

Exploring the Impact of Kindergarten Scheduling on
Children's Physical Activity and Classroom Behaviour

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Human Kinetics (MHK)

The Faculty of Graduate Studies
Laurentian University
Sudbury, Ontario, Canada

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THESIS DEFENCE COMMITTEE/COMITÉ DE SOUTENANCE DE THÈSE
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Faculty of Graduate Studies/Faculté des études supérieures

Title of Thesis Titre de la thèse Behaviour	Exploring the Impact of Kindergarten Scheduling on Children's Physical Activity and Classroom		
Name of Candidate Nom du candidat	Thirkill, Laura		
Degree Diplôme	Master of Human Kinetics		
Department/Program Département/Programme	Human Kinetics	Date of Defence Date de la soutenance	May 11, 2015

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Abstract

The Ontario Ministry of Education implemented the new Early Learning Kindergarten (ELK) program province-wide in September 2014. The ELK program advocates for inquiry- and play-based learning, and the use of the outdoors. Some school boards have implemented a 60-minute outdoor exploration block replacing outdoor recess breaks. These changes have not been evaluated for their potential impact on both the physical activity levels and classroom behaviour of children while at school. This thesis investigated physical activity levels and classroom behaviour of children in the new ELK schedule, and in the Balanced School Day (BSD) schedule. The results suggest that children following the ELK program exhibit reduced physical activity levels, but greater academic engagement and less disruptive behaviour. Thus, results suggest that the ELK program provides benefits for students, but modifications are needed to ensure that adequate physical activity is introduced in early-year programming therefore providing a strong foundation for both education and physical activity.

Keywords: Children, Early Learning Kindergarten; Physical Activity; Classroom Behaviour

Co-Authorship Statement

Chapters three and four are presented as a manuscript for publication, and a published article respectively.

Paper 1: The Impact of Early Learning Kindergarten (ELK) Scheduling on Patterns of Physical Activity and Classroom Behaviour

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Laura J. Thirkill assisted with the conceptualization of the study, co-led the data collection, conducted all data analyses, wrote the manuscript and revised it according to co-authors comments.

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Paper 2: Physical Activity in Kindergarten: Setting the Stage for a Healthy Life

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ACKNOWLEDGEMENTS

There are many people that I could not have completed this master's thesis without.

First and foremost, thank you to my family. Thank you for supporting me through this degree in so many ways. Your unconditional love means the world to me. Knowing that I have a solid foundation of support through the most beautiful, and most difficult of times allows me to maintain strength and perseverance. Thank you for allowing me the time to focus and pursue this degree. Thank you for your patience and support, and thank you for understanding the stresses of the process, and supporting me through them. I love you all very, very much!

To my supervisor, Dr. Sandra Dorman, I simply could not have asked for a better supervisor. You are one of the most hardworking and intelligent people I have ever met. I thank you for always being approachable, kind, and passionate about our work. I consider you both a role model, and a friend and am so fortunate to have been able to work so closely with you for the past two years. Thank you for your time, your knowledge, your humour and your energy. You are truly a mentor for me in so many ways.

To my committee, it goes without saying that I have a dynamite committee, and your support, critiques and suggestions pushed me to better this thesis, and myself. I thank you for pushing me, instilling resilience, and supporting me along the way. The time that you dedicated to my project does not go unnoticed. Thank you for including my work on never ending to-do list, especially when you all have young, growing families.

Thank you, to my two fabulous MHK role models, friends and honorary committee members, Michelle Laurence and Caleb Leduc. Both Michelle and Caleb “get me” and my teacher mind, and were always there for questions, support, chats, and necessary drop-in breaks with cookies and/or beautiful kids. Thank you for all that you have done for me. I so value our friendship!

To my LUNCH Research group, thank you for supporting me along the way by sharing knowledge, sharing laughs and sharing time. I have built some amazing friendships along the way and I am so thankful for that. I am so unbelievably fortunate to have been paired up with Charley for this thesis. The time we spent together on our projects allowed us to create some fabulous work, but more importantly, we have built such a beautiful friendship. I am so happy to have had you by my side the whole way, and look forward to a lifelong friendship with you! You are a role model for me too, my friend.

This degree was very much a journey and I am so fortunate to have had the support along the way. Thank you, thank you, to everyone who motivated me along the way.

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Chapter 1

INTRODUCTION

Schools are an ideal environment for implementing community health practices as the majority of children in Ontario attend government-funded schools (Pascal, 2009). Kindergarten children represent a key demographic cohort from a community perspective since a strong foundation for academic success and a love of learning begins in kindergarten. Additionally, the promotion of healthful behaviours at an early age has a significant impact on lifestyle choices and lifelong health (Ontario Ministry of Education, 2010b). As such, the programs and schedules presented to kindergarten students at school have the potential to significantly affect student health.

The new Early Learning Kindergarten (ELK) program was introduced in Ontario in 2010 and brings with it numerous changes for three to five year old children. This program promises positive outcomes in terms of student success, although this has not been empirically assessed. Meanwhile, school day scheduling has been modified within this student cohort, with changes to instruction- and break-time. Since there is a strong link between childhood obesity, early adiposity rebound and adult obesity (Whitaker et al., 1997), as well as an association between early and continued academic success in school (Canadian Council on Learning, 2007), it is vital to examine the effects of any early kindergarten program and scheduling changes. Indeed, such changes can potentially impact the 261,565 *current* kindergarten students in the province of Ontario alone (Ontario Ministry of Education, 2015).

Today, four- and five-year-old children are integrated into a full-day of learning, in a single classroom, led by a team of two: an Ontario Certified Teacher (OCT) and an Early Childhood Educator. This team provides a child-focused, inquiry- and play-based approach to learning, in which children are given a leading role. The environment promotes self-regulation, and the program has been developed on the premise that kindergarten lays the ‘foundation for

success in learning' with the goal to give students a strong start by developing a foundation for future intellectual, physical and social development (Ministry of Education, 2010b, p.3). These changes were implemented because they are believed to be instrumental in enhancing a child's experiences at school, promoting positive associations with school and learning that will carry-over into later years and ultimately improve academic success and healthful practices (Ministry of Education, 2010b). The development of self-regulation for academic success is linked with children's behaviour during classroom time (Rudasill et al., 2010). However, although the ELK program is purported to improve self-regulation, evidenced-based research supporting the claim that the ELK program improves classroom behaviour compared to balanced school day kindergarten classes is currently lacking.

In addition to the implementation of the new ELK program, some school boards have also began modifying the schedule for this young cohort by incorporating a 60-minute block of outdoor exploration time (Personal Communications, 2013) to align with suggestions by the Ontario Ministry of Education to use the outdoors as an extension of the classroom (Ontario Ministry of Education, 2010b). Schools implementing outdoor exploration, have placed it in the middle 100-minute block of the Balanced School Day (BSD) schedule and concurrently removed the two, 20-minute morning and afternoon recesses, instead, replacing these with extended nutrition breaks. Extending nutrition breaks addressed parental concerns that younger children did not have enough time to eat (Woehrle, 2008). However, this schedule change also reduced the number of times that very young children must dress to go outside during the school-day, which is generally perceived to be time-consuming and frustrating by educators. Although practical, these modifications have not been examined with respect to their overall impact on physical activity outcomes and classroom behaviour. Research has shown that physical activity

levels in children are lower than historical levels and lower than those recommended by health agencies (Active Health Kids Canada, 2014), warranting concern. One of the predominant opportunities for children to achieve recommended levels of physical activity during the school day is recess time (McKenzie, 1997, Ridgers, 2005).

With the majority of children in Ontario as young as three now attending school full-time, we are presented with a critical turning point in children's health. Children of this age may either achieve more physical activity, along with its associated academic benefits, or experience lower levels of daily physical activity and potentially disengage from the school structure. We must be proactive in assessing kindergarten programs and schedules to prevent any long-term, negative consequences.

We question whether this new *ELK program* is effective in engendering academic engagement and whether this modified *schedule*, including the outdoor exploration block, is beneficial for physical activity (critical for lifelong health).

Purpose: The purpose of this thesis was to compare physical activity levels and classroom behaviour amongst kindergarten students using the traditional BSD schedule and program with those using the ELK schedule and program (implementing the outdoor exploration block and removal of recess).

Thesis Rationale: Low levels of physical activity in children are well documented (Active Healthy Kids Canada, 2014, Canadian Society for Exercise Physiology, 2012b), as are the strategies to increase physical activity in schools (Ontario Ministry of Education, 2010). However, much of this research has focused on older children, of ages at which many health

behaviours are already established. Many questions remain about the physical activity levels of the youngest learners in schools, particularly now, as the new ELK program and schedule has been implemented across the province of Ontario. As such, an examination of the impact of the ELK program on its ability to improve classroom behaviour, as proposed, and its impact on physical activity levels in children, is warranted. This is essential in order to facilitate the development and implementation of the best possible school program and schedule while addressing a number of key concerns for children's health and academic success.

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Chapter 2

REVIEW OF LITERATURE

2.1 School

2.1a School Environment

Schools are an ideal environment in which to teach health behaviour as part of the curriculum. Schools comprise our youngest community members, at the best developmental stages to incorporate lifelong habits (Pascal, 2009). There are 3,980 publically-funded elementary schools in Ontario, which are home to 261, 565 kindergarten students, including more than 90% of all four and five year olds, who attend school for a minimum of five hours of class time per day, five days per week. The school environment thus provides ample opportunity to teach many community health practices (Ontario Ministry of Education, 2015, Pascal, 2009). For this reason, many interventions have been adopted by schools under the direction of the Ministry of Education to foster healthy living, including strategies to help students learn the foundations of healthy eating, physical activity, bullying prevention, personal safety and injury prevention, substance use and abuse, healthy growth and development, and mental health (Ontario Ministry of Education, 2014).

In order to fully adapt these healthy teachings, students must regularly attend school, actively participate in the teachings, and overall, succeed academically. Academic success is believed to be largely impacted by student engagement and on-task behaviour (Rudasill et al., 2010), and children who have positive perceptions about school early in their learning experiences are said to continue with these positive perceptions in later grades, and are also said to be more likely to succeed in school (Ontario Ministry of Education, 2010b).

2.1b School Scheduling

School scheduling is a key element to examine in relation to developing strategies to improve student engagement and physical activity (PA) levels. The Ministry of Education has

mandated the number of minutes that students are expected to engage in academic pursuits, food consumption and recess (Ontario Education Act, 1990). However, schools have flexibility in implementing their schedules, as long as they achieve the minimum requirements set out by the Ministry of Education. Today, many schools in Ontario have adopted the Balanced School Day (BSD) schedule; this schedule complies with Ministry standards, and divides instructional time into three, 100-minute blocks. Each block is separated by a 40-minute break, during which students are given 20 minutes to eat and 20 minutes to participate in recess time. Assuming a general start-of-day time between 8 and 9, these two breaks will fall over the mid-morning and mid-afternoon time periods. This schedule applies to all children within an elementary school from grades one to eight.

The BSD was implemented to improve student learning based on longer uninterrupted instruction blocks, reductions in transition time, and regular nutrition and physical activity breaks to allow students to focus and concentrate (Woehrle et al., 2008). The BSD was also said to be the best option for supervision schedules for staff, and was additionally said to provide more opportunities for teachers to engage in dialogue with their colleagues (Waterloo Region District School Board, 2005, Woehrle et al., 2008).

2.1c Kindergarten Scheduling

Until recently, kindergarten children were generally excluded from the BSD schedule, due to the reduced time spent at school for this cohort. However, within the past few years, kindergarten programs have undergone substantial changes. First, all publically-funded elementary schools must now provide full-day kindergarten programs for all children turning four in that calendar year (Ontario Ministry of Education, 2010b). This means that today, the majority of Canadian children, as young as three, now attend school on a full-time basis, whereas

previously it was on a part-time basis, either for half a day, or for a full day every other day. This mandate came into effect in 2010 (Ontario Ministry of Education, 2010b), and therefore a subset of children in elementary schools have attended full-day kindergarten using traditional programming and the BSD school schedule.

At the same time, the Ministry of Education began implementation of a new kindergarten program, also to be fully implemented into all publically-funded elementary schools in Ontario by September 2014, called the Early Learning Kindergarten (ELK) program. In this program, junior and senior students are integrated into the same classroom led by two instructors: an Ontario Certified Teacher (OCT); and an Early Childhood Educator (ECE). This early-learning team presents a play- and inquiry-based approach to learning in the classroom that is different from the traditional kindergarten program. The ELK program aims to “establish a strong foundation for the early years by providing young children with an integrated day of learning, to provide a play-based learning environment, to help children make a smoother transition to Grade 1 and to improve children’s prospects for success in school and in their lives beyond school” (Ontario Ministry of Education, 2010b, p.1).

On a practical level, the new ELK program introduces some key classroom changes. First, the number of students enrolled in a kindergarten class increases from 20 to 26 (Ontario Ministry of Education, 2010c). Second, the style of classroom instruction involves less desk-time. In line with this, the ELK curriculum encourages teachers to “take children out of the classroom and into the world beyond the school to help them observe, explore, and appreciate nature” (Ontario Ministry of Education, 2010b, p. 43). The Ministry of Education suggests the use of the outdoors as an extension of the classroom (Ontario Ministry of Education, 2010b), and some school boards have implemented a 60-minute block of time in the outdoors each day

(Personal Communications, 2013). This 60-minute outdoor exploration block has led to an overall modification of the kindergarten schedule and has the potential to improve the behaviour of students (Bagshaw, 2014), in addition to using the outdoors as an extension of the classroom; as students have the opportunity to roam and explore in an environment less structured than the four walls of a classroom (Burdette, 2005, Passmore, 1972). Specifically, schools have modified the 40-minute block for eating/recess, giving kindergarten students the entire 40 minutes for eating and cancelling outdoor recess. During the second 100-minute instruction block, kindergarten students now go outside for a 60-minute period combining outdoor learning and recess. Notably, this is an increase in total outdoor time for these students from forty to sixty minutes; however, the structure of this period can vary significantly from free-play to instruction. Additional perceived/anecdotal benefits to this modification are: i) kindergarten children are not on the playground at the same time as older children; and ii) children do not need to dress for outdoors as frequently during the school day. Conversely, fewer recess breaks may also mean fewer intellectual breaks from learning and may lead to declines in classroom engagement (Jarrett, 2002). However, the idea of outdoor exploration time holds a great deal of potential. Similar to play-based learning within the classroom, the long period of time outdoors allows for inquiry and investigation, in addition to the ability to roam more freely without the constraints of the classroom (Dietz, 2002). This freedom and reduction of strict protocols are thought to improve behaviour, motivate students, and improve engagement in learning (Passmore, 1972, Dietz, 2002, Burdette, 2005).

2.2 Academic Success

2.2.a Classroom Skills Development

As briefly discussed above, the ELK program was developed to provide children opportunities for self-regulation thereby ensuring that the province's youngest learners have a strong start in their educational journey leading to long-term success and fulfilment. The program focuses on the child as a unique individual and strives to connect the interrelated systems in which the child lives and performs in, including: family, school, community and world (Ontario Ministry of Education, 2010b). The goals of the program are to establish a strong foundation in the early years by providing young children with an integrated day of learning, to provide a play-based learning environment, to help children make a smoother transition to grade one, and to improve children's prospects for success in school and in their lives beyond school (Ontario Ministry of Education, 2010b).

Self-regulation is one of the most emphasized portions of the new ELK curriculum, and is an important skill for students to develop in life as it is related to physical, social, emotional, behavioural, and cognitive competence (Best Start Expert Panel on Early Learning, 2007). In kindergarten specifically, self-regulation related to the "ability to control attention, to direct and monitor thinking and problem solving and to engage in independent learning activities" (Rimm-Kaufman et al., 2009 p.3). Self-regulation is "central in a child's capacity to learn" (Ontario Ministry of Education, 2010b, p.7) and is thought to predict academic success (Ministry of Education, 2010b, Zimmerman, 1994, Galinsky 2010, Florez, 2011).

The ELK program has been put in place to nurture the development of self-regulation in our youngest learners. In the new ELK program, a strong foundation for learning and self-regulation is built through an exploration and inquiry-based learning approach which allows

students to interact and explore freely and to not be constrained to a desk or table (Ontario Ministry of Education, 2010b). Charles Pascal, the special Advisor on Early Learning for the Ontario Government, said that implementation of the ELK program will provide significant improvement for children moving to Grade one as they will have the cognitive, social, emotional, and physical skills necessary to succeed (Pascal, 2009). Additionally, this free-range learning is thought to reduce behaviour issues of children, as the students are more in control of their learning, and can develop their self-regulation abilities more thoroughly (Ontario Ministry of Education, 2010b). Through play-based learning, students in the ELK program are more likely to form a strong base for education and are more likely to develop positive perspectives towards learning and school.

2.2b Play-Based Instruction

Play allows children to engage and explore on their own, solve problems, make friends, express themselves and recognize things in the world around them (Michealis, 2014), and by allowing the framework of kindergarten to be play-based, children can enjoy learning from day one.

As compared to traditional kindergarten programs, in which students are seated at tables with prescribed tasks from educators based on a strict curriculum, the ELK program allows educators to create lessons and learning opportunities based on the interests of the students. The day typically revolves around participation in various centers, of the students choosing; known as play-based learning. The curriculum includes areas of personal and social development, language mathematics, science and technology, health and physical activity and the arts; very similar to subjects that older students are taking part in during the school day. The ELK curriculum also suggests using the outdoors as an extension of the classroom, and many schools have adopted

“outdoor exploration” time (Ontario Ministry of Education, 2010b). During these daily blocks of time, students enjoy play and discovery outside of the classroom, typically in the schoolyards.

2.2c Creating Positive Perspectives of School

Kindergarten is the first time a child is exposed to the school environment. Although school is an amalgamation of many experiences, the prevailing purpose is for learning through instruction. Teaching strategies are highly varied, but careful consideration is given to deciding appropriateness of level and content. Research shows that children who thrive in, and enjoy kindergarten are more likely to succeed academically in later years (Best Start Expert Panel on Early Learning, 2007).

The ELK program provides an opportunity for students to explore and inquire in areas they are interested in, and thus form an early positive relationship with school and education. Students are engaged in learning that they connect to and care about, under the guidance of an early learning team with their best interests in mind. The ELK program focuses on instilling self-regulation techniques in students, which allows for a smoother transition into grade one and for later life (Ontario Ministry of Education, 2010b).

Research shows that children rated as ‘high risk’ for academic failure in grade two were also rated as ‘more disruptive and aggressive’ by their kindergarten teachers (Wasik et al., 1993, Welsh et al., 2001) and that early positive child-teacher relationships are predictors of academic success and positive behavioural outcomes (Hamre et al., 2001). Additionally, research supports the idea that social outcomes, and positive networks of peers in kindergarten influences later academic success (Welsh et al., 2001). This evidence illustrates the importance of a solid start in the first years of school. Setting the foundation for a love-of-learning is important in the kindergarten years, as an early negative perception of school can create long-standing beliefs

about academia and impact both effort and perceptions about one's own capabilities in school-related activities.

2.2d Sex Differences

The ELK curriculum stresses the importance of developing self-regulation in children, to ensure success in later grades, and later life. Related to early academic engagement and long-term academic success, differences are noted between the sexes. It is well documented that boys and girls have different experiences, and different outcomes are seen between the sexes within the education system (Ontario Ministry of Education, 2009, Jackson, 2010). It is hypothesized that in the education system, schools and teachers have developed structures that prevent 'boys from being boys,' (Mulvey, 2009 p.38) the so called feminisation of schools (Martino et al., 2009), which may lead to an early dislike for school amongst boys, and consequently, an overall decline in success-rates amongst this cohort (Mulvey, 2009, Trentacosta et al., 2007).

Specifically, it is believed that boys are inherently drawn towards rough-and-tumble and warrior-like play; which are activities that are have been historically frowned upon by kindergarten teachers, the majority of whom are female (Martino et al., 2009). This creates the idea that school is a feminized place, where impulsive play behaviour is a sign of less engagement, and suggests to boys in their first school experiences that their behaviour is not welcomed. Supporting this supposition, are EQAO test results, which show that boys in grades three and six are not performing as well as girls on reading and writing tasks (Jackson, 2010). This is corroborated with statistics indicating that boys are expelled 4.5 times more frequently than girls (Logue, 2007).

The Canadian Council on Learning discussed in 2004/05 that more boys exhibited delayed social development compared to girls (Ontario Ministry of Education, 2009), and

students who show emotional regulation have been shown to succeed academically as they pay more attention to tasks in the classroom (Trentacosta, 2007).

One of the strengths of the ELK program is that teaching strategies and academic activities can be tailored to the learning styles and interests of students. The new ELK curriculum is therefore believed to be particularly beneficial for boys, in that the play-based learning approach encourages students to explore and inquire about subjects that are of interest to them. This pedagogy allows all students to investigate subjects and items that interest them most, while including the ability to move around the classroom and therefore not be constrained to a desk or table for long periods of time. This hypothetically should allow both sexes to immediately succeed in school, setting a foundation for them to flourish and enjoy school, rather than being forced to take part in activities that they are not connected to, or interested in.

A first grade teacher, interviewed by the Toronto Star regarding the changes that she has seen in her classroom since the implementation of ELK, said, “the most powerful aspect is the improvement in their engagement — they are completely engrossed in everything they do in the classroom and can’t wait to come back the next day,” (Rushowy, 2014). An instilment of a ‘love for learning’ in the early years creates promise for the future of these children. In fact, discussion and planning at the Ministry of Education is currently taking place to adjust the grade 1 and 2 curriculums. Currently grade one and two teachers are finding that there is now a gap between the curriculums during the transition from kindergarten. Teachers report that children who have experienced the ELK program are “more confident, ask more questions and are used to setting the agenda in the classroom,” (Rushowy, 2014).

2.3 Physical Activity

2.3a Physical Activity Skills Development

Physical activity is important for proper growth and development of children, and can have a positive impact on the physical, mental and social well-being of children (Active Living Research, 2015, Ontario Ministry of Education, 2010b, Trudeau et al., 2008) Health Canada uses the Physical Activity Guidelines put forth by the Canadian Society for Exercise Physiology (CSEP) for children in the Early Years (0-4 years), Children (5-11 years) and Youth (12-17 years) categories. The guidelines for 0-4 year olds include being physically active several times daily through interactive floor-based play. Toddlers (1-2) and Preschoolers (3-4) should accumulate 180 minutes of physical activity at any intensity spread throughout the day, including a variety of activities in different environments, activities that develop movement skills and a progression towards at least 60 minutes per day of energetic play by five years of age (Canadian Society for Exercise Physiology, 2012). Children 5-11 years old, and Youth 12-17 years old, should accumulate at least 60 minutes of moderate-to-vigorous physical activity each day and incorporate vigorous-intensity activities at least three days per week in addition to taking part in activities that strengthen bones at least three days a week (Canadian Society for Exercise Physiology, 2012).

Similarly, CSEP put forth guidelines for sedentary behaviour in these same age categories including children in the Early Years (0-4 years), Children (5-11 years) and Youth (12-17 years). The guidelines for children 0-4 years old discuss that children should minimize sedentary time, and limit screen time to no more than one hour per day. The guidelines change slightly for 5-11 year olds, as children are suggested to limit recreational screen time to a maximum of two hours a day and, like children and youth, are suggested to also minimize

motorized transport when possible. Most importantly for the school environment, CSEP suggests that extended sitting and time spent indoors be reduced wherever possible (Canadian Society for Exercise Physiology, 2012).

The Ontario Ministry of Education has not shied away from this idea and openly discusses that positive experiences of physical activity at a young age also help lay the foundation for healthy, productive habits later in life. An early start to active living improves development of brain function, physical coordination, gross motor skills, posture and balance, in addition to building confidence, social skills, emotional control and imagination (Canada Sport for Life, 2011). Physical activity is positively associated with better cognitive functioning in children, and research has shown that meeting the daily 60-minute recommendation for moderate-to-vigorous physical activity (MVPA) is linked with improved academic performance (Trudeau et al., 2008). An active start reduces stress and improves children's sleep, and participation in regular physical education has been shown to create more positive attitudes towards school, which leads to improved attendance (Canadian Association for Health, Physical Education, Recreation, and Dance, 2006). Physical Activity can have a positive impact on achievement, readiness to learn, self-esteem and behaviour (Ontario Ministry of Education, 2006).

2.3b Demographics

Active Healthy Kids Canada releases an annual report card on the physical activity (PA) of children and most recently, Canada received a D- minus grade for overall PA, based on the percentage of children and youth who meet the CSEP guidelines. This grade is representative of the majority of three and four year olds achieving 180 minutes per day of PA of any level, while

only 7% and 4% of 5-11 year olds and 12-17 year olds, respectively, meeting 60 minutes of MVPA daily (Active Healthy Kids Canada, 2014).

It was based on this data that the Daily Physical Activity (DPA) guidelines were developed (see section 1.4a below). Developers and proponents of the DPA program believed that its implementation would have an impact on student achievement, readiness to learn, behaviour, and self-esteem, in addition to improving health and implementing a foundation for healthy and productive lives (Ontario Ministry of Education, 2006).

2.3c Impact of Physical Activity on Student Success

Past research has looked at the impact of PA on academic success. A widely discussed intervention for low PA levels is that of the SPARK program and the book entitled SPARK by Dr. John Ratey (Ratey 2008). Dr. Ratey discusses the benefits of exercise and how it makes us ‘feel good,’ which was first assumed to be because of an endorphin boost, but Dr. Ratey argues that it is actually because it makes the brain function at its best. Most interestingly for this thesis, Dr. Ratey talks about the physical education program in Naperville, Illinois. This physical education program pushes students to achieve and maintain between 80 and 90% of their maximum heart rate, rather than learning the rules of a sport. The impact of this program has shocked many, including Dr. Ratey, as the students consistently rank in the top ten for academics. Naperville’s stand on fitness is that it “plays a pivotal role in its student’s academic achievements,” and PA’s impact on behaviour and academic success has been measured in the past by using results from standardized tests, showing that “fit kids scored twice as well on academic tests as their unfit peers” (Ratey, 2008).

Research has also been conducted showing that PA has a positive impact on classroom behaviour. Jarrett and colleagues (1998) suggest that uninterrupted blocks of instructional time

are inefficient for student behaviour, and that recess breaks are warranted for all students. Mahar and colleagues (2006) examined more specifically the impact of a PA program on overall step counts, and on-task classroom behaviour. Results found that a short, planned, ten-minute session of PA increased overall step counts for students during the school day significantly, with 782 more steps than the control group. Interestingly, Mahar and colleagues (2006) also evaluated the behaviour of students before the PA was delivered, indicating that the anticipation of receiving a bout of PA did not cause children to be more, or less, on-task. However, on-task behaviour increased by 8% between pre-and post- PA evaluations; which supports the idea of implementing short PA breaks. Overall, both areas of study suggest that incorporating short, classroom based PA opportunities allow for greater levels of PA, and improved on-task behaviour. Trudeau and colleagues (2008) assessed the effects of PA programs on academic achievement. Their research study showed that despite a reduction of academic time, the academic performance of students was unchanged with the introduction of a PA break. Additionally, this study confirmed the general agreement that PA has positive influences on concentration, memory and relevant to this thesis, classroom behaviour.

Despite the numerous studies looking into the effects of PA, to our knowledge, no research has been done to evaluate the step counts of full-day kindergarten students using the ELK or traditional BSD programs and schedules.

2.4. Opportunities for Physical Activity in Schools

In Canada, each province and territory has implemented a Health and Physical Education curriculum and the majority have implemented comprehensive school health initiatives. The Ontario Ministry of Education has implemented a Healthy Schools Strategy to support student learning and growth through nutrition and PA as they have identified that healthy students are better prepared to learn (Ontario Office of the Auditor General, 2013). In terms of physical activity, the Healthy Schools Strategy suggests various ways to increase PA during the school day. These ideas and others, outlined below, include: i) Daily Physical Activity (DPA); ii) recess play; and iii) physical education classes taught by specialists in the field.

2.4a Daily Physical Activity

The Government of Ontario mandated the Daily Physical Activity (DPA) guidelines in 2005, with the belief that being physically active has a positive impact on students' physical, mental and social well-being (Ontario Ministry of Education, 2006). Policy/Program Memorandum No.138 specifies that students should achieve a minimum of 20 minutes of Moderate to Vigorous Physical Activity (MVPA) each day *during* instructional time. These guidelines are for grades one to eight, excluding kindergarten and secondary school students (Ontario Ministry of Education, 2005). The policy specifies that PA is likely to: “have an impact on achievement, readiness to learn, behaviour, and self-esteem” and that “incorporation of physical activity at a young age helps lay the foundation for future healthy and productive lives” (Ontario Ministry of Education, 2005a p.1).

Research in the area of DPA has concluded that there is no formal monitoring strategy to ensure that the program is completed in Ontario elementary schools (Ontario Office of the Auditor General, 2013). Teachers find it difficult to integrate DPA into the school day while also

achieving the learning goals of the curriculum (Ontario Office of the Auditor General, 2013). A clear strategy to better implement DPA is therefore warranted.

2.4b Recess

Play is “the spontaneous activity in which children engage to amuse and to occupy themselves” (Burdette et al., 2005). ‘Play’ is acknowledged in Article 31 of the United Nation’s ‘Rights of the Child’ and it is stated explicitly that children have the right to play (International Play Association, 2014). Play is a key developmental task of early childhood (Hewes, 2006) and at school, it is during recess time, that students have the opportunity to play and interact freely with less supervision and direction than in the classroom (Jarrett et al., 2002). During recess, children are making choices, developing rules for play and developing social skills (Jarrett et al., 2002). Problem solving during play promotes higher-level thinking such as planning, decision making, sequencing and organizing, skills that are required for later success in academics and in everyday life (Burdette et al., 2005).

Recess play “allows children to experience the joys of movement, creativity, and friendship” and helps children develop physically, mentally, emotionally and socially (Burdette, 2005, p.49). Unfortunately, it has been reported: “long interrupted blocks of time for children to play, by themselves and with peers, indoors and outdoors, are becoming increasingly rare” (Hewes, 2006, p.1). Recess is one of the few times specifically set aside for children to engage in free play with minimal supervision or adult interference.

A component of free play recess time is PA, and recess time provides an important opportunity for children to be active during the school day. In fact, if students were engaged in PA for the entire duration of recess, students could fulfill 67% of the daily recommended 60 minutes of Moderate-to-Vigorous Physical Activity (MVPA) during the school day (i.e. the

traditional BSD school schedule provides 40 minutes of recess). Illustrating the importance of recess for PA, our research group has shown that elementary-aged students achieved 47% (2767) of their total steps during recess (Jaunzarins, 2014). However, research has shown that children do not use the recess time to its full potential. Specifically Ridgers and colleagues (2005) have shown that boys and girls aged 5-11 years spend only 33% and 25% respectively of their recess time being physically active. Further, McKenzie and colleagues (1997) report that students are *most* active in the first 10 minutes of this recess time at which point, activity levels decline. Accordingly, although recess time offers the potential to achieve substantial levels of PA, in reality, children are not continuously engaging in PA during this time alone. This underlines the importance of alternative opportunities during the day, including a structured approach to ensure adequate levels are achieved.

2.4c Physical Education

Physical activity (PA) and physical education are not the same thing, although they are directly related. PA, as defined by the World Health Organization, is “any bodily movement produced by skeletal muscles that results in energy expenditure” (Caspersen et al., 1985, World Health Organization, 2015). Physical education, on the other hand, is the subject area of the Ontario curriculum in which children are taught and engage in PA, at school by teachers. Physical education class is an important time of the school day in which students are physically active. In fact, PE may be the only time of day when boys and girls achieve the same level of PA (i.e. step counts); as was reported by Tudor-Locke and colleagues (2006). The Ontario Ministry of Education has mandated physical education for all students from kindergarten to grade nine (Ontario Ministry of Education, 2010a, 1999) but unfortunately has not mandated the number of minutes per day, or week. This decision is made by individual school boards based on available

space and infrastructure.

2.4d Physical Education Specialists

Teachers trained in PA and physical education are more likely to deliver better quality instruction in this field. This notion is supported by findings suggesting that students taught by a physical education specialist are more than twice as likely to be classified as ‘very active’ by other field specialists (People for Education, 2005). Previous research showed that students who were led by a physical education specialist achieved twice the amount MVPA and expended twice the number of calories as those in a control class with a non-specialist teacher (Sallis, 2006). Additionally, those taught by physical education specialists achieved greater fitness levels and were more likely to be considered ‘very active’ than students taught by teachers without special training (People for Education, 2005). These findings suggest the importance of physical education specialists. The 2005 Healthy Schools Initiative discussed the government’s plan to increase the budget from \$39 million in 2005 to \$146 million by the 2008-2009 school year in order to hire 2000 new specialist teachers, including the return of specialist physical education teachers (Ontario Ministry of Education, 2005b). In 2011 however, only 43% of Ontario elementary schools had a physical education specialist, and most were part-time employees (People for Education 2011).

Thus, physical education can provide daily PA, but without the expertise of a physical education specialist, the time provided for PE may not be utilized to its full potential. It can be argued that having physical education specialists delivering curriculum to kindergarten children is of even greater importance than older grades, given that lifestyle behaviours are learned very early in child development and can set a foundation for a healthy future.

2.4e Physical Activity in Kindergarten

Although the goals and principles of the ELK program are certainly important, the Ontario Ministry of Education has not listed or discussed specific goals for PA for kindergarten children during the school day. Given the current community issues surrounding lack of daily PA amongst Canadians and the associated health concerns, this is a crucial deficit. Similar to other grades, the curriculum breaks down the subject of Health and Physical Activity into a thorough overview, followed by a big idea, several overall expectations, and specific expectations for each, including examples of student demonstration of their own learning, and the potential interactions of the ELK team (Ontario Ministry of Education, 2010b). However, a prescribed amount of time mandated to be allocated for physical education and PA time is lacking.

The lack of mandatory PA allocation for kindergarten students could be planned using strategies that other grades are using to achieve PA during the school day. First, students in grades one to eight are mandated to DPA, as mandated in 2005. Although research suggests it is not being implemented adequately (Ontario Office of the Auditor General, 2013), it has potential and should be included in the kindergarten guidelines. Currently there are no recommendations for kindergarten students to be included in this mandate (Ontario Ministry of Education, 2005a).

Second, physical education allocation is given to individual school boards to decide how much school-time is dedicated to Health and Physical Education instruction each week for each grade, thus total time can vary from school to school. The ELK curriculum mandates four major overall expectations for the area of physical education for teachers (Ontario Ministry of Education, 2010b). These include: that students will need to demonstrate an awareness of health and safety practices for themselves, others, and show a basic awareness of their own well-being (1), participate willingly in a variety of activities that require the use of large and small muscles

(2), and develop both large (3) and small muscles (4) in a variety of contexts (Ontario Ministry of Education, 2010a). Daily opportunities for PA are of the utmost importance and are suggested for all children (Canadian Society for Exercise Physiology, 2012). PE classes provide an ideal, structured, opportunity for students to achieve these suggestions.

Third, as described above, the ELK program has altered the eating and recess schedule of kindergarten students in relation to the traditional BSD schedule: instead of having two, 20-minute recesses daily, kindergarten students do not have outdoor recess. Instead, during the middle instructional block, students have a 60-minute outdoor exploration. Guidelines for this time however, have again, not been mandated. Therefore, instructors can use it as they wish, including for instruction, free exploration, or play. This open-ended time creates large variances in the potential for PA during this period. Given that research has shown that during free time children are most active in the first ten minutes (McKenzie, 1997), more frequent, shorter breaks are likely more beneficial for PA purposes than one long block, as seen in the current ELK scheduling. Additionally, the ELK curriculum states the importance of free play for children, and recess time is one of the only times for students to have unstructured, less supervised free play in which to explore and interact socially without the immediate attention and oversight of teachers and supervisors.

Amalgamating this information, we can conclude that changes in school policy, including the proposal of an increased frequency of recess periods, opportunities for implementing daily PA breaks during instructional time, and the training of school personnel, all impact PA levels of students and should be implemented to provide optimal opportunities for PA in schools.

2.5 Method Validation

2.5a Measuring Behaviour

Direct Behaviour Rating (DBR) is a reliable and efficient method of behaviour assessment (Christ et al. 2013). DBRs are designed to be repeated and thus track behaviour over a period of time (Riley-Tillman et al., 2008). They measure a targeted behaviour on a scale, following a shorter period of time as compared to other means (Riley-Tillman et al., 2008). Thus, they are more ‘direct’ and efficient for use by teachers and researchers as an assessment tool to monitor progress and evaluate interventions (Riley-Tillman et al., 2008, Schlientz et al. 2009). DBR scales require little training, are non-invasive, allows students to be observed in their natural environment and provide a viable option for obtaining accurate estimates of student behaviour (Schlientz et al. 2009).

In this thesis we modified the implementation of the Direct Behaviour Rating scales to measure Academic Engagement and Disruptive Behaviour in a young subset of students, repeatedly throughout a school day and over a school week. We modified the descriptions for Academic Engagement and Disruptive Behaviour to better relate to the standards and expectations for a kindergarten student and we verified these descriptions with OCE-certified kindergarten teachers. The DBR scales have not been utilized under these conditions previously. We therefore piloted a novel use for this scale so that we could repeatedly, quantitatively measure classroom behaviour. Other options we considered included: daily behaviour report cards and Systematic Direct Observations (SDO). Daily behaviour report cards are similar to the DBR scale as they rate a specific behaviour for a defined period of time, but are meant to monitor the effects of a specific intervention in the classroom (Chafouleas et al, 2002). Daily

behaviour report cards have also been called ‘home-notes’ or ‘home-based reinforcement’ as the purpose is to have information shared between teachers and parents (Chafouleas et al, 2002).

The SDO is capable of providing an estimate of behaviour and has been accepted as an appropriate means of measuring student behaviour (Briesch, et al., 2010). However, SDOs measure student behaviour over a longer period of the day and require substantial resources in terms of time and personnel to monitor and record behaviour (Briesch, et al., 2010). We therefore concluded that these methods were not ideal for the purpose of the current thesis.

Results from previous studies support the idea that DBR scale ratings from individual and groups of raters “can approach reliability criteria for low- and high-stakes decisions” (Christ et al., 2010 p. 840). Although understood that a large variance can be found due to inter-rater differences, the DBR was still the ideal tool for our group to use. We argue, based upon intra-rater reliability, in applied settings, it is appropriate and realistic to have the same researcher rate the same students’ behaviour across multiple occasions. Additionally, the paper discusses that low-stakes decisions are supported after summing across five observation occasions, and large stake decisions are supported after 15 to 20 observations (Christ et al. 2010). As we measured each child three times a day for five days, our use of the scale was acceptable and aligned with those suggestions.

2.5b Measuring Physical Activity

Pedometers are reliable, affordable, non-invasive and have been proven to be a valid way to measure PA (Colley et al., 2012, Scruggs et al., 2010) in children. Pedometers are attached on the waistbands of subjects and measure the number of steps by testing up and down vertical accelerations of the hip using a spring-suspended lever arm (McClain & Tudor-Locke, 2009). Pedometers are a practical and low-cost way to monitor step counts and thus estimate PA levels. There are a number of different types of pedometers, but the Yamax Digiwalker SW-200 specifically has been proven to provide nearly complete precision of step counts in relation to hand-tallied steps (Beets et al., 2005), and has been set as the gold-standard as it is the most popular brand of pedometer used in research studies conducted with youth (Tudor-Locke et al., 2009). There has been some discussion regarding the reliability of pedometer use in adults versus children, and a number of studies have evaluated the difference of various brands in use for adults, but rarely for children (McClain & Tudor-Locke, 2009). Reactivity has also been discussed, which involves an increase from normal PA, based on the individual's awareness that they are being monitored. It is difficult to fully rule out reactivity in any study, and strategies such as sealing pedometers and assuming that the first days of use have an increased rate have been tested and found to be false (Tudor-Locke, 2009). Studies showed that there was no pattern of decline, nor an effect for sealed pedometers (Tudor-Locke, 2009). Other options include familiarizing students with pedometers before measurement days, which could include removing the first day of data if it was significantly different than the latter days of results, but this has not been directly evaluated (Tudor-Locke, 2009).

The use of pedometer step counts is most reliable in set-duration activities, such as a full school day with a recommended minimum of 4 days of data collection (Tudor-Locke et al.,

2009). Recently, the guideline of 12,000 steps per day was suggested to be equivalent to 60 minutes of MVPA based on correlation analyses of step counts and minutes of MVPA (Colley et al., 2012). This was based on data from the Canada Health Measures Study (Colley et al., 2011) and is suggested for children between the ages of six and nineteen years.

Due to these facts and past studies, pedometers, specifically the Yamax SW-200 design, are shown to be an effective method for measuring PA of children in school settings.

2.6 Statement of the Problem and Specific Hypothesis

2.6a Statement of the Problem

We believe that the new ELK program holds potential to greatly impact the youngest generation of children in school in terms of self-regulation and academic engagement, in addition to PA. Based on the literature related to this topic, a gap currently exists specifically in the investigation to the effects of the new ELK program both in terms of effects of the *program* on the classroom behaviour of children, and the effects of the coexisting *schedule* on the PA levels of children. Schools are the predominant environment for implementing community efforts to improve behaviours in children. Implementing effective strategies requires the assessment of school schedules to identify where, and how programs can, and should be modified to optimize best practices specifically for this important cohort.

Therefore in this thesis, the overall aim was to examine the effects of the ELK *program* on the behaviour of children in kindergarten, and to examine the effects of the kindergarten *schedule* on the PA levels of these children.

2.6b Hypothesis

Based on the literature and our observations in the field, we presented two hypotheses:

- 1) That the classroom behaviour of students would be better in the ELK program;
specifically that the ELK students would be more academically engaged and less disruptive.
- 2) That students using the ELK schedule would be more active than those using the traditional BSD kindergarten schedule.

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Chapter 3:

**THE IMPACT OF EARLY LEARNING KINDERGARTEN (ELK) SCHEDULING ON
PATTERNS OF PHYSICAL ACTIVITY AND CLASSROOM BEHAVIOUR**

To be submitted to the Health Behaviour and Policy Review (HBPR)

ABSTRACT

OBJECTIVES: How school scheduling impacts physical activity (PA) and classroom behaviour merits investigation; in particular, the new Early Learning Kindergarten Program (ELK). The purpose of this study was to compare students using the traditional Balanced School Day (BSD) kindergarten schedule to students using the ELK schedule on the following parameters: (1) PA levels; (2) academic engagement and disruptive behaviour; and (3) influences by age and sex.

METHODS Students (n=133) from two schools, using different schedules participated (70% response rate). Data were collected over five days using pedometers and Direct Behaviour Rating scales.

RESULTS Compared to the traditional BSD, ELK students took fewer steps (ELK: 5082±1131; BSD: 6263±1541; p<0.05). Steps achieved represented about half of the recommended daily steps (ELK: 42%; BSD: 52%). Compared to the BSD, ELK students were more engaged throughout the day (p<0.05), were less disruptive in the morning and mid-day (p<0.05); but showed no difference in disruptiveness at end-of-day. Boys (5887±1478) were more active than girls (5212±1290), but less engaged than girls in the BSD schedule only. Senior-year kindergarten students (5872 ±1392) were more active than junior-year kindergarten students (5293±1392).

CONCLUSIONS The ELK program may have a positive impact in overall academic engagement and success, however physical activity benefits are questioned.

KEYWORDS Children; Early Learning Kindergarten; Physical Activity; Classroom Behaviour

INTRODUCTION

Schools play an important role in embedding the learning and health behaviours that children adopt. They are an ideal environment in which to instill community health practices, as schools reach a high proportion of children; currently 2,015,423 in Ontario alone ^{1,2}.

Until recently, children did not engage in full-time study at school until the age of five or six; however, today, children as young as three years of age now attend school full-time in Ontario. To enhance both learning and health outcomes for all Canadians, it is critical that schools effectively engage this young cohort to develop both a love of learning and a desire to participate and stay within the school community. Physical activity is an important component of a healthy lifestyle and similar to other healthy practices, if incorporated early in life, is more likely to be continued into adulthood ^{3,4}.

Health Canada uses the Canadian Society for Exercise Physiology's (CSEP) guidelines for physical activity, which state: that children should strive to reach 180 minutes of any level of physical activity from the ages of 0-4 and recommends 60 minutes of moderate-to-vigorous physical activity (MVPA) for children ages 5-11⁵. This measurement can be translated to 12,000 steps per day as per Colley and Colleagues⁶. Interestingly, Active Healthy Kids Canada reports that 84% of three and four year olds are meeting their recommendation, while only 7% of 5-11 year olds are reaching the recommended target ⁷. However, these data were collected prior to the complete implementation of full-day kindergarten.

Research on physical activity levels in schools is important because children spend a significant part of their day at school and it is therefore a potentially significant time period to achieve healthful levels of physical activity. Research has shown that, in children aged 5-11, younger students are more active than older students ^{8,9,10}, and boys are more active than girls ^{8,10}. However, physical activity levels for children in full-day kindergarten have yet to be reported.

Several studies suggest that physical activity has a positive impact on academic performance and on cognitive functioning^{11,12,13}. For example, regular physical activity has been demonstrated to improve academic achievement, increase productivity and improve self-esteem¹⁴. In fact, increases in physical activity have been shown to maintain or even enhance student academic performance, even with a reduction in curricular teaching time¹⁵.

Student behaviour is also influenced by academic engagement. Academic engagement is an indicator that combines academic identification (which refers to getting along with teachers, having an interest in the subject matter, and related behaviours and attitudes) and academic participation (which captures the student's work effort both inside and outside of school, including hours spent on homework, meeting deadlines, not skipping classes, and so on). Academic engagement increases the enjoyment of learning, instilling a desire and amusement in learning while also decreasing behaviour issues within the classroom. The Ministry of Education fosters academic engagement by supporting the concept of students being involved leaders in their own learning¹⁶.

In 2010, the Ontario Ministry of Education (MOE) began implementing full-day kindergarten across Ontario. When first implemented, this youngest cohort was integrated into the regular school schedule, using a traditional kindergarten curriculum. As many schools use the traditional Balanced School Day (BSD) schedule, full-day junior (four year old) and senior (five year old) kindergarten children had three 100-minute teaching blocks separated by two 40-minute breaks; each break had 20 minutes for eating and 20 minutes for recess. Following their strategy to engage students through active participation, the MOE then developed and began phasing in a new program for kindergarten students, known as the Early Learning Kindergarten (ELK). As of September 2014, this two-year, full-day kindergarten program, has been fully

implemented province-wide in publically funded schools. ELK classrooms have a mix of junior and senior kindergarten students promoting student-mentorship and are co-taught by a certified teacher and an early child educator (ECE), who oversee 26 four and five year old students in a classroom and present a play- and inquiry-based approach to learning ¹⁷. This play-based approach is purported to allow students to form a foundation of self-regulation and enjoyment for the school environment from the start, allowing for a smoother transition with greater success into grade one, and in later life ³.

In terms of scheduling, the ELK program differs from the traditional BSD kindergarten schedule in two ways. First, the MOE has suggested that educators include a 60-minute block of ‘outdoor exploration time,’ preferably in the middle 100-minute block of the BSD schedule. Outdoor exploration functionally can be used as a physical activity period or as an outdoor classroom learning opportunity, or both. Second, the ELK schedule breaks from the BSD’s 20-minute nutrition break/20-minute recess division; ELK students are given the full 40-minutes to eat, if they require it, twice per day and move to an indoor activity when they feel they are finished eating. Thus, children in the ELK schedule do not engage in outdoor recess time during the school day, so opportunities for physical activity come only from physical education classes and class time. Although the ELK program holds potential for improved student success, the impact of the program and schedule on children’s physical activity, academic engagement and behaviour have not been tested.

Therefore the purpose of this study was threefold: (1) to compare physical activity levels between kindergarten students using the traditional BSD schedule with students using the new ELK schedule; (2) to compare academic engagement and disruptive behaviours between kindergarten students using the traditional BSD program with students using the new ELK

program; and (3) to investigate how age and sex influence these variables.

METHODS

Participants

Ethical approval was granted by the participating school board, the local health unit and the university's research ethics boards. Two schools were approached for participation based on match for socioeconomic status, geographic location and population size using the School Information Finder, from the Ministry of Education's website. Each school had four kindergarten classrooms: one school ran the Early Learning kindergarten program and schedule (ELK), and the other ran the BSD kindergarten program and schedule. A total of 133 parents out of a potential 189 provided consent for their children to participate in the study, representing a 70% response rate. After removing students with less than three full days of data, the sample size was 126 students.

Study Design

Data were collected over the same five-day (Monday-Friday) period in both schools during the month of May. One research assistant was assigned to each classroom, where they assisted children with attaching the pedometers in the morning, and recording the step count at the end of the school day. These same in-class researchers observed the students throughout the school day and rated the students' behaviour thrice daily: once in each learning block. The same research assistant observed and rated the same children for all five days of the study. All Research Assistants were trained in the use of the Directed Behaviour Rating scales, using training modules provided online and specific classroom examples from kindergarten classrooms. Lead research assistants also practiced rating students in classrooms prior the data collection to compare and discuss choices. In the classroom, students were rated in alphabetical

order and reverse alphabetical order on alternating days to ensure that students were not always rated first, or last.

Instruments

Physical Activity

Digi-Walker SW200 Pedometers were used to record the step counts of the children to estimate physical activity levels. These pedometers are considered the “gold-standard”, and have been used in much larger-scale projects including the Canada Health Measures Study ⁶.

Pedometers were attached at the hip on the waistband of the children’s clothing at the beginning of the school day. If students were wearing clothing without a waistband, a belt was provided to attach the pedometer. Students were introduced to the pedometers in class on the first day by the research assistants, and advised not to touch or play with them; pedometers were also taped shut to discourage tampering. Total step counts were recorded on log sheets at the conclusion of each school day.

Behaviour

Direct Behaviour Rating (DBR) scales were used to evaluate student behaviour in terms of ‘academic engagement’ and ‘disruptiveness’ in the classroom, at three points during the school day. DBR is a flexible, efficient and reliable tool, which rates behaviour following an observation period in a natural setting. DBR combines both systematic direct observation and behaviour rating scales, and is often used in school settings to change, monitor and manage student behaviour ¹⁸. A ten point scale was used to measure and evaluate each child’s behaviour during each of the three 100-minute blocks of instructional time ¹⁹; resulting in three evaluations per day, per child: block A (before first nutrition break), block B (before second nutrition break), and block C (end of day).

We chose to measure Academic Engagement (AE) and Disruptive Behaviour (DB) as positive and negative contributors, respectively, to academic success. Each child was observed for five minutes prior to assigning a score for each. For academic engagement, a score of 0 represented 'not at all academically engaged,' while 10 represented 'totally academically engaged.' Similarly for disruptiveness, 0 represented 'not disruptive,' while 10 represented 'fully disruptive.' Due to the young age and structure-differences as compared to a typical classroom for older children, we altered the definitions of academically engaged and disruptive behaviour for the ELK setting. We consulted kindergarten teachers to verify descriptions, and researchers piloted the scales prior to study commencement. AE was defined as: actively/passively participating in classroom activity, such as exploring, experimenting with a variety of materials, sharing findings with oral or visual representation, inquiring about objects or events, participating in creative movement or other daily physical activities, or taking charge of one's own learning. DB was defined as any action that interrupts regular school activities, for example, acting aggressively towards peers and/or educators, disrupting the learning environment and activities of other students, rejecting rules and routines set by the educators, and speaking out during instructional time.

Data Analysis

Data were expressed as the mean plus/minus the standard deviation of the mean (SD). Independent-sample t-tests were used to test for differences between: school schedules (ELK vs. BSD); grade-level (year one vs. year two students); and sex (boys vs. girls). A univariate Analyses of Variance (ANOVA) was performed when comparing step counts from multiple groups (between group: ELK vs BSD; within group: boys vs girls and junior vs senior kindergarten). A General Linear Model was used to analyze the behaviour data (between groups:

ELK vs BSD; within groups: time1 vs time2 vs time3; the independent variable was gender and the dependent variables were: academic engagement and disruptive behaviour). Statistical significance is reported at less than alpha 0.05, for all analyses.

RESULTS

Physical Activity

Schedule

Children in the ELK schedule (n=79) achieved significantly fewer steps per day with an average of 5082(\pm 1132) steps per day, in comparison to 6264(\pm 1542) achieved by children in the BSD kindergarten schedule (n=47) (t=4.94, p<0.01) (Figure 1).

Based upon a 12,000/day step goal (Colley et al., 2010), children in both programs achieved 52.2% - BSD and 42.2%- ELK of the recommended daily physical activity levels during their time in school.

Sex

Boys (n=58) were significantly more active than girls (n=68), with an average of 5887 (\pm 1478) steps per day as compared to 5212 (\pm 1290) for girls (t=2.74 p<0.05).

Schedule and Sex

No significant interaction was found between sex and schedules (p=.236). This confirms boys were more active than girls, regardless of schedule (Figure 1).

Age

Senior-year students (n=50, 5872 \pm 1392 steps) were more active than junior-year students (n=76, 5293 \pm 1392 steps) (t= 2.29, p<0.05).

Schedule and Age

A significant difference was noted between schedule (F=21.0; p<0.05). A near significant difference was found between junior and senior years (F=3.3; p=0.074), however, no interaction effect was found (p =.293) . Senior year students in the ELK program were more active than

junior-year students ($p=0.01$), but no difference was found between junior and senior students of the BSD program ($p=0.696$) (Figure 1).

Behaviour

Academic Engagement: Schedule

Children in the ELK program were more academically engaged than BSD students ($F=26.65$, $p<0.0001$) across all three instructional time blocks ($p_{\text{blockA}}<0.01$, $p_{\text{blockB}}<0.0001$, $p_{\text{blockC}}=0.001$). There was no main effect for time ($F=1.381$, $p=.253$), nor interaction between time and schedule ($F=1.08$, $p=.341$) with respect to engagement scores. (Figure 2a)

Academic Engagement: Sex

Girls were more academically engaged than boys ($F= 12.07$ $p<0.01$). Differences were significant in the first block of the day, and the last block of the day, but not during the middle block of time ($p_{\text{blockA}}<0.05$, $p_{\text{blockB}}=.162$, $p_{\text{blockC}}<0.01$). Post hoc analysis showed that these differences were found specifically between the sexes in the first ($p<0.05$) and last blocks of the day for children in the BSD schedule only ($p<.001$) (Figure 3).

Academic Engagement: Age

No differences were found in academic engagement between the junior and senior-aged students ($p>0.05$), in any of the time blocks of the school day. Post Hoc analysis with pairwise comparisons showed no difference between junior and senior students at any time of the day ($p_{\text{blockA}}=0.859$, $p_{\text{blockB}}=0.573$, $p_{\text{blockC}}=0.272$) but within group comparisons showed a difference between students in the junior age group between time points B and C ($p<0.05$) (Figure 4)

Disruptive Behaviour: Schedule

Disruption levels in BSD classrooms were higher than those in the ELK classrooms ($F=10.67$, $p<0.01$). Students in ELK were significantly less disruptive at instructional blocks A ($p>.01$) and B ($p<.01$) but showed no difference in disruptiveness levels in block C ($p=0.664$).

Disruptiveness increased over time, regardless of program ($F=12.42$, $p<0.01$); and there was a significant interaction effect between time and schedule type ($p<0.05$). Results showed that ELK students were more disruptive at the end of the day as compared to the first two blocks of time ($p_{\text{blockA}}<0.01$, $p_{\text{blockB\&C}}<0.01$). There were no differences in disruption levels over time for BSD students. (Figure 2)

Disruptive Behaviour: Sex

There were no differences found in disruptive scores between sexes ($p=0.152$), in any of the time blocks. There was no effect for time, or interaction between time and schedule.

Disruptive Behaviour: Age

There were no differences found in disruption scores between age groups ($p=0.136$), in any of the blocks of the day, there was no effect of time, or interaction between time and schedule with respect to disruption scores.

DISCUSSION

Physical Activity

The 40 minutes of recess time previously scheduled for BSD kindergarten students had the potential for students to attain 66% of their recommended daily steps, (~8000 steps), whereas the 60 minutes of outdoor exploration time in the new ELK schedule has the potential for students to achieve 100% of their daily requirements (i.e. 12,000 steps per day). Results from this study show that although neither kindergarten schedule provided students with optimum amounts of daily PA, students following the new ELK schedule are in fact engaging in even less physical activity. This is despite an increased amount of outdoor time. The fact that neither school schedules achieved the daily physical activity recommendations, despite opportunity for such, stresses the importance of designating a portion of each day to structured physical activity.

Research has recently shown that 84% of younger children are consistently achieving physical activity recommendations, compared to 7% of school-aged children⁷. This suggests that the early enrollment of Canadian children in school may have an overall adverse effect on their physical activity participation rates and that the Ministry of Education needs to develop and enforce physical activity guidelines specific to this cohort. These shortfalls are likely best explained by research from McKenzie and colleagues who showed that children are most active in the first ten minutes of recess time, illustrating the importance of increased frequency, rather than duration, of outdoor time²⁰. A secondary consideration is that the 60-minute block of outdoor exploration time in the ELK schedule is also planned at the discretion of the classroom teachers, such that the time can also be used for instruction, rather than free play, during which students would be less active. Strategies and tools to encourage teachers to plan and execute innovative outdoor exploration activities that engage students in physical activity are strongly advised to maximize the potential of this specific time period.

We also found that sex had an impact on the number of step counts, as boys were achieving more steps than girls, regardless of schedule. This finding is consistent with results in older school-aged children, where this pattern persists from grades one to six and beyond ^{21, 22}. Researchers with Active Healthy Kids Canada only recently released the 12,000 steps per day guideline for both boys and girls ⁶. This recurrent finding stresses the importance of a structured portion of daily physical activity, as previous research showed that boys and girls achieve the *same* number of steps during physical education ²³. It also stresses the importance of inclusive activities that are attractive to young girls in order to increase physical activity levels.

We also found that the age of the student had an impact on the number of steps they took in a day, as senior-year students were achieving more steps than junior-year students. Senior students as a group and irrespective of school scheduling took more steps than junior students, however both ages were more highly active in the BSD program than the ELK program. Step count data on children aged 3-4 is limited and it is at this age-point when physical activity standards diverge.

Behaviour

This is the first study to pilot the Direct Behaviour Rating scale for use in kindergarten children for the purposes of capturing classroom behaviour over time. Importantly, these data showed significant differences in favour of the ELK schedule for both levels of academic engagement and disruptive behaviour. These results were surprising, given the documented link between behaviour and PA ¹³, and given that the ELK children had lower overall PA compared to the BSD students. We hypothesize that our results are a function of both the play-based nature of the ELK program, which better engages students throughout the day, and the relatively small overall differences between schedules relative to recommended daily levels.

Additionally, we found that girls were more engaged than boys throughout the day, with the exception of the middle block of time. These sex differences related to academic engagement revealed from the DBR data are consistent with other lines of evidence reported in the literature²⁴ and therefore supports the reliability of the data collection using the DBRs under these novel circumstances. Interestingly, we also showed that academic engagement was significantly affected by schedule, such that there was a gap between girls and boys in the BSD schedule, but not the ELK schedule. The traditional kindergarten classroom structure (BSD) has been thought to favor girls over boys academically^{25,26} thereby contributing to future dis-engagement of boys. Our present results support the play-based nature of the ELK program suggesting that this program is better at engaging boys.

It is important to note however that for both the ELK and BSD schedules, disruptiveness was generally rated as very low and that engagement was generally rated as high. Although the differences in these measures were found to be statistically significant between the ELK and BSD schedules, the variation was marginal. Whether the differences in academic engagement and disruptiveness in the ELK and BSD translates into 'clinically meaningful' differences in the classroom setting remains an open question.

Limitations

One limitation of this study is that our data only consists of total step counts for each school day, and therefore does not capture the contribution of steps from recess, outdoor exploration and classroom time blocks individually. Future studies should consider segmenting the data to be able to delve more deeply into the contribution of various activities and blocks of instructional time.

Our data collection team for this project consisted of one researcher in each class. To strengthen this method, we would suggest the use of multiple researchers in the future to test the inter-rater reliability in this specific setting.

Finally, it is important to note that this study only evaluated the school-day contribution to daily physical activity levels, and does not account for physical activity achieved before or after school. Our results report only what occurs within the school day, and thus provides a start point for teachers and administration within schools, in addition to parents to help ensure that after school time is also utilized optimally to achieve target physical activity levels.

Conclusions

In conclusion, our results support the implementation of the ELK curriculum for optimum student achievement, but also show that modifications to the ELK schedule are required to improve overall levels of Physical Activity.

IMPLICATIONS FOR POLICY

Key priorities for the Ministry of Education’s implementation of the Early Learning Kindergarten program were to increase student engagement through play-based learning and active participation by students. However, this program was not examined prior to implementation for effects on physical activity levels. Our findings show increased academic engagement and decreased classroom disruptiveness for children using the ELK program, in line with program development, but also found reduced physical activity levels amongst children using this newly adopted kindergarten program. These results highlight the importance of reviewing all school scheduling and changes with respect to their impact on physical activity.

Based on our findings, we put forth a number of suggestions for educators and administrators of the ELK program in Ontario. First, we support the adoption of the 60-minute outdoor exploration block, but urge teachers to incorporate structured physical activity during this time: it is an ideal opportunity to obtain daily physical activity. Second, we suggest that two unstructured recess times be provided each day, in addition to the 60-minute outdoor block. This unstructured playtime is of the utmost importance for the development of children physically, as well as socially, with free interaction with other children without the structured supervision of teachers. Third, we recognize the importance of physical education (gym) classes, and we stress that a structured program, delivered daily in the kindergarten years may be optimal. Additionally, we suggest the adoption of the Daily Physical Activity (DPA) program in the kindergarten years, as this cohort has been “left behind” in this movement by the government of Ontario. Based on our results, we also stress the importance of ensuring that physical activity is made attractive and promoted to all students, but specifically to girls, to assist in closing the gap between the sexes. Finally, schools and school boards need to ensure that they provide adequate infrastructure, and

the expertise of physical education specialist teachers to provide a strong program that ensures a healthy foundation of physical literacy and adequate physical activity.

Acknowledgements

This project was funded by the Louise Picard Public Health Research Grant. Our research team is especially grateful for the assistance from the participating school board, principals, secretaries, teachers, students and parents for participating in this study and assisting to ensure our data collection went smoothly. Without the full support of the school boards, employees, students and parents, this project would not have been made possible.

Human Subjects Approval Statement

Ethical approval for this project was granted by the participating school board, post-secondary institution, and local health unit. Parental consent provided for all participants prior to data collection.

Conflict of Interest Disclosure Statements

All authors of this article declare that they have no conflicts of interest to declare.

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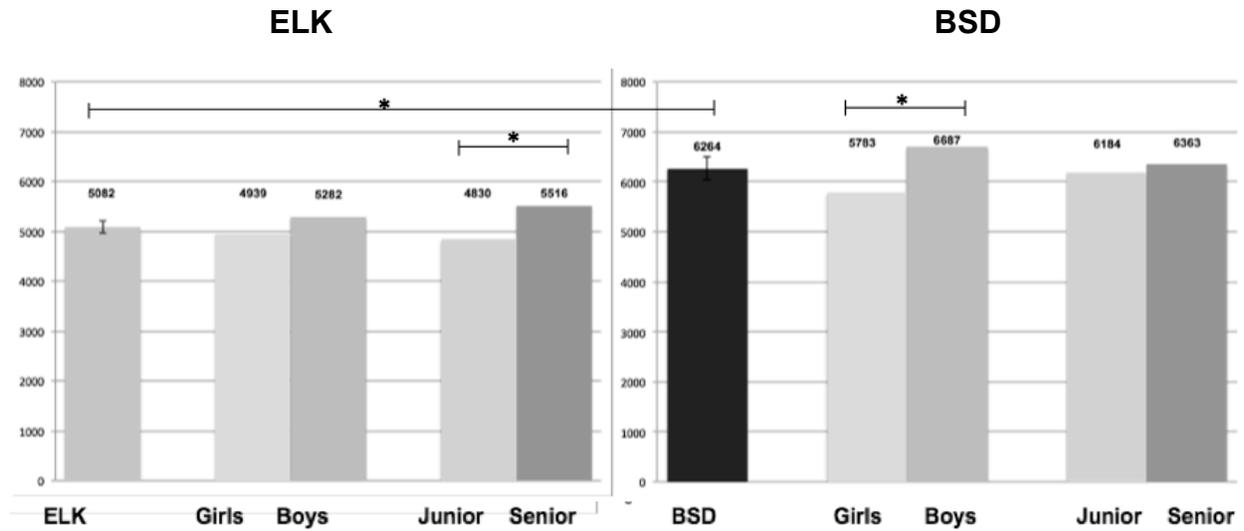
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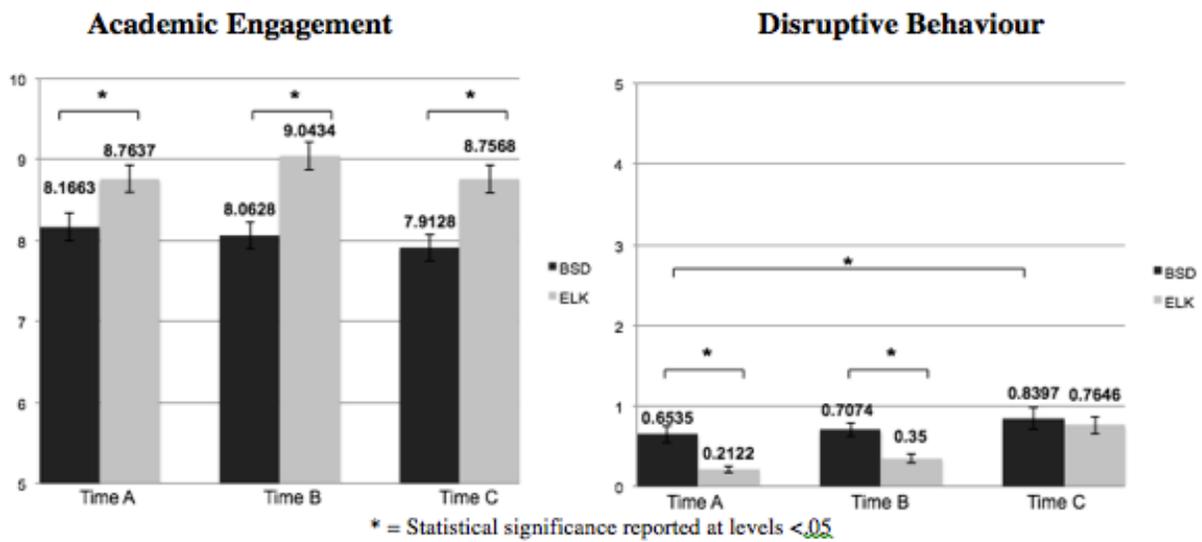
Figures/Tables

Figure 1: Physical Activity by Schedule, Sex, and Age



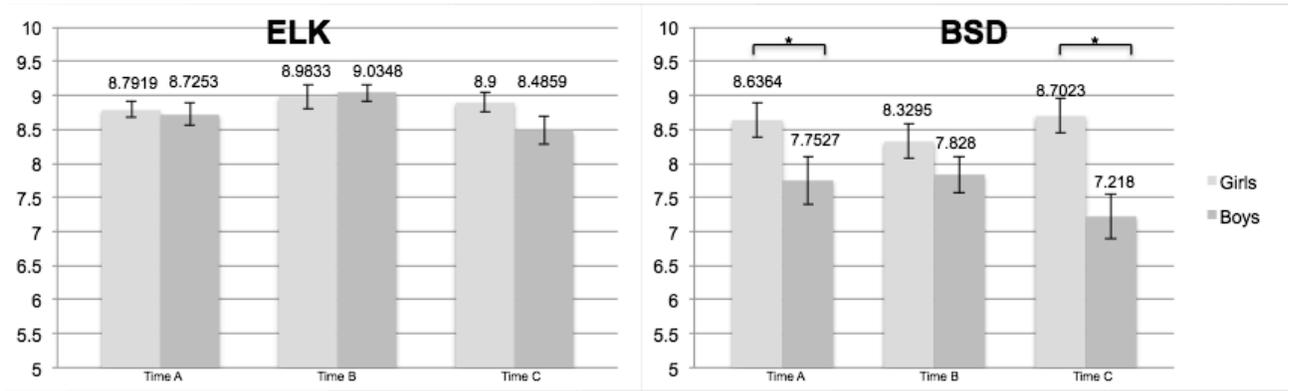
* = Statistical significance reported at levels <.05
ELK= Early Learning Kindergarten Schedule
BSD = Balanced School Day Schedule

Figure 2: Academic Engagement and Disruptive Behaviour by Program



ELK= Early Learning Kindergarten Schedule
 BSD = Balanced School Day Schedule

Figure 3: Academic Engagement by Schedule and Gender

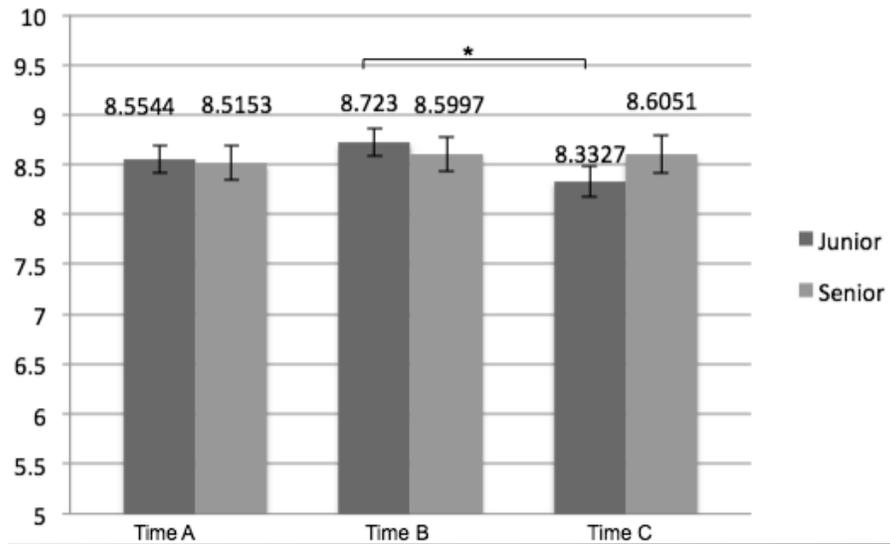


* = Statistical significance reported at levels <.05

ELK= Early Learning Kindergarten Schedule

BSD = Balanced School Day Schedule

Figure 4: Academic Engagement by Age



* = Statistical significance reported at levels <.05

Chapter 4

PAPER 2: EDUCATION CANADA

PHYSICAL ACTIVITY IN KINDERGARTEN: SETTING THE STAGE FOR A HEALTHY LIFE

Laura Thirkill, Charley-Anne Dinnes, Alain Gauthier and Sandra Dorman (2014). Physical activity in kindergarten: Setting the stage for a healthy life. *Education Canada*. 2014: 54(3). Retrieved from <http://www.cea-ace.ca/education-canada/article/physical-activity-kindergarten>

Physical Activity in Kindergarten: Setting the stage for a healthy life

By Laura Thirkill, Charley-Anne Dinnes, Alain Gauthier and Sandra Dorman

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Physical activity is an important part of a healthy life and incorporation of an active lifestyle in the early years sets the foundation for continued activity in later life. In this article, we put forward our suggestions of “best practice” for administrators and educators in primary school settings to promote compliance with recommended guidelines for physical activity. We also suggest policy development using these guidelines for students in the new Early Learning Kindergarten programs established in Ontario.

<main text>

“In the past, it was assumed that children were naturally active on their own, but sadly, this is no longer the case.” – *Myriam Benoit, BPHE.*

Members of the Laurentian University Nutrition, physical activity, and Community Health (LUNCH) Research Group regularly engage in discussions related to the peripheral impacts that administrative change has on children’s health. Specifically, during educational reform, a key component to consider is the need for meaningful physical and health education; and not just in the gymnasium. One important example is school schedules. Schools have moved away from traditional schedules, which incorporated two recesses separated by a single lunch period. Today, many schools have adopted alternative schedules, the most prevalent of which is the “Balanced School Day,” which has two 40-minute nutrition/activity breaks, separated by three 100-minute teaching blocks. While modern schedules have their benefits, assessment prior to implementation seldom considers how the changes will impact children’s physical activity levels.

Most recently, implementation of the Early Learning Kindergarten (ELK) program has begun across Ontario. In this article, we discuss the impact of the ELK program on physical activity in Kindergarten-aged children and recommend ways to safeguard this important aspect of health and well-being.

The new ELK program has been developed on the premise that Kindergarten lays the foundation for future school experiences. According to former Ontario Minister of Education, Leona Dombrowsky,

“Full-day learning is part of our overall plan to help more children get a strong start in school, so they can go on to have successful, rewarding lives. By giving them more opportunities at a young age, we’re giving our children a brighter future.”ⁱ

Research has consistently shown that early success predicts long-term success and adjustment outcomes. We would like to extend this argument to include healthy lifestyles. Children who enjoy and participate in activities in kindergarten are likely to build upon this success in later years. We would also like to highlight that suitable physical activity can lay the foundation for academic success. Engagement in physical activity throughout the school day has been shown to improve student achievement and readiness to learn in addition to bettering classroom behaviour.

The ELK program will be fully implemented across Ontario in the 2014-15 school year. Several key changes have occurred with the implementation of this program, which have potentially positive and negative consequences with respect to student physical activity.

First, while Kindergarten class size will increase to a maximum of 30 students, they will be team-taught with both an Ontario Certified Teacher (OCT) and an Early Childhood Educator (ECE). We see this as being highly beneficial to maximizing individual needs, including health behaviour instruction. Second, children as young as three are now enrolled in school for the full day, and for the entire school week. This is a noteworthy change from previous generations that should facilitate children’s accommodation to the school setting and provide significant opportunity for developing healthy behaviours in the early years. Schools now have the opportunity to engage a large audience in active play and education from a very young age. Third, the curriculum has moved to an inquiry- and play-based approach. Students are given a

leading role in their own learning, in an environment that is supportive of their self-regulation and development. We strongly support this type of learning and speculate that it will involve less desk-time and therefore enhance physical activity levels in the classroom.

In addition, some schools are also implementing a 60-minute outdoor exploration block, to use the outdoors as an extension of the classroom as the Ontario Curriculum suggests. We see this as an amazing opportunity for students to learn in a different environment, and also see potential for this time to be used as an opportunity for students to achieve an increased level of physical activity during the day.

However, we also note an important negative consequence of this schedule-change – specifically, the coinciding change in recess times. Before implementation of the 60-minute outdoor exploration block, Kindergarten children went outdoors for free play during recess, which occurred twice a day in schools using the Balanced School Day schedule. However, with the implementation of the outdoor exploration block, Kindergarten students remain in the school during these two blocks of time, extending their nutrition breaks. This gives the children more time to eat their lunches, addressing a concern that many parents have (i.e. that their children do not have enough time to eat). Research in our centre, however, has shown that this causes an overall decrease in the total amount of physical activity that the children engage in. From a time perspective, this seems surprising since 60 minutes outside is more time than the combined time for two recesses (40 minutes). However, there are two reasons why this does not result in increased activity. First, the instructional nature of this time may alter the degree of physical activity that the children engage in. Second, we know that during free time, children are most active in the first ten minutes. Therefore, frequent shorter breaks achieve more physical activity among students than fewer, longer breaks, as seen with this modified schedule.

Another significant factor is that individual school boards, rather than the Ministry of Education, decide how much time is allocated to Health and Physical Education instruction. Currently, Kindergarten children are excluded from the Daily Physical Activity Program mandated for other grades in Ontario. Therefore, the allocated time varies from school to school.

So how can schools adopt the ELK program while still creating a school environment that supports physical activity for our youngest learners?

We first need to consider the recommendations from the Canadian Society for Exercise Physiology for children's physical activity². In this document, young children between the ages of one and four are suggested to achieve a minimum of 180 minutes of physical activity at any level throughout the day, while children aged five to 11 should achieve at least 60 minutes of moderate-to-vigorous physical activity. Kindergarten students range from 3-5 years of age and therefore crossover into both of these categories. In this scenario, the benchmark more commonly used is that for the older children, i.e., 60 minutes of moderate-to-vigorous physical activity each day. Additional physical activity above these recommendations produces even greater health benefits for children.

Given that Active Healthy Kids Canada has rated Canadian children with a failing grade for physical activity levels for the last nine years, and less than half of all school-aged children are achieving daily activity recommendations, it's important for schools to build physical activity into the curriculum right from the beginning³. When evaluating physical activity in the classroom, there are three target areas.

First, recess time is important for children to have unstructured play. Play allows children to explore and interact socially with other students and learn from these experiences. As such, we recommend that all school children should enjoy two scheduled recess breaks.

Second, we strongly support the adoption of the 60-minute outdoor exploration block; however, we would urge instructors to ensure that physical activity is included as a component of this time. We note that resources, such as the Ontario Physical & Health Education Association, are readily available for schools to use and provide step-by-step instructions for a variety of games and activities for this age group.

Third, Physical Education (gym) classes are another important component of the elementary school curriculum, and we stress the importance of a structured program, delivered daily, for Kindergarten children. While the Ministry of Education has mandated 20 minutes of Daily Physical Activity (DPA) for grades 1 to 8 during classroom time, no recommendations have been made regarding DPA for Kindergarten classes, and the number of Physical Education classes expected per week is not explicitly stated.

We strongly recommend that these important elements be added to the Ministry of Education's agenda. Likewise, teachers must ensure that a structured approach to physical activity is taken to maximize the benefits for children during this scheduled time. Schools need to have adequate infrastructure to support daily physical education and every school should have at least one Physical Education Specialist. To date, the many capabilities of these specialists are largely under-utilized and overlooked and we would urge all schools to examine their capacity in this area.

We are very excited about the direction the Ontario Ministry of Education has taken in developing this forward-thinking curriculum for the Kindergarten cohort. However, currently lacking are specific development plans to address best practice for physical activity during the school day. We believe the recommendations put forward in this article will promote future success.

Notes

¹ Leona Dombrowsky, Ontario Minister of Education, in *The Full-day Early Learning Kindergarten Program* (2010-11), 5.

www.edu.gov.on.ca/eng/curriculum/elementary/kindergarten_english_june3.pdf

² Canadian Society for Exercise Physiology (CSEP) Guidelines for Physical Activity:

<http://www.csep.ca/english/view.asp?x=804#>

³ Active Healthy Kids Canada Report Card on Physical Activity for Children and Youth:

<http://www.activehealthykids.ca/ReportCard/ReportCardOverview.aspx>

Chapter 5

DISCUSSION

5.1 Summary

The aim of this thesis is to examine how the ELK *schedule* influences PA levels in kindergarten children and whether the ELK *program* does indeed improve classroom behaviour. To our knowledge, this is the first study to assess both step counts in kindergarten children attending full-day school as well as schedule-induced changes in PA levels. Likewise, we believe this study is the first to assess the ability of the ELK program to improve classroom behaviour as measured using a novel methodology.

Importantly, we confirmed that children in the ELK program did have higher scores for academic engagement throughout the school day. In addition, students in the ELK classrooms were less disruptive compared to those in the traditional BSD kindergarten program. However, equally important we found that children using the ELK schedule took significantly fewer steps than those children in the traditional BSD kindergarten schedule. Therefore although the ELK program appears to be yielding promising outcomes in terms of academic engagement, modifications are required in scheduling to address the needs of children more holistically including their PA participation. This is particularly critical given that these children are the youngest generation to attend school full-time and from a health perspective, dramatic decreases in their daily PA would portend poorly for their future health.

In this study, we also evaluated the impact of the ELK program/schedule on PA and classroom behaviour according to sex and age. The PA data was consistent with the literature, with boys and second-year kindergarten students achieving more steps on average than girls and first year kindergarten students. Interestingly, the ELK program appeared to improve behaviour in boys. Girls were more academically engaged than boys in the first and last blocks of the day in the traditional BSD program, whereas there were no differences found between boys and girls in

the ELK program. This advocates for the ELK program as it has reduced the 'gender gap' in terms of academic engagement. First year kindergarten students became less engaged by the last block of the day, which is perhaps not surprising as not only is this their first year in full-time schooling, but for many is also their first year without a scheduled afternoon nap.

5.2 Relevance of the Study

Given that the Ministry of Education has dedicated significant efforts into developing the ELK program and is committed to its implementation, it is critical that the program be carefully examined for its ability to meet all the developmental needs of 3-to-5 year old children. Since our study found that students in the ELK program are not achieving the step counts of their counterparts in the traditional BSD kindergarten program, despite having more dedicated outdoor time, it is important to identify ways to increase PA for this program, by focusing attention on the factors that can limit PA accumulation during the school day including: schedule, sex and age.

Additionally, although our study supports the implementation of this program for its ability to enhance academic engagement and decrease disruptiveness, it is important to discuss the factors that can further influence the behaviour of these young learners in school, including: program, sex and age.

5.3 Physical Activity

The current implementation of a province-wide standard which enrolls children as young as three into full-day school, exposes this youngest cohort to similar school day schedules, which have not been validated to promote strong PA behaviours in children. Canadian children have consistently been given failing grades for overall PA, most recently scoring a D-minus in the first ever global report card to measure childhood physical activity (Active Healthy Kids Canada, 2014). Canadian children under five years of age specifically are said to be “dangerously, physically inactive” (Active Healthy Kids Canada, 2010, p.1).

It is therefore critical that steps be taken immediately to develop the best schedule for these children, which will instil a strong foundation for continued PA behaviours. In fact, early implementation may incur long-term improvements for academic success (Ratey, 2008, Trudeau, 2008, Mahar 2006).

5.3a Schedule

Our study found that school scheduling, and specifically the change seen with the implementation of the ELK schedule, plays a large part in the number of steps achieved by students during the school day; kindergarten children are achieving about half of the daily recommended 12,000 steps, (42% and 52%, for ELK and BSD, respectively) (Colley et al., 2012).

In our paper, published in Education Canada (REF), we suggest a variety of ways to modify the ELK schedule to improve daily PA, including: ensuring that teachers and ECEs use the 60-minute block of outdoor exploration time as an opportunity for teacher-led, structured, group PA. This would ensure some form of daily PA, which is particularly important for girls as they tend to be less active than boys. Outdoor exploration time is an ideal opportunity for

students to be physically active, and resources need to be readily available to engage students in this activity. Equally important, we stress the significance of role models and suggest a gradual release of responsibility teaching model (Pearson et al., 1983, Ontario Ministry of Education, 2006) wherein students are taught games and activities that support PA, and that can be extrapolated to other free time during a child's day, e.g. recess without direct supervision from teachers.

In addition, in this paper, we argued that PE classes are a large contributor to daily PA (Tudor-Locke et al., 2006, Sarkin et al, 1997), and these opportunities, we think, should be provided daily for all students, including kindergarten students. Lastly, it has also shown that PE specialists are underutilized (People for Education, 2014, Canadian Association for Health, 2006), and we suggest that the Ministry of Education utilize these professionals in order to further increase PA levels of students, specifically in the early years in the ELK program.

5.3.a.1 Recess

One of the major differences between the ELK schedule we studied, and the traditional BSD schedule is the removal of free recess time. Recess has long been known as a time for students to expend energy before returning to the classroom (National Association of Early Childhood Specialists in State Departments of Education, 2002)

We advocate for the reinstating of recess time in the ELK program for several reasons. First, we recognize that recess offers students the chance to interact with peers outside of the classroom and to engage in social or free play, which has benefits in and of itself. Learning occurs during recess in ways not possible in the classroom, as recess supports social and emotional development of children (Jarrett, 2002, Burdette, 2005). Recess presents opportunities to connect with peers, and has potential to act as an outlet for anxiety and provide opportunity for

students to learn to manage stress and gain self-control (National Association of Early Childhood Specialists in State Departments of Education, 2002). Through free play, children take part in PA, problem solving, socializing, and rule creation, all while enjoying time with peers (Jarrett et al., 2002, McKenzie et al., 1997). If a large component of the outdoor exploration time is set aside for both outdoor learning and structured PA, recess becomes a critical time in the school day to ensure some unstructured time is given to children as well.

Second, recess provides another daily opportunity for PA. In fact, McKenzie and colleagues (1997) have shown that students are most active in the first ten minutes of recess time (McKenzie et al., 1997). Based on this information, a clear strategy to improve daily activity in children would be to have more frequent bouts of activity, of shorter duration.

We do recognize the challenges inherent in this group, i.e. the extra time required for eating and changing into outdoor wear, as well as the desire to separate this group from older children on the playground. We therefore suggest that rather than reverting back to the Balanced School Day schedule, that shorter recess breaks (10-15 minutes) be implemented at the beginning and end of the day, directly before start and finish of the school day. This timing solves all of the above issues while minimally impacting instruction time. In fact, lost instruction-time could be recaptured by reducing the morning and afternoon nutrition breaks from 40 to 30 minutes. In addition, given that disruptiveness was highest at the end of the school day, particularly for the junior kindergarten students, an early finish to the school day may be particularly warranted for this cohort.

5.3.a.2 Physical Education Classes

In Ontario, the decision regarding exact timetabling requirements, including that of time dedicated to physical education, comes from independent school boards and principals must

ensure that the requirements are fulfilled in their school (Avon Maitland District School Board, 2013, Ontario Ministry of Education, 2010b Ottawa-Carleton District School Board, 2010). The timing for health and physical education specifically is often based on the school's population and availability of gymnasium space. We think that irrespective of infrastructure issues, children in kindergarten should be taking part in physical education on a daily basis. Adequate infrastructure is important and should support daily physical education for all students, but opportunities to use the schoolyard for physical education instruction and participation is a viable option that allows students to connect perceptions of physical education to everyday life. This solution to infrastructure restrictions should be further developed to allow students to engage in daily physical education classes (Moore et al, 2013, Schwab, 2014).

Physical Education classes must involve developmentally appropriate activities for kindergarten students in order to build physical literacy and competence in the early years in school. This foundation is important for both healthy development and to instill the love for activity at a young age; it has also been shown to be beneficial for both boys and girls (see section: 5.3b Sex Differences).

5.3.a.3 Specialist Teachers

Building on the importance of physical education classes, physical education specialists are a vital element in ensuring that students are receiving quality physical education instruction. Studies show that students taught by physical education specialists engage in more moderate to vigorous PA during class time, and expend more energy (Telford et al., 2012, McKenzie et al., 1993). Children in one study taught by PE specialists were given more opportunities to be physically active and received more minutes of teacher modeling, instructional cues and prompts (McKenzie et al., 1993). PE specialists dedicate a greater proportion of class time to physical

fitness activities, provided higher quality instruction and thus provide better opportunities for children to be physically active while in school (People for Education, 2011). Additionally, physical education specialists understand the importance of age-appropriate activities and games, and are more prepared to help develop students who are physically literate and competent with fundamental movements skills (CAHPERD, 2006). Physical education specialists are more likely to instil positive attitudes towards PA and thus create the foundation for a love of activity (CAHPERD, 2006).

In both of the schools we studied, kindergarten students were taught by what is known as a ‘prep teacher,’ or a teacher who covered the class while the classroom teacher prepared upcoming activities and lessons. We observed that the physical education teachers involved in these schools were not specialists. This is in fact not an uncommon finding as only 47% of schools employ at least one physical education specialist, and most are part time and do not cover all grades (People for Education, 2014). If ELK students had physical education specialists planning and instructing their physical education classes, PA participation would likely be improved. Given the continued poor records for PA in Canadian Children of all ages, specifically a D-minus for overall Physical Activity (Active Healthy Kids Canada, 2014), we think that the targeted, increased hiring of physical education specialists is warranted. In addition we would argue that a physical education specialist would also be ideally positioned to plan age-appropriate activities for this youngest group of learners while engaging all students for the maximum time period.

In context of the ELK program and to help mitigate the current trend of reduced PA participation in school children, we think it is particularly critical that ELK administrators ensure that kindergarten students are taught by physical education specialists, *daily*. The competencies

of these professionals are currently underutilized. The importance of a structured daily program, delivered by a positive role model for PA, will go a long way in instilling the foundation for a love of activity in the early years of children's lives. Critically, instilling this foundation at this developmental stage will set the foundation for change in children's health across Canada.

5.3b Sex

Although differences in step counts between the sexes are well documented for older children (Canadian Fitness and Lifestyle Research Institute, 2012, Colley, 2011), this is the first study to our knowledge to show the same differences reflected in this younger subset during a full day of school. This is interesting because it supports common beliefs, by parents and teachers alike, that boys and girls are inherently different in their PA levels. Classically, in the kindergarten setting, girls are described as being more passive and are ready to sit, whereas boys are said to be impulsive, more physical and to have natural spatial capabilities that drive them to explore and design more so than girls (Mulvey, 2009). Despite potential differences in 'approach to activity' between the sexes (Blatchford et al., 2003, Woods et al., 2012), given that growth and development at this age is similar (Canadian Sport for Life, 2014), it is generally agreed that all children, regardless of sex, should achieve the same number of daily steps (Colley et al, 2012). Therefore, although all children in kindergarten should increase their daily PA, special attention should be given to increase PA for girls. We suggest that this requires a structured PA component to be included as part of the daily schedule. We also recommend that consideration should be given to opportunities that are attractive to young girls, to close the gap in PA levels between the sexes.

Several methodologies to approach the PA gap between boys and girls have been identified in the literature; many include the creation of positive environments fostering self-

esteem, confidence and role models (Keilburger, 2015, Ontario Ministry of Education, 2010, Weiss, 2000, Fenton et al., 2009). Dr. Gary Goldfield, when interviewed by the Globe and Mail, said “girls should be encouraged to take part in enjoyable PA that provides a sense of mastery or accomplishment and opportunities to build and strengthen relationships” (Keilburger, 2015). Results from his previous studies have also shown that physical education classes are the only time during the school day when boys and girls achieve an equal number of steps (Tudor-Locke, 2006). These results highlight the need for structured PA for both sexes, but particularly for girls.

Role models are also considered to be of vital importance for young girls when it comes to PA participation (Fenton et al., 2009). While parents are certainly significant role models for PA participation in their children, teachers also exert tremendous influence while children are at school, and accordingly are equally important role models for instilling PA participation. Teachers who encourage self-defined success such as improvement or enjoyment, rather than normative standards and peer comparison, are more likely to influence students’ self-perceptions and motivation to continue participating in physical activities (Weiss, 2000). Allowing for participants to have choice in activities also is associated with greater motivation for involvement in PA activities (Weiss, 2000). The Canadian Association for the Advancement of Women and Sport and Physical Activity (CAAWS) discusses the top ten success factors for the participation of girls and women in Canadian Sport and PA, and specifically state that “leaders should be female, enthusiastic, positive, encouraging and accepting” (Fenton et al., 2009, page 44). Therefore, *female* physical educators should be incorporated into a health promotion plan for schools to promote positive perspectives of PA. Although we do not advocate for the specific hiring of one sex over the other when employing a Physical Educational Specialist, we do recommend that schools look to providing instruction on the importance of PA and games

training for an educator of the opposite gender to provide a role model for all children.

5.3c Age

Differences in PA between year one and year two kindergarten students are interesting and important to document from an educator's perspective in order to address and improve the currently low levels of PA. We found that the 5-year-old participants were more active than the 4-year-old participants, regardless of schedule.

Our results were surprising as first and second year students took part in the same scheduling during the day. Interestingly, our research group has been conducting preliminary research into investigating the idea that perhaps school in general decreases the PA of students. Active Healthy Kids Canada's statistics reflect the change in guidelines between the early years (0-4 years) and children (5-11 years), showing that 84% of the early years population are achieving their 180 minutes of PA at any level, while only 7% of the 5-11 year olds are achieving 60 minutes of MVPA; this data collection was prior to the implementation of full-day kindergarten for all children in Ontario. This may be due to differences in the PA guidelines between the groups, but it may also be due to the fundamental shift in lifestyle at age 5; that is the initiation of full-day schooling. Ongoing studies looking at step counts in children aged 18 months to 4 years show that children in a daycare setting are highly active with average daily step counts between 9 a.m. and 4 p.m. of approximately 5900 (Personal Communication, Duguay and Dorman, 2015). This, compared to our average of 5082 steps per day in the ELK program is interesting, as it is more similar to the step counts of those children in the traditional BSD schedule, at 6264 steps per day, again highlighting the importance of examining the ELK schedule and its impact children's' PA participation.

This area regarding patterns of PA based on the age of students requires further study. We think our findings may simply reflect the differing physical capabilities and varying levels in development of general movement skills between the younger three and four year olds versus 5/6 year old kindergarten students (Canadian Sport for Life, 2014).

5.4 Behaviour

5.4a Program

Our study found that the school program does play a role in student behaviour. Children in the ELK program were more academically engaged at all three time points, and less disruptive in the first two time points of the day compared to those in the traditional BSD kindergarten program. Interestingly, students were equally disruptive at the end of the day in both programs.

5.4.a.1 Physical Activity

We had originally hypothesized that the program whose students engaged in higher levels of PA would also incur higher levels in academic engagement and lower levels of disruptive behaviour. However, we did not find this congruence. This assumption was based on the literature, which supports a link between PA and improved academic success (Ratey, 2008, Shephard, 1997, Ontario Ministry of Education, 2014). We hypothesize that this discrepancy in our own study may be a function of the play- and inquiry-based instruction style of the ELK program, which is more physical in nature and involves a reduction in desk-related activities. Four and five year old children are still very much maturing emotionally, and improving their ability to pay attention and concentrate while regulating their responses, thus have limited attention span (Canadian Council on Learning, 2007). Since the ELK program allows children to move around the classroom while exploring and discussing learning topics, incorporating learning centers that interest them, and since the pace of this exploration is self-determined, the new program incorporates this concept of ‘time-to-focus’ allowing for more rapid changes in points of interest; this presumably better engages the students overall. Meanwhile, it also presumably increases step counts taken during class time. This raises an interesting side-note regarding PA, in that one would predict that students in a play-based curriculum would have

more in-class step counts than out-of-class. Future research needs to conduct a segmented assessment of daily step counts in the kindergarten program, because if true, changes in scheduling (as outlined above) to improve PA, could dramatically improve daily PA in kindergarten students when combined with a program that may inherently enhance step counts in class.

5.4.a.2 Time-of-Day

When looking at disruptive behaviour, all students irrespective of schedule were most disruptive at the end of the school day; this aligns, anecdotally, with teacher and staff reports. This finding supports the Ministry of Education's campaign to schedule larger blocks of time for literacy and math instructional within the morning instructional blocks (Ontario Ministry of Education, Literacy and Numeracy Secretariat 2009). Based upon our results we would support this idea, and we restate our suggestion that kindergarten children have a scheduled recess break at the end of the last instruction block; this would support both students and teachers during this most difficult time for student focus.

5.4b Sex

Our study found that, in general, girls were more engaged than boys in the first and last blocks of instructional time during the day, which was found to be due to program differences. Boys and girls in the ELK schedule were not significantly different from each other in terms of academic engagement, but girls were more academically engaged than boys in the traditional BSD kindergarten program. There were no differences in disruptive behaviour between the sexes at any point of the day.

These findings support assertions that the ELK schedule is best for all students, as it closes the 'gender gap' related to student engagement that has been seen in academia between

boys and girls in the primary years (Ontario Ministry of Education, 2009). The ELK program was implemented on the foundation that it would be best for all students. The ‘gender gap’ for academic success traditionally seen between boys and girls was not discussed explicitly in the ELK documents; however, the present study is the first, to our knowledge, to have measured the effectiveness of this program in this regard. It supports the implementation of ELK programming in classrooms to create a strong foundation with positive first experiences in school, to ensure a love for learning that continues as the children grow.

5.4c Age

Our results show that there was no difference in academic engagement between junior and senior students in any of the time blocks during the school day. However, first year kindergarten students were found to be more disruptive in general in the second and third block of the day.

In terms of disruption, there were no differences found between the age groups in any of the blocks of the day and there was no effect of time, nor interaction between time and schedule with respect to disruption scores. These findings support the idea of mixed ages in the ELK classroom, known as “blended classes”, as there were no documented differences in capabilities for academic engagement, nor amount of disruptive behaviour. The ELK program takes into account that children have a diverse range of abilities and experiences, and thus advocates for students’ contribution of knowledge to the classroom. Students are invited to share their knowledge and second year students are often given leadership roles to assist with new members of the ELK classroom. School boards report that children in blended classrooms offer feedback to other students who are learning, and this feedback is often acted on when discussed with

peers. It allows for students to act as role models for each other, and again allows students to become more self-regulated (Rainbow District School Board, 2010).

5.5 Limitations and Future Recommendations

As with all research, this thesis is not without limitations. First, our sample size was relatively small (n=133) when compared with projects of similar topic areas including the Canada Health Measures Study (Colley et al., 2011); however it is important to note that we were able to show statistically significant findings supporting the conclusion that our population size was adequate for our purposes. We can not explicitly confirm the differences in PA are due to the schedule differences alone, as the children themselves, on average, could have been more or less active. For our purpose, we could not use the same students in different conditions, thus our approach was the most idea for the scenario.

Furthermore, two factors were not controlled for that may have impacted the study. First, the qualifications of the classroom teachers involved were not evaluated, so the approaches and strategies used in some classrooms could have perhaps had a greater activity element than others. Second, although we did investigate the qualifications of the physical education teachers, all were non-specialists. Due to this, we could not directly address how specialist teachers may have impacted our results. Our arguments that physical education specialists positively impact PA participation are based only on what has been reported in the literature. Readers should bear in mind that results are estimated and group levelled effects were not looked at.

Another limitation of the current study was that step counts were not collected in a segmented fashion throughout the school day, such that classroom, recess and outdoor exploration time could be examined separately for their contribution to total daily step counts. This would have allowed us to better understand the changes in PA over the course of the school day and in relation to the school program/schedule to optimize our recommendations.

It is also important to note that this was the first study to implement the Direct Behaviour Rating scales as a means of analyzing the behaviour of the children in a quantitative manner. Although we view the use of this tool under these circumstances as effective, we recognize that more research is required to establish the effectiveness and repeatability of this methodology. In particular, it would be useful to examine the inter-and intra-rater reliability in evaluating student behaviour.

Finally, it is important for readers to remember that our data only represents the PA and behaviour of the students during the school day. Future work should include full-day data analysis to examine how kindergarten programs affect children outside the school day.

5.6 Strengths

This study is the first, to our knowledge, that evaluates the PA and behaviour of the youngest cohort of elementary school students and it is also the first to evaluate the successes and limitations of the ELK program.

The response rate for such a young audience was relatively high at 70% representing a majority of the targeted audience. The findings of our study are in line with results from much grander scale projects that show low levels of PA participation during the school day.

The demographics of the schools approached for participation were matched using the School Information Finder through the Ontario Ministry of Education website. The schools used in this study had similar demographics in terms of population size and education level of parents. Both schools had four kindergarten classrooms and were within 2.5km of each other. Differences could be argued for the percentage of students in lower income homes, as there was a 10% difference between schools, however based on the geographic proximity, the match for parental university education, and the population size, these schools were the ideal match for our purposes.

5.7 Conclusion

Overall, we think that the change to a play-based kindergarten program was a good choice for the Ministry of Education. The ELK program appears to provide students with a positive first experience with school, and allows them to develop self-regulation techniques, both of which will give them a better chance of success in school, and therefore in life.

Based on findings from this thesis, which reflect and resemble findings from population studies (Colley et al., 2011), implications for parents, teachers and school administrators of the ELK program can be provided. Schools are an ideal setting in which to implement change, and the ELK program specifically holds a great deal of opportunity for advancement in children's academic success and health. Key priorities for the Ministry of Education's implementation of the ELK program were to increase student engagement through play-based learning and active participation by students. However, this program was not examined prior to implementation for effects on either. Our study is the first to show increased academic engagement and decreased classroom disruptiveness for children using the ELK program, in line with program development. However, we also found reduced PA levels amongst children. These results highlight the importance of reviewing all school scheduling and changes with respect to their proposed impact, ideally prior to implementation. To remediate the negative changes of ELK program implementation on PA levels and given that specific development plans to address best practice for PA during the school day are currently lacking; we summarize the following recommendations:

- 1) That two unstructured recess times be provided each day to kindergarten children.
- 2) That an additional mandated 20-minute component of structured PA be incorporated into the 60-minute outdoor exploration block

- 3) That kindergarten students have mandated daily physical education with a structured program, delivered using age-appropriate games and training.
- 4) That kindergarten students be included in the mandated DPA policy.
- 5) That specific strategies be developed to promote PA to girls.
- 6) That funding and planning be focused on addressing the need for adequate infrastructure to support daily physical education for all students, including kindergarten students.
- 7) That all schools should have at least one physical education specialist on staff.

We conclude that the ELK program provides many benefits for Ontario's youngest learners, but modifications are needed to the schedule on which the ELK program is run. Educators and administrators must ensure that adequate PA is introduced and included in early year programming to provide a foundation for a love of both education and PA.

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Acronyms

BSD: Balanced School Day

DBR: Direct Behaviour Rating

DPA: Daily Physical Activity

ECE: Early Childhood Educator

ELK: Early Learning Kindergarten

MOE: Ministry of Education

MVPA: Moderate to Vigorous Physical Activity

OE: Outdoor Exploration

PA: Physical Activity

PE: Physical Education

Appendix A: Laurentian University Research Ethic Board

Approval for Conducting Research Involving Human Subjects



APPROVAL FOR CONDUCTING RESEARCH INVOLVING HUMAN SUBJECTS Research Ethics Board – Laurentian University

This letter confirms that the research project identified below has successfully passed the ethics review by the Laurentian University Research Ethics Board (REB). Your ethics approval date, other milestone dates, and any special conditions for your project are indicated below.

TYPE OF APPROVAL / New X / Modifications to project / Time extension	
Name of Principal Investigator and school/department	Laura Thirkill (SHK) Charley-Anne Dinnes (SHK) Supervisors: Sandra Dorman, Alain Gauthier
Title of Project	The Impact of Classroom Scheduling on Student Health
REB file number	2013-02-13
Date of original approval of project	March 8, 2013
Date of approval of project modifications or extension (<i>if applicable</i>)	
Final/Interim report due on	March 8, 2014
Conditions placed on project	Final report due on May 31, 2014

During the course of your research, no deviations from, or changes to, the protocol, recruitment or consent forms may be initiated without prior written approval from the REB. If you wish to modify your research project, please refer to the Research Ethics website to complete the appropriate [REB form](#).

All projects must submit a report to REB at least once per year. If involvement with human participants continues for longer than one year (e.g. you have not completed the objectives of the study and have not yet terminated contact with the participants, except for feedback of final results to participants), you must request an extension using the appropriate [REB form](#)

In all cases, please ensure that your research complies with [Tri-Council Policy Statement \(TCPS\)](#). Also please quote your REB file number on all future correspondence with the REB office. Congratulations and best of luck in conducting your research.

Susan James, Acting chair
Laurentian University Research Ethics Board

Appendix B: Sudbury and District Health Unit Research Ethics Review Committee

Statement of Approval



Joelle Martel, Diana Urajnik – Health Promotion

From/De: Ido Vettoretti, Chair, Research Ethics Review Committee (RERC)

Date: April 2, 2013

Re/Objet: Statement of Approval

File #: 2013-02 - The Impact of Classroom Scheduling on Student Health

<input type="checkbox"/> Urgent	<input type="checkbox"/> For Review	<input type="checkbox"/> Please Comment	<input type="checkbox"/> Please Reply
<input type="checkbox"/> Urgent	<input type="checkbox"/> À réviser	<input type="checkbox"/> Commentaires svp	<input type="checkbox"/> Répondre svp

Thank you for submitting the above Research and Ethics proposal.

DECISION: Approved.

This project has been approved until **May 1, 2014** and the study may now proceed. The final report is due **June 1, 2014**.

Please note that the RERC requires that you continue to adhere to the protocol as last amended and approved by the RERC. The RERC must approve any further modifications before they can be implemented. If you wish to modify your research project, please contact the RERC Committee outlining changes to any future proposals.

If there is a change in your source of funding, or a previously unfunded project receives funding, you must report this as a change to the protocol.

Adverse or unexpected events must be reported to the RERC as soon as possible with an indication of how these events affect, in the view of the Principal Investigator, the safety of the participants and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and approvals of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-Council Policy Statement (TCPS) requires that ongoing research be monitored. A final report is required for all projects. Researchers with projects lasting more than one year are required to submit a report annually.

Please quote your original RERC file number on all future correspondence. If you have any questions, please do not hesitate to contact:

Ido Vettoretti, Chair
Research and Ethics Review Committee (RERC)

Appendix C: Direct Behaviour Rating Scale Form

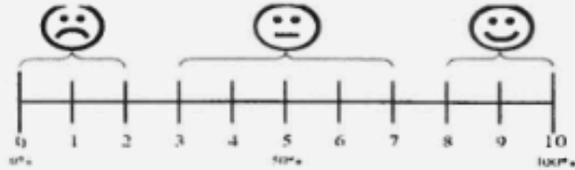
DBR Smiley Face Form – Standard Behaviours

ID #: _____ Rater: _____ Day: M T W Th F

1.

Academically Engaged

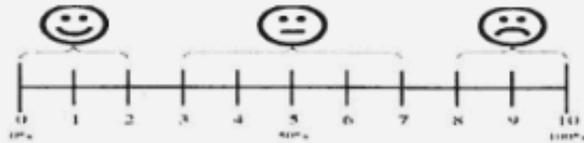
% of Total Time



Disruptive*

% of Total Time

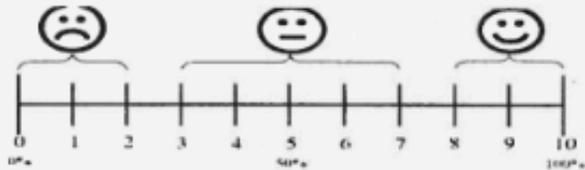
*Note that a lower score for
"disruptive" is more desirable



2.

Academically Engaged

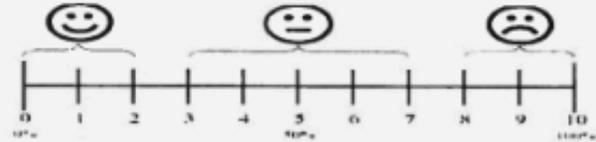
% of Total Time



Disruptive*

% of Total Time

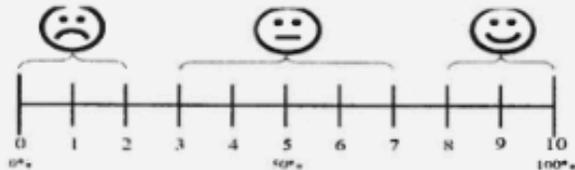
*Note that a lower score for
"disruptive" is more desirable



3.

Academically Engaged

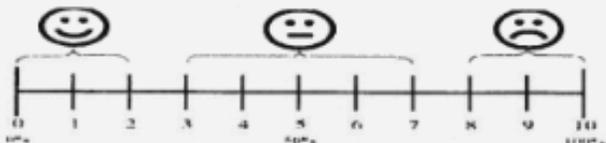
% of Total Time



Disruptive*

% of Total Time

*Note that a lower score for
"disruptive" is more desirable



Appendix D: Direct Behaviour Rating Scale: Behaviour Definitions

Behaviour	Definition
Academically Engaged	<p>Actively/Passively participating in classroom activity</p> <p>Ex. Exploring, experimenting with a variety of materials</p> <p>Sharing findings with oral or visual representation</p> <p>Inquiring about objects or events</p> <p>Participating in creative movement or other daily physical activities</p> <p>Taking charge of one's own learning.</p>
Disruptive Behaviour	<p>Student action that interrupts regular school activities</p> <p>Ex. Acting aggressively towards peers and/or educators</p> <p>Disrupting the learning environment and activities of other students</p> <p>Rejecting rules and routines set by the educators</p> <p>Speaking out during instructional time.</p>