children and youth pursue during the after school time period, it appears that a significant amount of time is spent on screen-based activities.

A longitudinal study that took place between 1991 and 2007 showed that the majority of time spent in MVPA for children occurred during the after school time period (Nader, Bradley, Houts, McRitchie & O`Brien, 2008); however, the majority of children

are still not meeting physical activity guidelines (Active Healthy Kids Canada, 2011). Research needs to target the after school time period as a way to incorporate greater amounts of physical activity into the day. Encouraging the use of active transport (bicycling, walking, skateboarding, etc.) has been one suggested method for doing this (Active Healthy Kids Canada, 2011). After school programs, as well as non-programmed opportunities to engage in physical activity during the hours immediately after school, are another major target for increasing activity time and decreasing sedentary time (Active Healthy Kids Canada, 2011). Research has shown that time spent in MVPA decreased significantly on a yearly basis between the ages of 9 and 15 years (Nader et al., 2008; Thompson & Wadsworth, 2012), which means interventions and programs need to look at targeting children of all ages, as well as look at what is inhibiting adolescents from participating in sufficient levels of physical activity to meet the guidelines and what factors promote continued participation in physical activity.

In order to generate a picture of what the accessibility and attendance rates of current after school programs offered in Canada, a subsample of parents surveyed for the Physical Activity Monitor were asked specific questions regarding these issues (CFLRI, 2010). Findings revealed that after school programming is not universally accessible for Canadian youth with only 28% of parents reporting that their child had access to a supervised program (CFLRI, 2010). In Nova Scotia, more than 50% of children and youth indicated that they have access to an after school program (Thompson & Wadsworth, 2012). This discrepancy may not necessarily represent an actual difference, as Canada wide data was reported by parents, as opposed to children. Age plays a significant role in access to programs, with 33% of children aged 5-12 years with access compared to only 21% of youth aged 13-17 years (CFLRI, 2010). Additionally, children living in larger

communities with a population greater than 250,000 have greater access to after school programs than children living in smaller communities (CFLRI, 2010). Within the group of parents reporting their child having access to such supervised after school programs, 35% of children aged 5-12 years attend one on a daily basis, but less than 15% of 13-17 year olds have similar attendance (CFLRI, 2010). Of those with access, less than 15% of children aged 5-12 never attend an after school program, compared to almost 30% of adolescents aged 13-17 (CFLRI, 2010). These discrepancies may be due to parents allowing older children to care for themselves after school, or disinterest from older children in engaging in such programs, but may also be a result of a lack of programming for older children. When both groups are combined, 81% of children and youth aged 5-17 years with access to a supervised after school program attend on at least 1 day of the week (CFLRI, 2010).

According to parents, the majority of these programs are offered at schools, with smaller percentages offered at a community or recreation centre (16%), in someone's home or at a daycare (10%) or somewhere else (14%) (CFLRI, 2010). Physical activity was most commonly cited as the primary focus of these programs, with 41% of parents responding as such (CFLRI, 2010). Other primary purposes included daycare (27%), homework and tutoring (17%) or other (15%) (CFLRI, 2010). With such a high percentage of parents indicating physical activity as the primary purpose of the program, further investigation into whether children obtain a significant amount of physical activity from these programs is warranted.

2.7 After School Programs and Interventions

Researchers have started to examine the feasibility of utilizing programs taking place in the after school time period to increase time children spend in MVPA during 3-

6pm. This research has been primarily interventions, and has studied increases in physical activity participation. Some studies have also examined additional physical health factors. A meta-analysis looked at the outcomes of 11 after school physical activity interventions, and found that physical activity time, physical fitness (as measured by cardiovascular outcomes, skeletal health or muscular strength), body composition (i.e. BMI, waist circumference, skinfold measurements) and blood lipids all improved after interventions, but no effects were seen in psychosocial constructs or sedentary activities (Beets, Beighle, Erwin & Huberty, 2009). Beets et al. (2009) highlighted that more research is needed to determine what components of a program make it successful. A systematic review attempted to clarify what aspects of interventions rendered them effective or ineffective, but found little conclusive data (Atkin, Goreley, Biddle, Cavill & Foster, 2011). Atkin et al. (2011) commented that what set successful interventions apart was focusing on only increasing physical activity, as opposed to incorporating other outcomes, such as healthy eating. One unique research project examined general after school programs to determine time spent in MVPA during program time (Trost, Rosenkranz, & Dzewaltoski, 2008). Additional research such as this also needs to be undertaken, in order to see if current physical activity based programs are providing the opportunities and benefits they claim. Additionally, if children are not attending an after school program or if they are attending non-physical activity based programs research should examine if they are meeting physical activity guidelines on their own, and if not, how can they be engaged in physical activity programming.

Trost et al. (2008) examined seven existing after school care programs in the Midwestern US to determine the amount of time children spent in MVPA during program time, and during what aspects of the program were children the most active.

Accelerometers were used to measure MVPA and VPA on 140 participants, and data was collected six times over the course of one academic year; however, individual participants were involved in a varying number of data collections ranging from one to six (Trost et al., 2008). On average, participants spent 13.4 minutes in MVPA and 6.9 minutes in VPA, totalling 20.3 minutes of activity per day (Trost et al., 2008). Activities were broken down by type and location, and six specific after-school sessions were identified: free play indoors, organized PA indoors, free play outdoors, organized PA outdoors, snack time and academic time (Trost et al., 2008). Time spent in MVPA was greatest during indoor and outdoor free play sessions, and organized PA indoors was significantly greater than organized PA outdoors, but less than free play (Trost et al., 2008). Additionally, boys were significantly more active than girls, and overweight children were significantly less active than their non-overweight peers (Trost et al., 2008). While the amount of MVPA and VPA children were participating in appeared promising, the researchers cautioned that programs should be doing more to increase activity levels in participating children because they are still not meeting guidelines (Trost et al., 2008). In addition, Trost et al. (2008) highlighted the importance of finding activities that would target all groups in order to increase activity level in the girls and the overweight children.

Certain after school interventions have been successful in increasing physical activity in youth, and have been gaining interest both in the literature, as well as in mainstream society. Community centres such as the YM-YWCA and the Boys and Girls Club of Canada have started to implement these programs on a larger scale, showing that existent after school programs can provide exceptional opportunities for physical activity. Programs such as Coordinated Approach to Children's Health (CATCH) Kids Club, Get Building the Ultimate and Sensational You! (Get BUSY!), Cool Moves, Kidfest's

Running and Reading Club, and Active by Choice Today (ACT) are all programs that attempt to increase the amount of physical activity children engage in during the after school time period, as well as provide education or information on nutrition with the exception of Kidfest's Running and Reading Club, which was a combined physical activity and literacy intervention (CCBR, 2010; Darisi, Love & Newberry, 2010; Kelder, Hoelscher, Barroso, Walker, Cribb & Hu, 2005; Sharpe, Forrester & Mandigo, 2011; Wilson et al., 2011).

The CATCH Kids Club (CKC) is a subsequent project to the original CATCH program, which was run in a school-based setting, and both programs continue to operate today (Kelder et al., 2005). CKC is a widely implemented program throughout North America, and is often conducted through YM-YWCA and Boys and Girls Club locations (Sharpe et al., 2011). The program has four main physical activity objectives, which Kelder et al. (2005, p.134) outlines:

> "1. Involvement of students in at least 30 min of daily physical activity;
>
> 2. involvement of students in MVPA for at least 40% of daily physical activity time;
>
> 3. providing students with many opportunities to participate and practise skills in physical activities that could be carried over into other times of the day and maintained later in life; and
>
> 4. providing students with a variety of enjoyable physical activities."

CKC also provides an educational component, which includes information on making healthy physical activity and food choices in one's daily life (Kelder et al., 2005). An initial pilot study was run in the early 2000s, which evaluated activity levels using direct observation, as well as diet, healthy behaviours, and knowledge of healthy food (Kelder et

al., 2005). Observed movements were divided into five categories: lying down, sitting, standing, walking and very active, of which walking and very active were summed to represent MVPA (Kelder et al., 2005). This categorization system is in accordance with the System for Observing Fitness Instruction Time (SOFIT), a validated physical activity program measurement tool (Kelder et al., 2005). There was a significant difference between the intervention and the reference groups in the change in amount of time spent in MVPA (Kelder et al., 2005). Not only was time spent in MVPA increased in the intervention group, but time spent in sedentary activities was decreased (Kelder et al., 2005). Walking may not be representative of MVPA, as slow walking does not usually meet the MVPA threshold and fast walking exceeds it. A more objective measure of MVPA, using a tool such as accelerometers, may provide a different insight into time spent in MVPA in this program.

The CKC was implemented in 330 after-school programs in Ontario at YMCA and Boys and Girls Club locations in 2008 (Sharpe et al., 2011). A sample of these sites were examined using a pre-test/post-test design comparing 22 YMCA CKC sites, 12 YMCA control sites and 6 Boys and Girls Club sites (Sharpe et al., 2011). The Boys and Girls Club sites were running a sports program at baseline, and the YMCA sites were running general activity programming (Sharpe et al., 2011). Only a small increase in MVPA was seen at YMCA CKC sites, and time spent in MVPA at YMCA control sites was in fact higher than at YMCA CKC sites (Sharpe et al., 2011). The only significant change seen was the increase in MVPA seen between the Boys and Girls Club sports program at baseline and the Boys and Girls Club using the CKC program (Sharpe et al., 2011). It was thought that this difference was because the shift in program focus allowed the activities to be more inclusive, instead of only targeting children with an interest in

sports (Sharpe et al., 2011). Sharpe et al. (2011) expressed that the biggest surprise overall was that all programs at baseline had children engaged in MVPA for greater than 35% of the program time. Current after school programs with a physical activity component or focus may already be providing a positive contribution to total minutes of MVPA children are engaged in per day, but there is no research to confirm this.

The Boys and Girls Club have developed two after school initiatives intended to increase healthy behaviour choices, and develop life skill such as leadership and communication (CCBR, 2010). The Cool Moves program is considered a sub-set of the Get BUSY! Program, with a specific focus on healthy eating and physical activity (CCBR, 2010). The programs are unique because they are geared towards older children and youth, aged 11-17 (CCBR, 2010; Darisi et al., 2010). While no peer-reviewed research has examined the two programs, evaluative reports have been done by the Centre for Community Based Research, a non-profit organization and the two programs have been highlighted in the 2011 Active Healthy Kids Canada report card (Active Healthy Kids Canada, 2011; CCBR, 2010; Darisi et al., 2010). Overall, the evaluative reports found that the programs were well-accepted and enjoyed by the participants, but there was no significant change in self-report of physical activity participation (CCBR, 2010; Darisi et al., 2010). A more structured research design, utilizing objective measures, may provide better insight into the efficacy of the two programs at increasing physical activity amongst participants.

The ACT program conducted an after school intervention over a 17-week period at 12 intervention and 12 control schools throughout South Carolina (Wilson et al., 2011). Low-income and minority adolescents were specifically targeted for this intervention, as rates of obesity are typically higher in these populations (Wilson et al., 2011). The

intervention was comprised of three components: snack and homework, physical activity and motivation activities (Wilson et al., 2011). MVPA was measured at baseline, mid-intervention and two weeks post intervention via accelerometers (Wilson et al., 2011). On program days, the intervention group engaged in approximately 9 min more of MVPA, a weekly increase of 27 min of MVPA from baseline; however, outside of the program no increases in MVPA were seen (Wilson et al., 2011). The ACT program saw minimal increases in MVPA, but noted that these were clinically significant for the population (Wilson et al., 2011). Accelerometry is an objective measure of activity intensity, and therefore the results are likely more accurate than in evaluations of the CKC.

Research on the contribution of after school programs to total minutes of MVPA has been limited, and primarily focused on interventions. Large scale studies, like research on the CKC program have utilized non-objective measurements, such as SOFIT, to quantify physical activity involvement. Other research has been evaluative in nature, or the findings have gone unpublished. A systematic review of these after school program interventions has been conducted, but few conclusive recommendations have come from this review (Atkin ,Gorely, Biddle, Cavill, & Foster, 2011). Ultimately the review highlighted that interventions that focused solely on physical activity had higher success rates in increasing time spent in MVPA than programs with multiple outcomes, but that location of program, such as a school or community setting, was not necessarily important (Atkins et al., 2011). The current body of research fails to capture whether current after school care programs with a primary focus on physical activity are engaging children in significantly greater amounts of MVPA during the 3-6pm time period than national averages show children to be engaging in. There is a need for further research into after school programming in order to gain funding and recognition for programs that

are effective in engaging children in MVPA, as well as to provide recommendations for programs in order to increase the amount of time children are engaged in physical activity in the after school time period.

2.8 After School Motor Skill Programs and Interventions

Little research exists on the subject of motor skill interventions taking place in the after school hours; however, one short-term high intensity intervention did show positive results (Matvienko & Ahrabi-Fard, 2010). Kindergarten and first grade students either participated in an intervention or a non-intervention control group (Matvienko & Ahrabi-Fard, 2010). From baseline to four-weeks the intervention group saw significant improvements in the three measured motor skills (kicking, throwing distance and stationary jumps with a jump rope) and at follow-up four months later there remained a significant difference between throwing and jumping than the control group (Matvienko & Ahrabi-Fard, 2010). While these results are promising, the study utilized outcome measures, as opposed to process measures, to test motor skills, which have not been positively correlated with engagement in physical activity (Stodden et al., 2008) and the intervention appeared to cater towards improving these three skills. There remains a gap in the literature as to the effects after school programs have on the development of motor skills.

2.9 Summary

Given the documented benefits and low prevalence of physical activity, establishing regular physical activity behaviours in children that will be maintained throughout the lifespan is a key goal for the current population (Active Healthy Kids Canada, 2011). Creating time and opportunity for children to achieve this is a first step, and the after school time period has been highlighted as a "critical period" for increasing

physical activity participation (Active Healthy Kids Canada, 2011). While being physically active as a child is a predictor of lifelong physical activity, other factors have been identified including motor skill proficiency (Stodden et al., 2008). The after school time period may provide an ideal opportunity for children to both engage in MPVA and improve FMS proficiency. Current research has examined interventions aimed at achieving these goals individually both during the school day and the after school time period, and together during the school day; however, research has not examined current after school programming to see if these outcomes are already being met, and whether program time affects these outcomes. Understanding what current programs are accomplishing will provide valuable information to the literature as to whether further intervention research is needed to generate programs that will meet these goals, or whether current programs can be examined in order to provide direction to future programs, as well as help programs already meeting these goals receive the attention they deserve. Finding ways to increase MVPA engagement in childhood, which hopefully will translate into increased MVPA in adulthood, will help the population receive the health benefits associated with sufficient physical activity, and potentially increase the health of the overall population. Accordingly, the purpose of this project is to measure the effectiveness of two current after school programs with a physical activity focus at promoting time spent in MVPA and improving motor skill proficiency.

2.10 Research Questions

Primary Questions:

1. Do children attending a low-organized games based after school care program engage in more MVPA and less sedentary behaviours than children attending a structured sport-based after school care program, and do children attending these

programs engage in more MVPA and less sedentary behaviours than regional and national averages for the after school time period?

2. Do children attending a low-organized games based after school care program have a faster rate of motor skill development than peers attending a structured sport-based after school care program?

Secondary Questions

1. Is there a correlation between motor skill proficiency and time spent in MVPA for children attending physical activity based after school care programs?
2. Is there a difference in the correlation between motor skill proficiency and time spent in MVPA for children attending a low-organized games based after school care program and children attending a structured sport-based after school care program?

Chapter Three: Methodology

3.1 Study Design

This research project employed a non-randomized quasi-experimental design, and utilized within and between group measures to generate group comparisons. Data collection took place over 13-weeks. Ethical approval for the research project was obtained from the Dalhousie Health Research Ethics Board.

3.2 Study Site

Research took place at two established after school programs within the Halifax Regional Municipality (HRM). A low-organized games-based program, and a structured sport-based program were chosen through purposeful sampling following an internet search of all after school programs offered within the HRM. Eighteen programs were considered, and the two chosen were selected on the basis of providing care to a large number of children (>50), access to playground or jungle gym type equipment, a focus on physical activity, and convenience, as both programs were located within Metro Halifax.

3.3 *Recruitment*

Program coordinators of the two selected programs within the HRM were initially contacted through an emailed letter outlining the details of the research project (see Appendix A), which was followed-up with telephone contact to determine interest, and finally a meeting with the primary investigator was arranged so that questions and concerns could be addressed. Both programs provided written agreement to participate in the research project (see Appendix B).

Parents/guardians of program participants received initial information regarding the research project in late August and early September 2012 through letters sent via email by the after-school program coordinators of the program that their children were

registered in (see Appendix C). Additionally, the principal investigator held information sessions during the first week of program in early September 2012 with program registrants to follow-up for interest, provide formal invitation letters and consent forms, and thoroughly explain the research project to the parents and children so that they were able to make informed consent/assent (Appendix D and E). Male and female participants between the ages of 5 and 10 years were recruited to participate in this study, as the Test of Gross Motor Development 2 (TGMD-2) does not provide normative data for children over the age of 10.9 years. Additionally, many after school programs within Halifax only provide programming for children up to age 10, as noted during the internet search.

3.4 Procedures

Informed consent from parents and assent from the program participants were obtained during the first weeks of September, 2012. Birth date and participation in other organized physical activity programming was collected through a parent survey. Baseline motor skill proficiency, height and weight were collected at the pre-test. These measures were collected again at follow-up approximately 11 weeks later. In accordance with the protocol, pre- and post-testing of motor skill proficiency using the TGMD-2 was videotaped. The video recording also allowed for a secondary tester to score the data to generate inter-rater reliability.

Physical activity data was collected using accelerometers during one week of program time. Data was collected on separate weeks at each program in order to facilitate daily accelerometer distribution and collection. These weeks were separated by two weeks due to civic and school holidays so that a full five day snapshot of typical program physical activity could be analyzed. The weeks were not immediately before or after motor proficiency data collection, in order to help minimize interruption to programs. The

principal investigator, along with a research assistant distributed accelerometers to children at the low-organized games program upon their arrival at the after school program from their classrooms. Program leaders distributed accelerometers at the sports program, as children are picked up at multiple locations and walked to the program center. Accelerometers were collected from children at both programs when they left at the end of each day. This was to ensure maximal wear of accelerometers during program time.

3.5 Measures

3.5.1 Demographic Information

Birth date and gender were collected from all participants. This information was required to calculate a motor skill proficiency score from the TGMD-2. Height was collected using a portable seca stadiometer (seca GmbH & Co., Hamburg, Germany) and measured to the nearest 0.1 cm. Weight was collected using a Health o Meter digital scale (Model: 349KLX, Jarden Co, Rye, NY) and measured to the nearest 0.1 kg. The scale was calibrated prior to data collection. Height and weight measurements, along with age and gender were used to determine group similarities and differences between the two programs.

3.5.2 Motor Skill Proficiency: Test of Gross Motor Development 2 (TGMD-2)

The TGMD-2 is a validated test of motor skill proficiency. Six locomotor skills, (run, hop, leap, gallop, slide and horizontal jump) and six object control skills (over-hand throw, strike, underhand roll, stationary ball bounce, two-hand catch and kick) are assessed, and make up the two sub-tests of the larger motor skill test. A large sample of US children aged 3-10 years were used to develop norm-referenced scoring (Ulrich, 2000). For the locomotor subtest, Ulrich (2000) noted test-retest reliability is r=0.88

(α=0.85) and for the object control sub-test it is r=0.93 (α=0.88). As previously mentioned, pre- and post-testing of the TGMD-2 was videotaped to establish inter-rater reliability. The secondary viewers watched 10 videos and were assigned either the locomotor or object control subset to view. Each viewer was given a short training session on how to use the TGMD-2 using video data he or she would not be scoring. For the current study, inter-rater reliability was found to be 0.80 or good for the locomotor subset and 0.93 or excellent for the object control subset, as measured by Cronbach's alpha. The TGMD-2 is a preferred test of motor skill proficiency as it measures both motor skill process and outcome, as opposed to outcome only tests. Approval to use the TGMD-2 can be found in Appendix I.

3.5.3 Physical Activity

Tri-axial Actigraph accelerometers (Model: GT3X, Pensacola, FL) were used to measure time spent in MVPA and VPA. The GT3X accelerometer measures steps taken, activity counts, energy expenditure and activity levels, and has a frequency range of 0.25 to 2.5 Hz, which allows it to detect regular human movement, but does not detect high frequency vibrations, which may be present from other sources. Vertical accelerations from 0.05 to 2.5 Gs can be accurately measured by the GT3X. Accelerometers are a reliable and valid measure of intensity of physical activity (Freedson et al., 1998). Previous research has been used to establish cut-points for accelerometer counts, which correspond to activity levels from 0-1.5 METs (sedentary activity), 1.6-2.99 METS (light activity), 3.0-5.99 METS (moderate activity), 6.0-8.99 METS (vigorous activity), and >9.0 METS (Freedson et al., 1998). Age-related equations were used to calculate these cut-points, as age can directly affect accelerometer counts (Freedson, Pober, & Janz, 2005). A 5-second epoch was chosen, as previous research has established that children

typically perform physical activity, particularly vigorous activity, in short spurts lasting less than 10 seconds (Baquet, Stratton, Van Praagh, & Berthoin, 2007; Nilsson, Ekelund, Yngve, & Sjostrom, 2002). Accelerometers, placed in small pouches on an elasticized belt were worn around the waist of the participants. Participants removed accelerometers if they went swimming. For the sport program participants this ranged from 0-3 times per week; however, for the low-organized games program participants this occurred 1 time every two weeks. During the week of physical activity data collection, half of the low-organized games program participants engaged in swimming activities.

Physical activity data was compiled into three categories sedentary behaviour, light physical activity, and MVPA, which was calculated from moderate and vigorous physical activity. Data were analyzed using Actilife 6 software. Percentage of time spent in each of sedentary behaviour, light physical activity, and MVPA were calculated using the software in order to compare between the two programs, as program length differed and participants were picked up by parents at varying times. Minutes of time spent in sedentary behaviour, light physical activity, and MVPA were calculated using average wear time per day, and percentage of time spent in the three respective activity states.

3.5.4 Program Adherence: Attendance and Other Activities

Administrators provided the number of days per week the participants were registered in the program. Attendance over the data collection period was not collected, due to logistical difficulties with the two programs. Additionally, parents were asked to fill out a survey itemizing any other physical activity or sport related programs their child attended during the course of the research project, and how many hours they spent at each program during the week (see Appendix F).

3.5.5 Program Structure

Sample weekly program schedules were obtained from both programs during the week of physical activity data collection in order to provide a picture of what activities children participated in and can be found in Appendix G. Typical daily schedules for the two programs can be found in Table 1. While both programs had access to indoor and outdoor play areas, the low-organized games program typically spent program time outdoors, and the sports program spent program time indoors. Program administrators were asked to provide additional detail on program structure and goals (see Appendix H).

Table 1

Typical daily schedules for the games and sports programs.

Time	Low-organized games	Sports
2:30-3:00	School still in session.	School still in session for approximately half of program participants. Pick up at some schools, and walk back to program centre.
3:00-3:30	School day ends, children make their way to classrooms for snack/unstructured seated activities.	Pick up at other schools, and walk back to program centre. Unstructured free play on playground and snack time for children in attendance already.
3:30-3:45	Snack/Unstructured seated activities.	Unstructured free play on playground and snack time.
3:45-4:00	Transition to outdoor time.	Unstructured free play on playground and snack time.
4:00-5:00	Structured physical activity (15-60 min) followed by unstructured free play on playground.	Structured activity.
5:00-5:30	Unstructured free play on playground until pick up.	Unstructured free play on playground until pick up.
5:30-6:00	Program no longer in session.	Unstructured free play on playground until pick up.

3.6 Statistical Analysis

All statistical analysis was done using IBM SPSS Version 20. Independent samples t-tests were used to test for differences between the two programs in terms of time spent in sedentary behaviour, light physical activity and MVPA, as well as change in motor skill proficiency. Additionally, effect sizes were calculated in order to determine

differences in change in motor skill proficiency between groups. Effect size may provide a greater understanding of group differences, particularly when using a scale, such as the TGMD-2, where significance may not reflect meaningful group differences (Coe, 2002).

Pearson correlation coefficients were determined for time spent in MVPA and motor skill proficiency scores, for each individual program, as well as the two programs combined, and the coefficient of determination and effects were examined for statistical and clinical relevance. Finally, group differences were tested in terms of age and biological sex of participants, and other activities, in order to determine if any significant differences existed between groups.

3.7 Ethical Considerations

Ethical approval for this project was obtained by the Dalhousie Health Research Ethics Board. All electronic data were encrypted using True Crypt and stored on a password protected computer in a locked office. All video tape data and paper records were stored in a locked cabinet in a locked office. Data were recorded using participant codes in order to ensure confidentiality.

Anthropometric data were taken confidentially and only recorded using participant codes. Both the principal investigator and research assistant who attended the after school program sites undertook criminal record and Nova Scotia Child Abuse Registry checks, as per standard child protection guidelines. Copies were provided to both after school programs.

Chapter 4: Results

4.1 Participants

Forty-one individuals returned signed parental consent, assent and questionnaires detailing structured physical activity participation outside of the after-school program. Of the 41 participants, two did not attend their after school program during the week of physical activity data collection and one participant did not complete the motor skill post-test due to a family move. Detailed participant information can be found in Table 2, organized by after-school program type.

Table 2

Pre- and post-test sex, age, height, weight, and registration of after-school program participants

	Games	Sports
Sex		
Male	9	9 (8 at post-test)
Female	16	7
Age (years)		
Pre-test	7.64 (1.06)	8.18 (1.22)
Post-test	7.87 (1.07)	8.37 (1.27)
Height (cm)		
Pre-test	126.22 (10.33)	130.19 (8.20)
Post-test	127.42 (10.38)	130.69 (8.29)
Weight (kg)		
Pre-test	27.85 (8.19)	28.89 (8.07)
Post-test	28.24 (8.57)	28.25 (6.62)
Days registered in program	5	3.67

Note: Significantly more females ($p<0.05$) than males were recruited. Values represented as XX (XX) indicate $\bar{x}$ (SD).

4.2 Physical Activity

As not all participants were in attendance during the week of accelerometer data collection at least one day of objective physical activity data was collected from 22 (15 females; 7 males) participants from the games program and 17 (9 females; 8 males) participants from the sports program. Participants from the games program wore accelerometers for an average of 4.08 days out of 5 potential wear days, providing an average of 94.94, SD=18.81 min/day worn. Participants from the sports program wore accelerometers for an average of 3.60 days out of 5 potential wear days, providing an average of 101.87, SD=19.76 min/day.

Percentage of time in sedentary behaviour, light and MVPA can be found in Table 3. Using average wear time and average percentage of time in MVPA, children in the games program participated in approximately 48.12 minutes of MVPA during program time and children in the sports program participated in approximately 65.74 minutes of MVPA during program time.

Table 3

Mean, SD, minimum and maximum percentage of program time spent in MVPA, light activity and sedentary behaviour between games and sports program*

	Games	Sports	p-value
Sedentary (%)	38.50 (10.79)	26.09 (9.13)	0.001
Light (%)	10.84 (1.68)	9.38 (1.88)	0.016
MVPA (%)	50.69 (10.80)	64.53 (9.00)	0.000
Minimum MVPA (%)	32	42.40	
Maximum MVPA (%)	69	75.91	

* MVPA = Moderate to vigorous physical activity
Note: Values represented as XX (XX) indicate $\bar{x}$ (SD).

When MVPA was broken down into moderate, vigorous and very vigorous activity, there was no difference in time spent in vigorous and very vigorous activity between the two groups (p>0.05). The sports program participants spent on average 11.70%, SD=5.25% of program time in vigorous activity and 1.84%, SD=1.95% of program time in very vigorous activity. The low-organized game program participants spent on average 8.65%, SD=5.41% of program time in vigorous activity and 1.80% SD=2.04% of program time in very vigorous activity.

4.3 Motor Skill Development

Only 40 of the recruited 41 participants completed both the pre- and post-test of the motor skill assessment. From the games-based program 25 participants (9 males; 16 females) were included in the data analyses, and from the sports-based program17 participants (8 males; 9 females) were included. GMQ, Locomotor Raw Score and Object Control Raw Score data can be found in Table 4. GMQ for the low-organized games

program participants GMQ scores indicate a percentile rank between the 12th and 16th percentile at pre-test, and the 21st and 27th percentile at post-test, and the sports program participants scores indicate a percentile rank between the 21st and 27th percentile at pre- and post-test (Ulrich, 2000).

Table 4

Pre-test and post-test GMQ and GMQ change scores for the Games and Sports after school programs*

	Games	Sports	p-value	Effect size (eta squared)
GMQ				
Pre-Test	83.20 (12.09)	89.20 (10.26)	0.911	0.063
Post-Test	88.84 (8.90)	89.60 (12.05)	0.092	0.001
Change score	5.64 (8.76)	0.40 (12.82)	0.160	0.058
Locomotor Score				
Pre-Test	36.48 (5.95)	38.20 (5.66)	0.373	0.021
Post-Test	38.84 (4.00)	39.80 (5.23)	0.517	0.011
Change score	2.36 (4.24)	1.60 (4.15)	0.584	0.008
Object Control				
Pre-Test	30.24 (8.32)	35.00 (7.56)	0.078	0.079
Post-Test	32.72 (6.66)	36.27 (10.75)	0.204	0.042
Change Score	2.48 (5.47)	1.27 (8.84)	0.594	0.008

* GMQ = Gross Motor Quotient

Note: Effect size values are: Small effect = 0.0099, Moderate effect = 0.0588, Large effect = 0.1379 (Cohen, 1988). Note: Values represented as XX (XX) indicate $\bar{x}$ (SD).

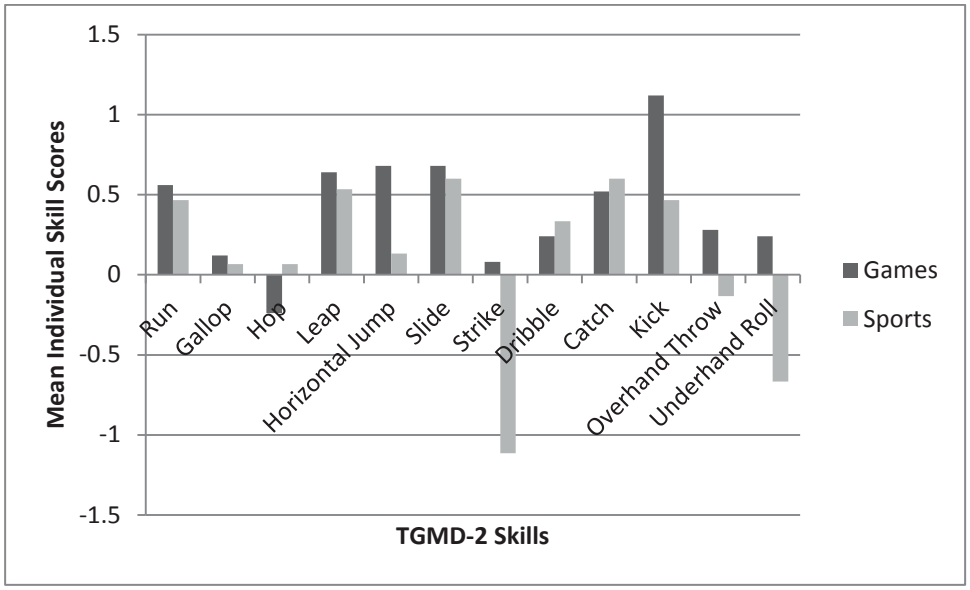

Figure 1. Mean change scores in 12 individual skills tested using the TGMD-2 for the Low-Organized Games and Sports programs, no statistical significance was found between the two groups for any individual skill.

4.4 Correlation between MVPA and Motor Skill Proficiency

No correlation was found between pre-test GMQ scores and time spent in MVPA in either the games (r=0.045) or sports groups (r=-0.083); however, a small, positive correlation was found when both groups were combined (r=0.171). At post-test, moderate, positive correlations were found between pre-test GMQ scores and time spent in MVPA in both the games (r=0.315) and sports groups (r=0.397). When both groups were combined, a significant moderate correlation was found (r=0.322, p=0.049).

4.5 Other factors

Sex differences were explored; however no significant differences were found between boys and girls in MVPA participation in either the games- or sports-based after school programs. As the sports-based program participants were picked up by program leaders and walked back to the program location it was explored whether this active

transportation time contributed to the difference in MVPA between the two programs. It was found that even with the 30 minute walk time removed, the sports-based program participants still engaged in significantly more MVPA ($\bar{x}$=61.04%, SD=10.36%, p=0.005). Participants from both after school programs participated in other structured physical activity programs; however, there was no significant difference in weekly hours of self-reported participation in other programs between the sports ($\bar{x}$ = 2.78, SD= 2.94) and games ($\bar{x}$= 2.40, SD= 1.56) programs, p=0.638. There was wide variance and no trends seen in the type of other structured physical activity programs attended by research participants.

4.6 Summary of Results

Participants from the sports-based program engaged in significantly more MVPA, and significantly less sedentary behaviour than participants in the games-based program. No significant differences were seen between the two programs in GMQ change scores; however, participants in the games-based program did increase their GMQ scores more than participants in the sports-based program, showing a moderate effect size. Comparative increases in the locomotor and object control sub-scores were found. Participants in the sports-based program had a number of decreases in individual skill scores, particularly the strike and underhand roll. Participants in the games-based program had a much greater increase in kick scores than participants in the sports-based program. No correlation was found in either group between time spent in MVPA and GMQ score at pre-test. A moderate correlation was found in both groups between time spent in MVPA and GMQ score at post-test.

Chapter 5: Discussion

5.1 Physical Activity

Children who participated in either the sports- or games-based programs obtained positive contributions to their daily physical activity. The sports program participants spent on average 65.74 minutes in MVPA during program time, which covers the minimum Canadian government recommendation of 60 minutes of daily MVPA (Tremblay et al., 2011b). The low-organized games program participants spent on average 48.12 minutes in MVPA during program time, which provides a major contribution towards the 60 minute daily minimum of MVPA recommended for children and youth. These findings support the conclusions of Sharpe et al. (2011) that after school programs with a physical activity focus may already be providing significant contributions to daily MVPA.

National research has shown that on average Canadian children aged 5-17 years participate in an average of 14 minutes of MVPA between the hours of 3 and 6 pm or 8% of their after-school time (Colley et al., 2011), which the participants of this study greatly exceeded. Direct comparisons between these two studies cannot be made due to the use of a 5 second epoch in this study, and a 60 second epoch used by the CHMS. While previous research has shown that a smaller epoch may collect greater vigorous physical activity data (Baquet et al., 2007; Nilsson et al., 2002), a small epoch is not necessarily feasible in large-scale studies such as the CHMS. This difference in data collection may create anomalies, making direct comparisons challenging. Additionally, the CHMS participants had a much greater age range of 5-17 years, versus the 6-10 year old age range used for this study. The differences are perhaps not surprising given that research has shown that participation in MVPA sharply decreases as children move into adolescence (Thompson

& Wadsworth, 2012). Thus, the lower levels of physical activity seen in the CHMS data may be due to the lack of physical activity participation in the older children and adolescents.

Data from the 2012 Nova Scotia Keeping Pace (KP) study may provide a more comparable result, as the results are broken down into three grade groups, as well as they are from Nova Scotia. Still, a similar limitation exists given the discrepancies in epoch length used (5 vs. 60 seconds). The KP study provides results for three age groups, Grade 3, 7 and 11, but for the purposes of this study, only Grade 3 data were compared, as the average age of a Grade 3 student, 8 years old, was comparable to the average age of participants in this study. Participants in both the sports- and games-based programs spent more minutes and a greater percentage of time in MVPA than the typical grade 3 boys and girls from Nova Scotia, who participated in an average of 38.50 minutes of MVPA (24.40% of time) and 38.70 minutes of MVPA (23.87% of time), respectively. Both the Nova Scotian and Canadian data sets measured physical activity participation between 3 and 6pm, a total of 180 minutes, rather than the specific program time measured in this study, which created an average wear time of 94.94 minutes per day for the low-organized games based program participants and 101.87 minutes per day for the sports based program participants. Despite this shorter time period, children in both the low-organized games based program and the sports based program of this study participated in more minutes of MVPA than the average Grade 3 student in Nova Scotia.

In addition to exceeding national and provincial physical activity averages for the after school time period, participants of this study participated in more than double the MVPA minutes in comparison to children attending a non-physical activity specific program, as found by Trost et al. (2008). The study by Trost et al (2008) found that on

average the after school program participants (n=140; $\bar{x}$=10.1 years) participated in 20.3 minutes of MVPA, while attending their after school program. This value is much smaller than the low-organized games and sports program participants of this study who engaged in averages of 48.12 and 65.74 minutes of MVPA per day during program time respectively. Although Trost et al. (2008) used a 30 second epoch, smaller than the CHMS and KP studies, direct comparisons to the current study should be interpreted with caution. Additionally, participants in Trost et al.'s (2008) study had a greater average age than participants in both the low-organized games and sports programs. This may have had a contribution to the smaller amount of time in MVPA. Nonetheless, the large difference in MVPA time during the after school programs suggests that physical activity concentrated after school programs may be more successful at engaging children in MVPA participation than generic after school programming/care. This is supported by Sharpe et al. (2011) who found that at baseline of their intervention study, after school programs with a physical activity focus were engaging children in MVPA for a minimum of 35% of program time. Overall, children who attended the two programs in this study participated in noticeably more MVPA than children in national and provincial studies, as well as children attending generic after school programs during the 3-6pm time period.

Sports-based program participants participated in significantly more MVPA than games-based program participants, contradictory to previous research that showed an increase in time spent in MVPA during after school program time when switching from a sport-based model to a games-based model (Sharpe et al., 2011). This difference may be explained by the type of participants in Sharpe et al.'s (2011) study since they were Boys and Girls Club participants, a general physical activity program open to all. In this study the sports based program participants elected to, or their parents elected to, enroll in a

multi-sport after school program potentially indicating increased motivation to participate in MVPA, as the children may already have been interested in sports, and therefore more likely to participate more vigorously in all aspects of the program. Additionally, Sharpe et al. (2011) examined the difference in MVPA participation after a switch in programming, which may have created a "novelty factor" for the children. In fact, children who were already participating in general YMCA after school programs did not experience an increase in MVPA participation (Sharpe et al., 2011). Interestingly, Trost et al. (2008) found that organized physical activity indoors contributed more to MVPA time in general after school programs than organized physical activity outdoors, which could also provide explanation for the results of this study, as the sports based program was predominantly indoors, and the low-organized games based program was predominantly outdoors.

The two physical activity programs examined in the current study differed significantly in time spent in light PA (p=0.016), with the low-organized games program participants spending 10.84% of program time in light PA and the sports program participants spending 9.38% of program time in light PA. While this is a significant difference, the percentage difference of 1.46% of program time does not likely reflect major differences in programming. This is particularly true as the percentage time difference represents less than 1.5 minutes of program time.

There was a significant difference in sedentary time, with the participants of the sports-based program engaging in significantly less sedentary time than the participants of the games-based program. There were also differences in the program structure between the sport- and games-based programs (see Table 1), which may account for differences in MVPA. The sports-based program participants used active transportation (walking) to reach the program site, whereas the games-based program participants were

already at the program site, as it was at their school. The sports-based program did not have a structured time for snack where the children were required to be seated, and the games-based program did. The sport-based program participants engaged in more days of swimming than the games-based program participants, which required the removal of accelerometers. This time period, which included changing into and out of swimwear, is unaccounted for in terms of contribution to MVPA during program time. Finally, the Tuesday data collected with the low-organized games program was a rainy day, which resulted in a change in programming and the inclusion of a movie day. Movie days are limited to one per month in the program; however, as this was a day where data were collected it could have lowered the time spent in MVPA for the week. Two groups did choose to go outside after the weather cleared; however, the complete removal of screen time activities at after school programs would likely increase overall time spent in MVPA time. The seated snack time, as well as changing time for swimming may have contributed to the discrepancy in sedentary time; however, it is likely that the sedentary screen time was the predominant contributing factor.

The findings of the physical activity data show similar trends to government suggestions to improve physical activity and reduce sedentary behaviour in children and youth, as the sports program utilized active transportation and did not use any screen activities as a part of their programming. Active transportation has been highlighted recently as a major gap in promoting physical activity amongst children, and limiting screen activities is considered an important step in reducing sedentary behaviour (Active Healthy Kids Canada, 2013). While analysis of the data did not show the walk time to be a significant contributor to the time the participants spent in MVPA, MVPA time did still decrease from 64.53% to 61.04% of program time for the sports participants when walk

time was removed. Additionally, the low-organized games group had a movie day for two of the program groups, which may have contributed to the lower time spent in MVPA in comparison to the sports program. While these recommendations are important to consider when planning after school programs for children, the results of this study should predominantly highlight that a focus on physical activity programming can result in a significant contribution to recommended daily physical activity requirements for program participants.

5.2 Motor Skill Development

At pre-test there were no significant differences between the low-organized games ($\bar{x}$=83.20, SD=12.09) and sports program participants ($\bar{x}$=89.20, SD=10.26) on the GMQ, as scored by the TGMD-2; however, there was a moderate effect size difference between the two groups, η=0.063. At post-test, there were no significant differences between the participants of the two programs and only a small effect size seen between the low-organized games ($\bar{x}$=88.84, SD=8.90) and sports program participants ($\bar{x}$=89.60, SD=12.05). This is reflected in the change scores, with the games program participants ($\bar{x}$=5.64, SD=12.09) having a non-significantly greater change score than the sports program participants ($\bar{x}$=0.40, SD= 12.82), but with a moderate effect size (η=0.058). No significant differences or effect sizes were seen between the Locomotor sub scores of the sports program participants and the games program participants at pre-test, post-test or in the change scores. No significant differences, but a moderate effect size (η=0.079) were seen between the Object Control sub scores between the low-organized games ($\bar{x}$=30.24, SD=8.32) and the sports program participants ($\bar{x}$=35.00, SD=7.56); no significant differences or effect sizes were seen between the two program participants at post-test or

between change scores. The moderate effect sizes seen indicate that the sample size may have been too small to show statistical significance with a t-test, but there is a meaningful difference between the two groups. Effect sizes may be more useful when utilizing non-traditional scales of measure, such as the TGMD-2, in comparison to using a standard p-value (Coe, 2002). In this case, the increases in GMQ score appear to show a meaningful difference in motor proficiency improvement.

Both groups showed GMQ scores that ranked low on the percentile scale, with the low-organized games program participants GMQ scores indicating a percentile rank between the 12th and 16th percentile at pre-test, and the 21st and 27th percentile at post-test, and the sports program participants indicating a percentile rank between the 21st and 27th percentile at pre- and post-test. A percentile ranking of 12 would indicate that the participant performed motor skills at a level higher than only 12% of their peers. While only a moderate effect size was seen between the two groups, the increase in percentile ranking of between 9 and 15 percent could be seen to represent meaningful change or improvement in motor skill performance. Both groups showed low percentile ranking scores, as calculated by their GMQ. These lower than average percentile rankings are in support of previous research that has suggested that children are not performing motor skills at age-level competence (Okeley & Booth, 2004; van Beurden et al., 2002). Normative data included in the TGMD-2 was collected during 1997-1998 (Ulrich, 2000), 14-15 years prior to the data collection in the current study, which is in line with Okeley & Booth's (2004) statement that children appear to be performing skills more poorly than children 5-10 years ago. Previous research has theorized that early childhood participation in MVPA promotes the development of motor skill proficiency, and then in middle to late childhood, and beyond, proficiency in motor skills can predict participation in physical

activity, as children and adults with high level skills are successful, and therefore often motivated to continue participation, which may be due to higher levels of self-efficacy due to increased perceived motor competence, or perceived ability (Bandura, 2010; Stodden et al., 2008). Children and adults with lower motor skill proficiency are more likely to withdraw from participation in activities, which Stodden et al. (2008, p. 296) present three explanations for: "they are not as competent as peers . . . , they do not want to publicly display low motor skill competence . . . , and . . . they have a limited motor repertoire and will be less motivated to participate in physical activities that demand high competence levels". The results of this study highlight a clear need for programming to generate a focus on developing motor skills, in order to prepare children to participate successfully in lifelong physical activity.

The greater change in motor skill proficiency in the low-organized games program participants show that low-organized games programs may provide an avenue for children with motor skill development that lags behind their peers, but not so greatly that they may be diagnosed with a developmental delay, such as developmental coordination disorder, an opportunity to improve their skills to a level on par with their more skilled peers. More importantly, when children improve their motor skill competence, they feel better about their ability to be physically active and may choose to do so more frequently. This is of particular significance when program participants have not elected to enroll in a sport or activity based program, but are simply attending the program primarily for supervision while parents or guardians are at work. Additionally, children that express disinterest in sports may benefit from participation in a low-organized games based program, as they may be afforded the opportunity to develop motor skills so that in the future they are equipped to participate in varying physical activity pursuits. Low-

organized games programs may have a more inclusive nature as they typically eliminate a "winner" and allow for ongoing participation for all game players. As well, low-organized games require all participants to play all roles, as opposed to sports, where different players take on specific roles, such as the goalie in soccer, pitcher in baseball or general offensive and defensive roles in sports such as basketball. Removing these elements may improve motivation to participate, as there is no negative experience of "losing". Additionally, low-organized games may increase practice times for skills, as all participants are engaged in the game for the entire play time and playing all roles. Further because everyone is busy at one time, there is less worry about one's actual skill level to be revealed. Motivation and practice are key elements in learning and improving skills (Schmidt & Wrisberg, 2004), therefore well-designed low-organized games may be a good model to aid in the development of motor skill proficiency in children, particularly those who do not show motivation or interest to participate in sports.

Figure 1 shows the average change score for each individual skill tested with the TGMD-2. Seven of the twelve skills indicated only minor differences between the participants of the two programs; however, four of the five remaining skills show a greater improvement in the low-organized games group. Horizontal jump and kick had greater improvements in the low-organized games program participants and only small improvement for the sports program participants, whereas strike and roll skills improved small amounts for the low-organized games program participants, and decreased for the sports program participants. For the remaining skill, the hop, the sports program participants had a small average increase; whereas the low-organized game program participants had a decrease in performance from pre-test to post-test, which may be due to individual child motivation, limitations of the test itself or an inconsistent ability to

perform the skill. There is limited research showing the influence of after school programs on motor skill development. Matvienko and Ahrabi-Fard (2010) found significant improvements in all motor skills tested after a four-week after school intervention to develop three specific motor skills: throwing distance, kicking and station. The results of this study show that low-organized games based after school programs may assist in the improvement of kicking skills, and contribute slightly to improvement in most other measured motor skills. The large improvement in kicking seen may have been because the low-organized games program spent the majority of program time outside, where there is a greater ability to practice kicking skills in comparison to an indoor space and were engaged in a number of programming activities that provided opportunities to engage in kicking, such as soccer and soccer baseball. A complete list of program activities provided to the two after school programs during the weeks of MVPA data collection can be found in Appendix G.

5.3 Correlations

A small positive correlation (r=0.171) between time spent in MVPA and pre-test GMQ scores was found when both groups were combined, and a significant, moderate correlation (r=0.322, p=0.049) was found between time spent in MVPA and post-test GMQ scores. A similar increase in correlation strength in the positive direction was seen in the two individual groups, with the correlation for the sports group data increasing from no correlation (r=-0.083) to a moderate, positive correlation (r=0.397) and the correlation for the games group data increasing from no correlation (r=0.045) to a moderate, positive correlation (r=0.315). If the sample size was larger, similar significant correlations may have been seen in the individual groups. No differences were seen in the correlation between MVPA participation and GMQ score between the two groups.

The inconsistency in correlation from pre-test to post-test may be due to the emerging relationship with this particular age group between motor skill proficiency and MVPA (Stodden et al., 2008). Previous research has found correlations between motor skill proficiency and MVPA in 8 to 10 year old children (Wrotniak et al., 2006); however correlations in younger children are usually weak (Fisher et al., 2004). This is thought to be due to an increased ability to perceive one's motor competence accurately (Stodden et al., 2008). Younger children are not able to accurately perceive their own abilities; therefore how well one performs a movement is not an influence on motivation, desire or decision to participate in activity (LeGear et al., 2012; Stodden et al., 2008). As the age group measured in the current study represents the transition from early childhood into middle and late childhood, the correlation between MVPA participation and motor competence may not be established. Additionally, as this study only measured participation in MVPA during program time, it is possible that the correlation between the two is more complex when children are attending organized physical activity programming.

5.4 Strengths and Limitations

Strengths of the study include the use of accelerometers, which provide an objective measure of physical activity including the intensity and length of the activities engaged in, and reduced bias often associate with self-report measures. The TGMD-2 has previously been validated and has proven to have high inter-rater reliability. The use of a secondary rater for the scoring of the TGMD-2 video data allowed for the generation of study specific inter-rater reliability, and showed good inter-rater reliability for the locomotor subset ($r=0.80$) and excellent inter-rater reliability for the object control subset ($r=0.93$).

Limitations to the study include the short duration of the study, as the 11-week period may not have been long enough to determine the influence of the after school programs on motor skill development. Previous research on motor skill development has ranged from 4 weeks to 1 year (Matvienko & Ahrabi-Fard, 2010; van Beurden et al., 2003), with shorter-duration studies typically focused on improving a select few motor skills. As this study looked at the contribution of multiple skills to general motor competence it is unknown if the study duration was great enough, particularly as there is not enough previous research to determine a minimum intervention length.

Results of this study are limited to children aged 6-10 years registered in after school programs with a physical activity focus within the Halifax Metro Area. The upper-limit age-range was due to normative data age-ranges offered in the TGMD-2; however, no child over the age of 10 years old elected to participate in the study, likely as both programs offered care to children in grades Primary to 5, which has a typical age range of children 5-10 years. Children under the age of 6 were excluded, as they were categorized as being in early childhood, and previous research has shown the relationship between motor skill development and MVPA do not present until at least middle childhood (Stodden et al., 2008; Wrotniak et al., 2006). Additionally, the sample in this study was a convenience sample, both in terms of the programs and the individual participants, which reduces external validity, as randomization did not occur.

No control group was utilized for this study, therefore direct comparisons between after school programs in the Halifax Metro Area with a physical activity focus and general afterschool programs cannot be made. Additionally, the similarities and differences in activities between the two programs were not controlled, which may have had an influence on time spent in MVPA and motor skill development over the 11-week

period. The low-organized games based program was based at an elementary school, and program participants were all students of that school; therefore, any motor skill development improvements could have been due to a particularly successful physical education instructor, or other school activities. The sport based program participants attended several different elementary schools within the Halifax Metro Area, and did not necessarily receive the same quality or frequency of physical education. Additionally, as the sport-based program participants were from multiple elementary schools, they or their parents had to find, select and then enroll their child in the particular program, as opposed to the low-organized games based program participants who attended the program offered at their elementary school, which may have been their "default" selection, as no additional transportation to the program was needed for their children. This difference in program selection may have pre-disposed the participants in the sport based program to be more interested and motivated to participate in MVPA. As well, a pre-existing interest in sports may have resulted in a selection of children with stronger motor skills than their peers.

Motor skill proficiency was measured using the TGMD-2, which utilized a sample of American children to develop and create percentile ranking norms (Ulrich, 2000). As the participants in this study were living in Canada, cultural differences could have created a bias in the data, with the participants achieving lower percentile rankings than they may on a Canadian scale. For example, the strike skill mimics a baseball swing, which Canadian children may not have been exposed to as frequently, as their American counterparts, for whom baseball is considered to be the *de facto* national pastime (Schrag, 2003), "versus the Canadian national sports of hockey and lacrosse (Department of Justice, 1994). Despite this, the TGMD-2 has been established as a valid measure in

countries outside of the United States (Valentini, 2012). To date there is no standardized measure of motor skill proficiency in Canadian children; however, a Canadian Assessment of Physical Literacy is being pilot tested at present, which may provide more relevant norm-referenced data (Lloyd, 2010). Future initiatives measuring physical literacy and/or motor proficiency in Canadian children should strive to use measures norm-referenced to Canadian children.

5.5 Practical Implications and Future Research Directions

Despite the limitations of the small study undertaken, there are a number of key recommendations that can be put in place for after school programs in order to enhance time spent in MVPA. Ensuring there are no sedentary screen activities offered during the after school program time will reduce time spent in sedentary behaviour, and may increase time spent in MVPA. Reducing time for, or removing, seated snack time will also reduce sedentary behaviour time and potentially increase MVPA participation. Prioritizing physical activity programming and ensuring that both structured and unstructured programming opportunities are available along with both indoor and outdoor activity time periods, as indoor free play activity may provide the most opportunity for MVPA participation (Trost et al., 2008); however, individual differences in children and programs may result in different levels of participation. Finally, incorporating new games, activities or program elements may generate a novelty factor in order to maintain motivation and interest in activity participation.

Ensuring programs are providing quality opportunities to develop and improve motor skill proficiency requires the incorporation of adequate practice time for all participants, as well as sufficient motivation to practice and pay attention to performance errors in order to correct them (Schmidt & Wrisberg, 2004). Low-organized game

programming may improve these factors, particularly in comparison to a sport based program because of increased practice time and motivation. Selection of low-organized games to be used for motor skill development must be done purposefully. Games with little to no elimination, that provide opportunity for all participants to fill all roles of the game, games that allow for multiple practice opportunities and games that utilize multiple motor skills (i.e. running, throwing, kicking and catching) throughout game play would be considered more likely to promote motor skill development in children. This is not to say that sport based programming should be eliminated, but rather from a physical activity promotion perspective used with caution, particularly if many program participants or the same participants repeatedly do not engage in sport game play.

Overall, after school programs with a physical activity focus enhance time spent in MVPA during the after school time period for program participants. That being said, many Canadian children are not able to attend after school programs at all. Of the 28% of Canadian children aged 5-17 years with access to a supervised after school program, over 80% attend one on a regular basis (CFLRI, 2010). While this is significant, there remains a major gap of Canadian children that are not being reached by current after school programs. These gaps particularly include children aged 13-17 years, as well as children living in communities smaller than 250,000 (CFLRI, 2010). This lack of access is compounded, as only 41% of parents cited physical activity as the primary purpose of the program (CFLRI, 2010). Given the significant difference in MVPA participation during the after school time period between children attending an after school program with a physical activity focus, versus average population data, there is a clear need to enhance access to physical activity programs for all children, and in particular older youth and those living in smaller communities. This is especially important, as children aged 13-17

years are at higher risk for non-participation in physical activity, with a steep decline in MVPA participation from childhood to adolescence (Thompson & Wadsworth, 2012).

Future research initiatives should attempt to determine if there is a gap in physical activity participation and motor skill development between general after school programs and after school programs with a physical activity focus through measurement of programs in similar regions. Additionally, a look at the influence of non-care based after school or weekend based activity programming is warranted, particularly as the sports and low-organized games program participants attended 2.78 and 2.40 hours respectively of physical activity programming outside of their regular after school program. The contribution of these hours to MVPA participation and motor skill development are unknown. As parents typically enroll their children in programs with a primary focus on physical activity (CFLRI, 2010), generating a better understanding of how these programs contribute is important, particularly if parents believe these hours are spent in health promoting physical activity, and that each hour of participation is considered an hour of MVPA.

From a methodological perspective, future research examining children's physical activity participation should move toward the utilization of a 5 second epoch, as opposed to a 30 or 60 second epoch as seen in previous research initiatives (Colley et al., 2011; Thompson & Wadsworth, 2012). The lack of, or very small vigorous physical activity participation seen in these initiatives may be due to the use of a large epoch, which likely misses short bursts of vigorous activity that is characteristic of children's activity (Baquet et al., 2011; Nilsson et al., 2007). The results of this study are in strong support of the need for the use of smaller epochs, as more than 10% of program time was spent in combined vigorous and very vigorous activity, results which are not typically found in

children's physical activity research.

Finally, better controlled research studies are needed to determine how individual factors influence participation in MVPA and motor skill development within an after school program setting. Program content, training of program leaders, program location, and program participants themselves may all influence MVPA participation and opportunity for meaningful motor skill development. Understanding how these factors influence program participants, as well as how they can be changed to better the physical activity and motor skill development experience for Canadian children, in order to assist them in engaging in lifelong, health-promoting physical activity.

5.6 Conclusion

Determining the most inclusive methods of providing opportunities for engagement in MVPA, as well as the development of motor skill proficiency is important in order to help children participate in lifelong physical activity. After school programs with a physical activity focus – regardless of whether it is low-organized games based or sports-based appear to enhance the amount of MVPA children aged 6-10 years engage in during the hours of 3-6pm. Low-organized game programming may aid in the improvement of motor skill development for children, particularly as they provides multiple practice opportunities and may enhance motivation. Further research is needed to substantiate these findings, and determine the transferability of them to other after school programs. Improving access to after school programs, particularly those with a physical activity focus, should be considered high priority in Canada, especially in rural communities and for children aged 13-17 years, as both of these populations have limited access to programming. By improving access to programs, and ensuring after school programs are providing a meaningful contribution to total time spent in MVPA for

children, as well as aid in the development of strong motor skills, children who participate in them are more likely to be physically active throughout their lifespan. Active individuals are less likely to suffer from a multitude of health issues, therefore creating a more active population will help in creating a healthier population.

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Appendix A

Letter to Programs

March 7, 2012

Dear Program Coordinator,

I am a 1st year Master's student in Kinesiology at Dalhousie working under Dr. Angela Thompson (St. Francis Xavier) and Dr. Melanie Keats (Dalhousie University). For my thesis I am hoping to look at two after school programs within the Halifax Regional Municipality that have a physical activity focus. Given the low prevalence of physical activity in youth, there is a need for programs that provide time and activities for children to get moving. The after school time period has been highlighted as a particularly important time to do this. I would like to investigate whether physical activity based after school programs are providing opportunities for children to increase their activity during these hours beyond the national averages, and am hoping you would be interested in partnering with our scientific team to explore this. Reducing the impact my research will have on your program is very important to me, and in no way would I want your participation to take away from the valuable time children spend with your staff.

I am currently in the process of completing my research proposal and applying to ethics through the Dalhousie Health Sciences Research Ethics Board. I plan to start data collection in September 2012 and finish in December 2012. I would welcome the opportunity to discuss the possibility of us working together on this project more with you in person, and will contact you by phone within the week to answer any questions you may have. If you have questions before then, please feel free to call me (902) 818-9379 or email me at el272538@dal.ca. Thank you for taking the time to consider my project.

Sincerely yours,

E. Jean Burrows
MSc. Kinesiology (c)
School of Health and Human Performance
Dalhousie University

Appendix B

April 13, 2012

Ms. Jean Burrows
School of Health and Human Performance
Dalhousie University
6230 South Street
Halifax, NS
B3H 3J5

Dear Jean Burrows,

I am writing this letter of support to provide evidence of the Halifax YMCA, Y-PHD programs' intent to participate in your study entitled **"Are we just playing games? Examining the physical activity and motor skill benefits of two after school programs"**. We are excited to take part in the study, and are looking forward to working with you following ethical approval of your study.

Sincerely yours,

[redacted]
YMCA Physical Healthy Development
South Park YMCA
2269 Gottingen
Halifax, Nova Scotia
B3K 3B7

DALHOUSIE UNIVERSITY
Inspiring Minds

May 21, 2012

Ms. Jean Burrows
School of Health and Human Performance
Dalhousie University
6230 South Street
Halifax, NS
B3H 3J5

Dear Jean Burrows,

I am writing this letter of support to provide evidence of Dalplex Active Kids After School programs' intent to participate in your study entitled **"Are we just playing games? Examining the physical activity and motor skill benefits of two after school programs"**. We are excited to take part in the study, and are looking forward to working with you following ethical approval of your study.

Sincerely yours,

[redacted]

Shawn Fraser
Senior Manager of Programs
Dalhousie Dept. of Athletics and Recreational Services
6260 South Street.
Halifax. Nova Scotia
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Appendix C

Jean Burrows
Health and Human Performance
Dalhousie University
6230 South Street
Halifax, NS
B4H 1T8

August 21, 2012

Dear Parent or Guardian,

This letter is to inform you of an upcoming opportunity for your child/ward to volunteer as a research participant in a study with Dalhousie University. My name is Jean Burrows and I am a graduate student in Kinesiology at Dalhousie. I will be working with your child/ward's after school program, Y-PHD/Active Kids, this fall to look at the benefits children who attend programs with a physical activity focus are receiving in terms of time spent being active, and the development of movement skills. Your child/ward's participation would be voluntary and your permission is required for your child/ward to participate. In the first week of September your child will receive a copy of our letter of invitation and informed consent form for you to review, and determine if you – and your child – are interested. Additionally, during the first week of September I will be at your child/ward's after school care program to answer any questions you may have. If you would like more details before this time, or have any questions about the research project you may contact me at (902) 818-9379 or via email at el272538@dal.ca. Or you may contact either of my supervisors Dr. Melanie Keats at (902) 494-7173, melanie.keats@dal.ca or Dr. Angie Thompson at (902) 867-3540, amthomps@stfx.ca.

I thank you in advance for your consideration of my project and look forward to sending you a formal invitation to participate in this project in early September.

Sincerely yours,

Jean Burrows.

Appendix D

School of Health and Human Performance
INFORMED CONSENT FORM

Study Title: Are we just playing games? Examining the physical activity and motor skill benefits of two after school programs.

Principal Investigator:
Jean Burrows, MSc (c)
School of Health and Human Performance
Dalhousie University
6230 South Street
Halifax, Nova Scotia B3H 1T8
P: (902) 818-9379
Email: el272538@dal.ca

Supervisors:
Dr. Melanie Keats
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Dalhousie University
6230 South Street
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Dr. Angie Thompson
Department of Human Kinetics
St. Francis Xavier University
1140 Convocation Blvd
Antigonish, Nova Scotia B2G 2W5
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Email: amthomps@stfx.ca

-

INTRODUCTION

We invite your child to take part in a research study entitled **"Are we just playing games? Examining the physical activity and motor skill benefits of two after school programs"**. This study is being conducted by Jean Burrows who is a graduate student at Dalhousie University as part of her Master's degree. Your child/ward's participation in this study is **voluntary** and you may withdraw him or her from the study at any time without any consequence. The quality of programming your child/ward receives from the after school program (Dalplex/YMCA) will not be affected by whether or not you provide consent for your child to participate. The study is described below. This description tells you about the potential risks, inconveniences, or discomforts that your child may experience. Participating in the study may not benefit your child/ward directly, but as a result of their participation we might learn things that will benefit others. You should discuss any questions you have about this study with Jean Burrows or her supervisors, Drs. Melanie Keats and Angie Thompson.

PURPOSE OF THE STUDY

The purpose of this study is to explore the amount of physical activity children obtain during the after school time period while they attend an after school care program. Additionally, the study will explore whether or not the after school care program helps children to improve their movement skills such as running, throwing, kicking and catching.

STUDY DESIGN

The research project will compare two after school programs with a physical activity focus to determine if there are differences in time spent in physical activity and motor skill improvements for program participants. The project will take place over three phases. The first and third phase will involve a movement skills analysis, which will be compared to see changes in your child/ward's abilities over a three month period. The second phase will measure the amount of physical activity your child does while they are attending the after school program. Data from the two programs will be compared.

WHO CAN PARTICIPATE IN THE STUDY?

Children between the ages of 6 and 10 years registered in either the Dalplex Active Kids or the YMCA Y-PHD after school programs with no known developmental movement difficulties such as developmental coordination disorder, Down syndrome, or cerebral palsy are invited to participate. Children with developmental movement difficulties may participate in the research study, but their data will not be used, as they are likely to develop motor skills at a different rate than their peers.

WHO WILL BE CONDUCTING THE RESEARCH?

Jean Burrows, the Principal Investigator for this study will conduct the study under the direction and guidance of her supervisors. Additional research assistants may be recruited to assist with the collection of data. Anyone involved in data collection will obtain Nova Scotia Child Abuse Registry Clearance and a Criminal Record Check.

WHAT WILL YOUR CHILD BE ASKED TO DO?

Your child/ward will be asked to take part in a 3 month study from September 2012 to November 2012. During your child/ward's time at either the Dalplex Active Kids or YMCA Y-PHD program, he/she will be asked to complete a movement skills test, the "Test of Gross Motor Development 2" during the first week (September) and the last week (November) of the study. In this test, your child/ward will be asked to do 12 movement skills: run, hop, leap, gallop, slide, horizontal jump, over-hand throw, strike, underhand roll, stationary ball bounce, two-hand catch and kick. The movement skills test will take approximately 20 minutes. With both you and your child/ward's permission, I will videotape his/her performance, so that I can better analyze his/her skills. If you or your child/ward objects to videotaping his/her performance, but still wishes to participate in the study they he/she will be able to do so. With your permission, your child/ward's height and weight will be recorded and his/her movement performance will be videotaped for future assessment. Videos will be destroyed following review of the skills tests. In addition to the movements skills tests, for one week in October, 2012 your child/ward will be asked to wear an accelerometer. An accelerometer is a small, lightweight device, about the size of a pager that measures his/her level of physical activity. The accelerometer will be worn around the waist attached to a belt. Your child/ward will be given the accelerometer when he/she arrives at the after school program and it will be returned before he/she go home each day.

Although we will not be able to use their results for the study, in an effort to allow all children to participate fully, if your child/ward has a movement disorder and wishes to wear the accelerometer or perform the movement skills test with his/her peers, with your permission he/she will be able to do so.

Finally, we will ask you, the parent/guardian, to fill out a short questionnaire about any other sport or physical activity based programs your child/ward attends during this time period, the questionnaire is attached to this invitation to participate.

POSSIBLE RISKS AND DISCOMFORTS

The risks for participating in this study are minimal. It is possible that your son/daughter/ward may find wearing the accelerometer and belt slightly uncomfortable; however, if the belt is worn over his/her clothing, this is unlikely. When performing the movement skills test your child/ward may get tired; however, at any point during the test, your child/ward will be able to take a break, or stop if they find the test too tiring. Following the test your child/ward may have slight muscle soreness, but this would not be greater than participating in physical activity they would normally engage in during the after school program.

POSSIBLE BENEFITS

There are no direct benefits to participating in this research project for you or your child/ward, however we may learn about how after school programs are able to get children active, and how we might be able to do this better.

CONFIDENTIALITY AND ANONYMITY

As the researchers will be doing face to face movement skills testing with your child/ward their identity cannot remain anonymous. However, all data collected from you and your child/ward will be stored in a locked file cabinet and all electronic data will be encrypted on a password protected computer ensuring confidentiality. Your child/ward's name will not be used on any testing sheets or reports. Any identifying data collected from your child/ward (e.g., birthdate), will be removed from data before it is included within any written report of the research. Any data collected such as movement skill test scores, will be included within average scores of the group (i.e., no individual data will be reported). During videotaping of movement skill testing, every effort will be made to avoid including your child's face from the recording. If you or your child/ward does not wish to be videotaped during movement skill testing they will still be able to participate in this study.

Every effort will be made to ensure confidentiality; however, if your child/ward discloses that he or she is the subject of abuse, the research team is required by law to report this to authorities.

WITHDRAWAL

If at any point during the data collection process you or your child/ward no longer wishes to participate you are free to withdraw. To withdraw, we ask that you inform the researchers by contacting Jean Burrows -via telephone (902) 818-9379 or email el272538@dal.ca or one of her supervisors, Dr. Melanie Keats phone: (902) 494-7173 email: melanie.keats@dal.ca or Dr. Angie Thompson phone: (902) 867-3540, email: amthomps@stfx.ca . Once we have received notice of this, all of your child/ward's data collected up to this point will be destroyed immediately. This notice can be given until January 5, 2013, at which point, we will be unable to remove your child/ward's data from the study, as it will have been anonymized and averaged with other data.

QUESTIONS

If you have any questions regarding the research project you can contact Jean Burrows or one of her supervisors at any point in time. Jean will also be in attendance during the end of your child/ward's program on (September 14 and 18) to answer any questions you have in person, and for you to return this form. If you are unable to attend on those dates, you may return this form and the attached questionnaire in the attached envelope to the program leaders for your child/ward's after school care program, and they will pass it on to Jean.

PROBLEMS OR CONCERNS

If you have any difficulties with, or wish to voice concern about, any aspect of your child/ward's participation in this study, you may contact Catherine Connors, Director, Research Ethics, Dalhousie University for assistance at (902) 494-1462, ethics@dal.ca.

INFORMED CONSENT
Signature Page

Study Title: Are we just playing games? Examining the physical activity and motor skill benefits of two after school programs.

"I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to my child taking part in this study. However I realize that my child's participation is voluntary and that I am free to withdraw my child from the study at any time and that my child is free to withdraw him/herself from the study at any time."

I, _____ give consent for my child/
Print Name and Signature

ward _____ to participate in this research
Print Child/Ward's Name

project _____.
Date of Signature

I give consent for my child/ward to be videotaped for the purposes of data collection

_____.
Print Name and Signature

I give consent for my video recordings of my child/ward to be used in presentations of the research findings, such as at conferences.

_____.
Print Name and Signature

DALHOUSIE UNIVERSITY
Inspiring Minds

CHILD PARTICIPATION ASSENT

Are we just playing games?

Over the next three months I, _____ agree to volunteer to participate in a research study being done by Jean Burrows from Dalhousie University. She is a researcher in physical activity and would like to learn more about what kids like me are doing when we go to after school programs. There are 3 parts to Jean's research. The first week she is going to get me to do some actions, like kick a ball, run and jump.

☐ I DO agree to allow Jean to videotape me doing these movements.
☐ I DO NOT agree to allow Jean to videotape me doing these movements.

The second part is going to be in October when Jean will come to my after school program and give me an "accelerometer" (a small activity monitor) to wear around my waist during the program. Finally, in December, Jean will get me to do the same movements I did at the start of the research project. Doing this research will help her and other researchers to understand more about after school programs and what kids like me are doing when we come to after school programs.

If I decide at any time today or up until January 5, 2013 that I no longer want to be part of this research, I just have to tell

Jean and she will remove my information from the study. If I do decide to leave the study, my involvement in the after school program will not be affected in any way. Nothing I do here today or during the study will affect my grades in school or my participation in this afterschool program. Jean told me that some of the movements may make me a little sore, but I know that I will not be asked to do anything that I do not feel I can do.

If I have any questions, my parents or I can speak to or call Jean at 902-818-9379 or one of her supervisors, Melanie Keats at 902-494-7173 and Angie Thompson at 902-867-3540.

Appendix F

Are we just playing games? Examining the physical activity and motor skill benefits of two after school programs.

Please fill out this questionnaire regarding your child's participation in physical activity programs that they are attending or will be attending between September 10 and December 15, 2012. This would include activities like soccer, swimming lessons, gymnastics, track or dance classes but would not include time spent at Active Kids/Y-PHD or any activities your child participates in during the school day.

Birthdate:_____

Gender:_____

Activity Type	Hours spent at activity per week
EXAMPLE *i.e. Soccer*	*EXAMPLE* *3 ½ hours*

Appendix G

Both programs split the group of participants into several smaller groups. Children participated in one of the listed activities on each day.

Sports program weekly schedule:

Monday: Dodgeball OR Swimming/water polo (30 min swim lesson, 30 min playing water polo).

Tuesday: Craft OR Floor hockey OR swim lesson (1 person).

Wednesday: Indoor wall climbing (half climb while the other half sit and talk or read and then they switch) OR dodgeball OR swim lesson (1 person).
Thursday: Badminton OR Lego

Friday: Free swimming OR Soccer.

Games program weekly schedule:

Monday: Neighbourhood walk OR Aerobics, basketball and obstacle course OR Free swimming (walk/public bus to travel to pool) OR Kids Choice – Hockey.

Tuesday: Rainy day. Movie OR Arts and Crafts/outdoor free play OR Gym activitites – Gaga Ball and outdoor free play.

Wednesday: Outdoor free play (playground, wall ball, basketball, four square) OR Kids choice – Capture the Flag, Stormy Seas OR Soccer Baseball OR Frisbee.

Thursday: Tag and races for 15-20 min then free play OR Field low-organized games OR Scavenger hunt OR Fire extinguisher demonstration (seated activity) and free play.

Friday: Out trip to nearby park/playground OR Free play OR Soccer OR Free swimming (walk/public bus to travel to pool).

Appendix H

Sports Program

What is the Mission or Philosophy of your program?
The Mission or Philosophy of our program is to provide children with after school care that focuses on a healthy lifestyle by incorporating healthy and physical activity.

What are the primary goals of the program?
The primary goals of the program are to provide after school care for kids ages 5 - 11. The after school care focuses on healthy living by incorporating physical activity into their eveyday lives. We provide a safe environment, that is inclusive to all children. We want to provide at least an hour of structured activity, that focuses on being active.

How is the program structured to meet these goals?
The program is structured to meet these goals by having at least two choices of physical activity every day for the kids to choose from. The ability to choose the activity that meets their needs also helps with the children feeling like they have a choice in how they get to spend their time, also helping them become more engaged in the activity. We also, have time before and after activity time that is structured to help the kids to learn to play together on their own.

Games Program

What is the mission or philosophy of your program?
The YPHD Department's philosophy is to develop the whole child by promoting social acceptance, emotional health, intellectual ability, and physical health following the Principles of YMCA Healthy Child Development, HIGH FIVE and CATCH.

What are the primary goals of the program?
In general the primary goals of the program is to provide a physically, emotionally and socially safe environment for children to play and grow

get children physically active
model and provide examples of aspects of healthy living through physical activity and learning about food choices (through the CATCH program)

How is the program structured to meet these goals?
All staff are trained in the High Five and CATCH programs. High Five delivers the theory of working with children in a recreation setting and CATCH delivers the practical side of recreational programming for children.

The four types of activities that we typically program in the run of a normal day or an in-service day are:

1. ***RECREATION/ PHYSICAL*** activities (R/PA) - These activities can include, but are not limited to:
    - CATCH Activities and/ or similar activities

- Free Gym or Outdoor Time
- Manual Transportation (i.e., walking to locations like museums)
- Sports
- Physical or RECREATION Games
- Swims or Skates

2. ***SNACKS AND LUNCH*** *(SL)* - These times would include the time during the lunch program when they sit down to have lunch, and the snack time after school and in the morning during in-service days.

3. C***REATIVE ACTIVITIES*** (CA) - These activities can include but are not limited to:
   - Crafts
   - Science Experiments
   - Drawing or coloring
   - Construction projects

4. ***LOW LEVEL ACTIVITIES*** (LLA) - These activities can include but are not limited to:
   - Movie (only once per month)
   - Free play in YPHD room
   - Motor Transportation (ie Bus, Ferry)
   - Board/ Trivia Games
   - Legos/ Building Blocks
   - Transition Times

Now that the typical four areas of programming have been defined here is how those areas will be distributed throughout the day:

<u>After School Programming</u>

(Based on a 3:00pm dismissal time)

1. **Minimum of 50% (1hr 15 mins)** of the after school time will be used for ***RECREATION/ PHYSICAL*** activities (R/PA).

2. **Maximum of 50% (1hr 15mins)** of the remaining time can encompass one or all of the following:
   - ☐ ***SNACKS & LUNCH***
   - ☐ C***REATIVE ACTIVITIES***
   - ☐ ***LOW LEVEL ACTIVITIES***

The programming focus for each day is providing recreation and/or physical activities for children to engage in. These activities will be planned out and indicated on the Monthly Recreational Program Calendars staff complete and then are provided to parents.

Creative Activities are secondary to the R/PA component of the program and should be used to blend with the already established R/PA, weekly themes or the Nutritional Components.

Y For Community Activities are to be done a minimum of once per month. These activities should be community focused and allow the children to be exposed to things outside of the four walls they are typically surrounded by. Some examples of activities include visiting fire station, guest speakers, food drives, pot lucks, making cards for veterans, volunteering, etc.

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June 4, 2012 Reference Permission Request #**T2878**

Ms. Elizabeth Jean Burrows
Dalhousie University
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The TGMD-2 will be used to determine whether after school care programs, focusing on physical activity, provide positive contribution to motor skill proficiency development among children aged 6 - 10 years. TGMD-2 will be administered to 40 students, as a pre and post test measure, to assess motor skill proficiency and compare proficiency change between two after school programs. Additionally, correlation between time spent in activity, and motor skill proficiency will also be examined.

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