

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

The Relationship Between
Morning Physical Activity and Student Engagement
In An Elementary School Setting

by

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Abstract

The problem under investigation in this mixed-methods study is the relationship between a morning physical activity intervention and subsequent student engagement in academic activities in an elementary school. Student engagement is examined as previous research has established a close relationship with academic achievement. The theory of grounded cognition is utilized as the framework to organize the discussion of results.

The physical activity intervention was a fifteen-minute period of hall walking and gym running for the entire school population at 9:05 a.m. The participants included four randomly selected elementary students in each of seven classrooms. Teachers and an educational assistant recorded students' level of engagement at the same time period for eight consecutive school days without the morning physical activity followed by ten days with the physical activity intervention. The mean scores for the two conditions were analyzed using a one-tailed paired t-test, resulting in findings of statistical significance. Interviews were conducted with the teachers and an educational assistant to provide a more detailed understanding of the specific student responses to the two conditions. Qualitative data analyses demonstrated increases in observed engaged behaviours after the activity condition, including improved student mood, memory, focus, and on-task behaviours. An additional effect, as noted by teachers and the educational assistant, was the value of social engagement opportunities provided by the intervention and its positive effect on classroom and school climate. This study contributes to new understandings of the fundamental question about the optimal academic learning states of children relative to physical activity.

Acknowledgements

I began this journey with a wondering. As a Physical Education teacher, I had observed that many of my students who were most successful and committed to involvement in physical activity in class and in extracurricular activities also appeared to be the students achieving the most academic success. Conversely, students who were the least interested and committed to physical activity tended to struggle academically, socially and behaviourally. I wondered if and how these two apparently separate areas of development were related. Did success in one area lead to success in the other or were there other variables involved? New research in neuroscience and psychology seemed to suggest that there might be a connection. What could schools do to capitalize on such a connection, if it does exist?

I would like to thank the staff, students and parents of the study school for their willingness to change routine and participate in a thoughtful examination of their experiences. Your information has been invaluable and, as a teacher, I understand the difficulties involved with finding time and energy to report and discuss findings.

The members of my committee provided the support and critical expertise to examine my work and ensure that I was asking and answering the right questions. Thank you, Dr. Mandzuk, for continuing to take an interest in my work as you took on the new challenges as first Acting and then Dean of Education for the University of Manitoba. Your incisive questions and detailed responses were delivered in a supportive and encouraging spirit. Thank you for the gift of your time.

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MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

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Table of Contents

Chapter One: Introduction	7
Chapter Two: Review of Literature	17
Chapter Three: Methodology	28
Chapter Four: Results	41
Chapter Five: Discussion	63
References	76
Appendices	85
Appendix A: Student Engagement Checklist	85
Appendix B: Adapted Version of the Student Engagement Checklist	86
Appendix C: Informed Consent for the School Division Administration	88
Appendix D: Informed Consent for the Study School Principal	90
Appendix E: Sample Completed Student Engagement Checklist	92
Appendix F: Informed Consent for the Teacher	94
Appendix G: Informed consent for the Educational Assistant	96
Appendix H: Informed Consent for the Parent	98
Appendix I: Informed Consent for the Student	101
Appendix J: Letter of Approval for use of Student Engagement	103
Walkthrough Checklist	
Appendix K: Pre-Study Information Session for Teachers,	104
Educational Assistants and School Administration	
Appendix L: Pre-Study Script for Study Explanation for Kindergarten	106
to Grade 3 students	
Appendix M: Teacher/Educational Assistant Interview One Questions	107

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Appendix N: Teacher/Educational Assistant Interview Two Questions	108
Appendix O: Quantitative Results Tables	109
List of Tables	
Table 1 Individual Student Means for Both Conditions	42
Table 2 Transition Time Comparisons	49
Table 3 Comparison of Incidence of Reported Disengaged and Engaged Behaviours	51
List of Figures	
Figure 1 Grounded Cognition: A Field Map	10
Figure 2 Frequency Distribution of Mean Differences	44

Chapter One: Introduction

The purpose of this study is to investigate the relationship between morning physical activity and subsequent student engagement in a number of classrooms in an elementary school by observing student behaviour after a school-wide morning physical activity intervention. Standard beliefs in many educational settings continue to be that mind and body are separate: that a child's cognitive abilities remain "all in their heads" (Hannaford, 2005). A new way of looking at optimal brain function for students would incorporate their physical and social needs prior to and during academic activity. In 2008, Ratey, in his book *Spark: The Revolutionary New Science of Exercise and the Brain*, describes new research in neuroscience and the effects of physical activity and exercise on the brain. This book has had a major influence on my interest in this area and in framing this study.

The recent use of brain scanning technologies, combined with research in neuroscience, has shown that the effects of exercise on cognition are more profound than once believed and that mind and body are inextricably interconnected in learning (Diamond, 2000). Studies in the area of physical activity and its effect on the brain demonstrate such positive outcomes for students as enhanced cognitive alertness, self-esteem, social skills and executive functioning (Field, Diego, & Sanders, 2001; Sibley & Beilock, 2007).

These positive outcomes for learners have been related to increased engagement in school, more and more an area of focus for school administrators. Increased engagement has been positively correlated with improved academic achievement (Klem & Connell, 2004; Finn, Pannozzo, & Voelkl, 1995). Student engagement in school activities, cognitively and socially, has been demonstrated to show a strong correlation with academic achievement (Appleton, Christenson, & Furlong, 2008). According to Klem and Connell (2004), "there is strong empirical support for the connection between engagement, achievement, and school behaviour" (p. 262). Engaged students tend to earn higher grades and perform better on academic tests

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

(Christenson, Reschly, & Wylie, 2011, p. 99). Disengagement with school tasks has increasingly become an area of concern for educators. The perception that cognitive tasks may be unrelated to students' everyday lives and therefore, seemingly irrelevant and uninteresting, has prompted educators to direct efforts to providing differentiated instruction and tasks which engage different students in different ways.

Educators continue to strive to provide the most productive learning environment possible to promote cognition in their students. This chain of connections from physical activity to increased engagement to enhanced academic achievement raises questions about the optimal programming model to provide that environment. The question then becomes, how can new understandings about the role of physical activity in affecting engagement and academic achievement be applied effectively in a school setting?

Theoretical Framework

During the development of this study, I investigated a psychological theory of cognition entitled “embodied” or “grounded” cognition (hereafter referred to as “grounded cognition”). It was not influential in the study design but provides a relevant framework for the analysis of results and subsequent discussion. Grounded cognition theory suggests that cognition can be influenced and biased by states of the body and the environment (Adam & Galinsky, 2012). A more traditional theory of cognitive psychology (classic cognition theory) holds that the brain and learning can be described as an input – export model in which the brain functions independently of the body and its environment (Newell, 1990). Using the information provided (input), the brain examines the evidence and arrives at the correct answer (output). In classic cognition theory, the brain is envisioned as a separate entity affected only by information provided primarily through vision and auditory input (seeing and hearing). Measureable input from other senses such as olfactory or tactile sensation might also be used to inform the intellect.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

However, the brain, in this view, was pictured as an organ taking this input, processing it independently of the rest of the body systems and producing knowledge and understanding. This “output” could be quantified as measureable aspects of learning such as attention, working memory, long term memory, choice, knowledge, language, executive functioning and reasoning.

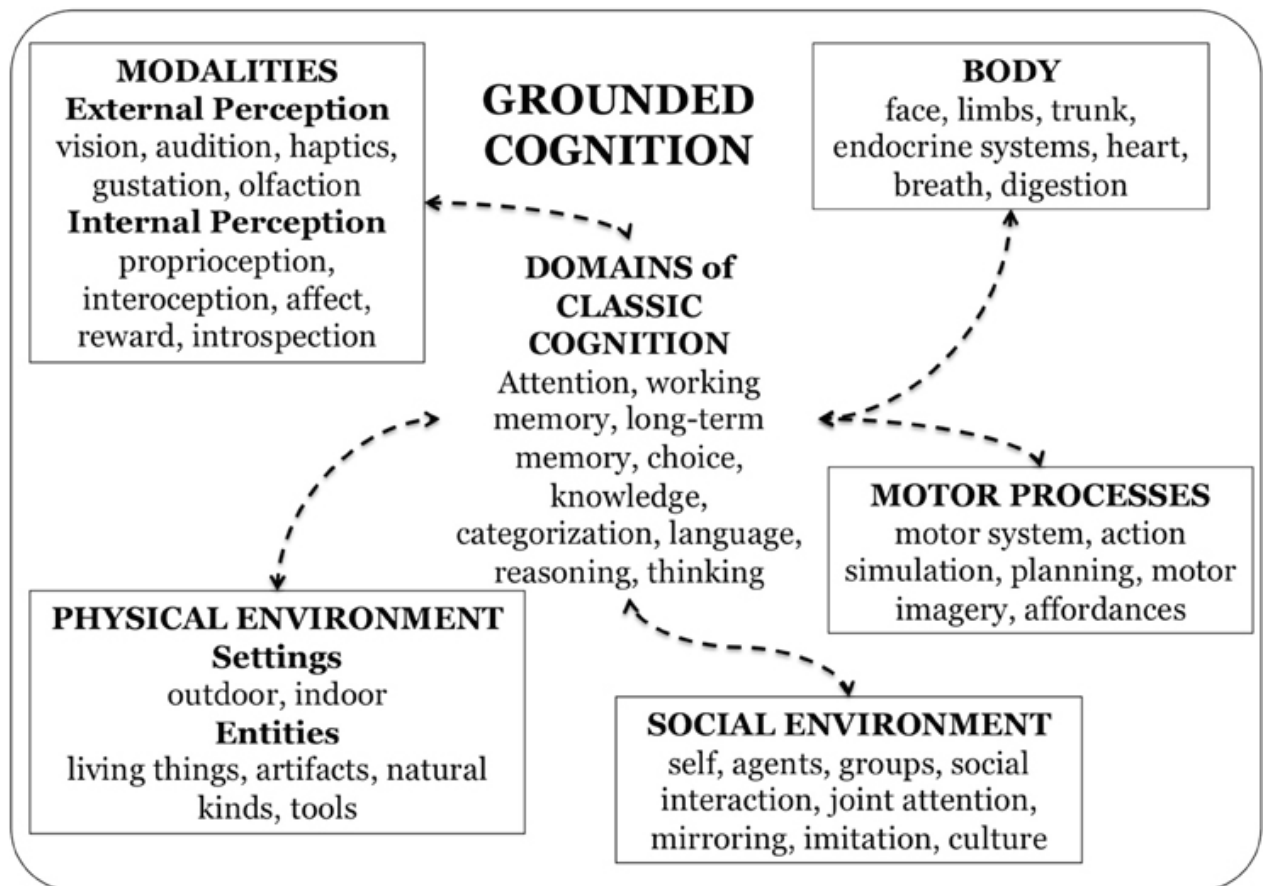
The more recently developed theory of grounded cognition suggests that, instead, the brain is “part of a broader system that critically involves perception and action as well” (Thompson, 2012, p. 1). Simply put, this theory argues that what happens to our bodies can influence our behaviour; that we are a complex system (physical, mental, emotional, etc.) within other complex systems (families, classrooms, friendships, schools, communities, etc.), and that we grow and learn within and because of the interactions of all of these systems. “According to this view, all cognitive phenomena, including those considered the province of amodal cognition such as reasoning, numeric, and language processing, are ultimately grounded in (and emerge from) a variety of bodily, affective, perceptual, and motor processes” (Pezzulo, Barsalou, Cangelosi, Fischer, Macrae & Spivey, 2012, p. 612). According to Lakoff and Johnson (1999), abstract cognitive states are grounded in states of the body. Using the latter affects the former. In the grounded cognition view these cognitive processes do not develop in a vacuum but are constantly being affected by input from the body, hence “embodied” or “grounded” in the body.

The traditional view of cognition would suggest that optimal learning states for children would occur when the brain is allowed to work undisturbed and undistracted with little or no movement. However, in the grounded cognition view, the brain has the responsibility of coordinating rapid, functional, and successful behaviours in a dynamic physical and social environment (Wilson & Golonka, 2013). According to Pezzulo et al. (2013), “grounded cognition theories are bases for studying how knowledge and concepts are grounded in the bodily states, how cognition processes such as language and thought are rooted in the body’s interactions with

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

the physical and social environment” (p. 612). As Nixon (2007) states, “it is only in the last 100 years that we have put children in a box and called it education.” (p. 34). He referred to the school institution model demonstrated by a class of students in neat rows experiencing education delivered primarily by lecture rather than through experience. In grounded cognition theory, cognitive domains are affected by body functions, motor processes, the physical environment, external and internal modalities and the social environment in which they are experienced. In turn, these modalities are affected by cognition.

Figure 1: Grounded Cognition: A Field Map



Adapted from Pezzulo, Barsalou, Cangelosi, Fischer, Macrae & Spivey, 2012, p. 612.
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This theory of grounded cognition brings together many seemingly disparate realities of modern education. For example, educators in some schools have recognized that learning is

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

difficult for hungry children. In order to improve student ability to learn, they have instituted breakfast programs. School divisions in Manitoba are encouraged to develop nutrition policies for lunches and snacks to meet healthy food requirements (Manitoba School Nutrition Handbook, 2006). Vision and hearing screening are offered through schools so that children affected by difficulty with vision or hearing will not lose ground in the classroom. In these cases, it is already being recognized that cognition is affected by the state of the body. Grounded cognition provides a framework to include other perhaps less obvious aspects of body states and their effect on engagement and learning.

The psychological theory of grounded cognition can be visualized using the field map (see Figure 1) developed by Pezzulo et al. (2012). They divide human physical realities into five categories: the body, motor processes, social environment, physical environment and the modalities of external and internal perception. The body includes such variables as height, clarity of vision, presence or absence of disease (diabetes, asthma, etc.), weight, nutrition (digestive system), level of muscular and aerobic fitness. For example, a tall individual may have a different perspective of an event than a shorter person (who may not be able to see it at all). A child who is hungry or hasn't had enough sleep may have difficulty focusing on all of the details of a lesson.

Another way the state of the body affects student engagement is in the amount and type of physical activity in which a child has had an opportunity to participate. In my opinion, immediate reporting of potential dangers through media has spread the perception that the world has become a very dangerous place. In the interests of keeping their children safe, many parents have adopted practices where they insist their children be within sight of a caregiver at all times. Where a caregiver is not an option, children are spending increasingly long periods of time indoors and in front of a wide array of screens such as computers and television etc., instead of outside experiencing experimental play. Parents worried about letting children make their way to school

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

on their own, drive them to school or put them on a bus or in a taxi rather than allowing them to use active transportation methods such as walking or bike riding. Unless there are morning extracurricular activities, many children arrive at school without having had an opportunity to wake up their bodies and brains with physical activity.

Motor processes are the mechanics of motor planning, imagery, and action simulation. All humans have varying levels of efficiency of motor planning and abilities to make spatial representations (Pezzulo et al., 2012). Those who have had many experiences in motor planning and action may have an advantage over those who have had less rich motor experiences (Diamond, 2000). Geometry, for example, also requires an ability to plan and envision spatial relationships and to picture their manipulation (Casey, 2004). Some children have difficulty with the three-dimensional representations required.

The physical environment in which an organism functions can affect how the organism absorbs and processes information (Pezzulo et al., 2012). Too much or too little noise, too hot or cold, too small or too large a space can affect the ability of some children to take in information and process it. Some students with autism are often overwhelmed by noise and light. Children with anxiety may find crowded spaces stressful. Anxiety and stress have been found to raise the levels of hormones such as cortisol, which can actively interfere with learning (Ratey, 2008). Alternatively, being outdoors in a natural environment has been shown to relieve stress and activate more areas of the brain (Selhub & Logan, 2012).

Other modalities such as internal and external perceptions affect how a person takes in and processes information (Pezzulo et al., 2012). External perceptions include vision (need for enhancement with glasses), hearing (loss of input through low levels of hearing), olfactory (ability to make observations and connections through the sense of smell) and gustation (taste). Haptics refers to the realm of nonverbal communication using touch. Internal perceptions include

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

variables such as proprioception (ability to sense stimuli from the body), interoception (sense of physiological condition of the body), affect (physiological expression of internal state), reward (internal or external) and introspection (Pezzulo et al, 2012).

Finally, the social environment is considered to be an important variable in cognition in the “grounded” cognition perspective (Pezzulo et al., 2012). A shy child may be afraid to ask questions where a more socially confident child may ensure that he/she understands by asking for clarification. A child too worried about social interactions or one unable to read social cues may be too anxious to focus on material. Likewise, a child too focused on social interactions may be unable to concentrate on presented lessons.

In grounded cognition theory, all of these aspects of the individual and group affect both the development of classical cognitive domains and their expression as learning. Equally, cognition, in turn, affects the individual’s body, his/her motor processes, the choice of environments, external and internal modalities and motivations and finally, his/her social environment. A child who is being positively enforced by these interactions will demonstrate engagement in the learning activities. Students who are negatively affected by one or more of these factors may have more difficulty remaining engaged. Cognitive and social engagement results in improved academic achievement. Higher academic achievement results in a higher willingness to be engaged. Conversely, disengaged students may show less evidence of cognitive learning. Lower academic results can result in further disengagement (Willms, Friesen, & Milton, 2009).

Study Description

In this study, a morning physical activity time period has been chosen because previous research results suggest that the first forty-five minutes immediately after aerobic activity provide optimal benefits for learning (Ratey, 2008). For example, students tend to be calmer, more

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

focused and demonstrate better executive functioning, less stress and higher cognitive alertness during this time period (Hillman, Pontifax, Raine, Castelli, Hall, & Kramer, 2009; Ratey, 2008). Students in the study school participate in a school-wide walk/run program for 15 minutes after morning announcements. Teachers were asked to stop the activity for two school weeks and observe the behaviors of four randomly selected students in each classroom during academic activity between 9:50 and 10:00 a.m. The activity was reinstated for the following two weeks and the teachers again recorded observations of student behaviors. They used a checklist focusing on student engagement behaviors with a page for observations and comments. The educational assistants in those same classrooms were recruited to take observations at the same time and complete the observation page on the four students in their classroom. The school principal, teachers and the one participating educational assistant also took part in formal interviews where they were asked to describe their observations.

Other studies (Hillman, et al. 2009; Mahar, Murphy, Rowe, Golden, Shields & Raedeke, 2006) have looked at the potential relationships between physical activity and academic achievement and/or student engagement. Several of these investigations are relevant to the present study although they have a different range of parameters. For example, Mahar et al., (2006) utilized a ten-minute activity period for elementary school students but the activities varied, may have been different in each classroom, and were conducted at different times in the day. The study focused on physical activity and on-task behaviours. These behaviours can be indicative of, but are only one observable aspect, of student engagement. (A more detailed examination of this and other similar studies is included in Chapter Two in the Review of Literature). The “Zero Hour program” from Naperville, Illinois utilized physical activity before literacy classes but specifically selected high school students struggling in literacy for inclusion in the program (Ratey, 2008).

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

The approach used in the present study is more specific to the actual programming taking place in the study school and may serve to fill the gap in studies for this particular grade level and in a whole school context. This study has the potential to contribute to new understandings of the fundamental question about the optimal learning states of children relative to physical activity conducted prior to academic classes.

This study provides an opportunity to answer the question: Does a morning physical activity intervention specifically affect student engagement in elementary age students in the 45 minutes following exercise by the analyses of both quantitative measures and qualitative observations? The null hypothesis in this investigation is: Teachers and Educational Assistants will not observe a change in student engagement in classroom activities following a morning physical activity intervention. Based on the grounded cognition theoretical framework, the research hypothesis is: Teachers and Educational Assistants will observe an increase in student engagement in classroom activities following a morning physical activity intervention. The research question for the qualitative section of the study is: What is the impact, if any, of a morning physical activity intervention on individual student and whole classroom engagement as measured by teacher and educational assistant observations and perspectives?

Definition of Terms

The following terms are defined in the context of this thesis:

Aerobic exercise is defined as physical exercise of relatively moderate to high intensity that depends primarily on the aerobic energy-generating process. According to the Centre for Disease Control (2014), in school children, aged 5 to 15, it can be associated with a heart rate in the range of 130 to 180 beats per minute, 50 – 75% of Maximum Heart Rate.

Engagement is defined as a model with four sub-types: academic, behavioural, cognitive and psychological (Reschly & Christenson, 2006a, 2006b). Behavioural data on engagement is

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

used here to infer cognitive and academic engagement.

Executive Functioning is defined as the “ neurocognitive processes that maintain an appropriate problem-solving set to attain a later goal” (Best, 2010, p. 332). It includes inhibition, (the ability to focus attention on a task and avoid distraction), updating working memory, and shifting (the ability to move smoothly from one concept to another).

Chapter Two: Review of Literature

This chapter will examine the research relating to this inquiry. The focus is on historical perspectives of cognition, new information from neuroscience on the brain's response to physical activity and research on physiological responses to exercise as they relate to cognition. Research on student engagement and its importance to academic learning will also be explored. Other related studies and programs conducted in schools are compared and contrasted to see how they relate to the current study.

Historical Perspective

The mind - body connection has been a matter of conjecture for teachers, philosophers and statesmen over the last three millennia. Does a healthy mind contribute to a healthy body? Does a healthy body help develop a healthy mind? Early Eastern philosophies of Buddhism, Confucianism, and Daoism shared a philosophy of interconnectedness of the mind and the body (Francis & Lu, 2009). They focused on a belief in the need for balance (the yin and yang) in which the mind and the body are connected in a harmonious whole (Francis & Lu, 2009, p. 4). The Roman Juvenal, characterized the human ideal as *Mens Sana Corpore Sano*: “a sound mind in a sound body” (Galen, AD 129-216/7). To the ancient Greeks and Romans, physical exercise and music instruction were important parts of a balanced education.

In modern Western society, education of the mind has traditionally been considered to be separate from that of the body (Hannaford, 2005). “Academic” subjects such as literacy and numeracy receive the most time and attention, perhaps reflecting perceived value at the top of the academic pyramid. Music, fine arts and physical education tend to be considered to be peripheral subjects and are often deleted when issues arise around monetary and time restrictions (Ginsburg, 2007, p. 185).

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Neuroscience Connections

Recently, research has challenged some previous assumptions about the connection between cognition and movement (Coe, Pivarniki, Womacki, Reeves, & Malina, 2012; McIlroy, 2009; Sibley & Etnier, 2003). More specifically, a number of recent studies stress the importance of physical activity in children – not only for physical health benefits but also intellectual, social, and emotional effects (Sibley & Beilock, 2007; Ratey, 2008).

It is known that from birth to age 10, sensory and motor experiences play a significant role in stimulating the development of connections between neurons (Chugani, 1998); in fact, the brain develops up to 90% of its eventual size between ages 7 and 14. In adolescence, any redundant or underutilized connections are pruned (Willis, 2007, p. 311). It is important that children have many early opportunities for movement as optimal brain function helps them handle impulsivity, address anger outbursts, and cope better with stress (Ratey, 2008, pp. 36-38).

The use of brain scanning technologies, combined with biochemical analyses, has shown that the effects of exercise on cognition are profound. The strongest correlations between cognition and movement have been with aerobic activity in the moderate to vigorous fitness range (Hillman, et al., 2009) and with aerobic fitness results (Castelli, Hillman, Buck, & Erwin, 2007). The California Department of Education reported that higher academic achievement was associated with higher fitness levels in students in grades five, seven and nine. According to Ploughman, Granter-Button, Chernenko, Tucker, Mearow & Corbett (2005), one explanation is that “it is likely that the effects of physical activity on cognition would be particularly important in the highly plastic developing brains of youth” (p. 991). In a cross-sectional study using public school data from 2004 to 2005, it was found that in grades four, seven and nine, students were significantly more likely to pass both the MCAS (Massachusetts Comprehensive Assessment Scores) Mathematics test and the MCAS English test as the number of fitness tests passed

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

increased (Chomitz et al., 2009).

It is widely accepted that aerobic exercise stimulates blood flow to the brain, bringing more oxygen and glucose to nourish brain cells and removing deleterious metabolites. Many other benefits of exercise have now come to light. According to Ratey (2008), aerobic exercise serves to increase the levels of dopamine, serotonin and norepinephrine in the brain (pp. 36-38). These neurotransmitters help to increase focus, decrease impulsivity, and serve to calm subjects and relieve stress (Mead, Morley, Campbell, Greig, McMurdo & Lawlor, 2008). Levels of astrocytes (cells which support and nourish neurons) were also increased. These neurons help remove metabolites resulting from the breakdown of neurotransmitters. In some studies, physical activity has helped stave off Attention Deficit-Hyperactivity Disorder (ADHD) and other cognitive disorders in children (Ratey, 2008, pp. 158-160). Physical activity has also been found to reduce the production of stress chemicals such as cortisol which, when found in excess, actively interfere with learning (Ratey, 2008, p. 74).

It was once thought that new neuron growth was not possible, but recent brain imagery has shown that the human brain generates new neurons with aerobic exercise. New neuron growth (via a process called neurogenesis) can be identified through the use of Magnetic Resonance Imagery (MRI). Hillman et al. (2009) tested fifth graders who were shown to exhibit new neuron growth in as little as 20 minutes of moderate- to-vigorous aerobic exercise. Students participated in a session of treadmill walking in which their heart rates were raised for twenty minutes into the 130 to 180 beats per minute range.

Brain plasticity, as evidenced by the discovery of new neuron growth, is a relatively new area of investigation and highlights the brain's ability to change in response to its environment. Vigorous exercise can cause nerve cells to form dense, interconnected webs that make brain transmissions faster and more efficient (Vaynman, Ying & Gomez-Pinilla, 2003). When a

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

muscle contracts, a protein called inter growth factor (IGF-1) is released. It travels via the blood, and crosses the blood – brain barrier. There, it causes increased production of brain-derived neurotropic factor (BDNF). This chemical fuels brain activities leading to higher thought processes. It has been demonstrated in mice that a brain low in BDNF shuts down cognitively to new learning (Vaynman, Ying, & Gomez – Pinilla, 2003). A German study (Schmidt-Kassow et al., 2013) found that adults learned vocabulary words twenty percent faster following exercise than before and that the rate of learning “correlated directly with levels of BDNF” (Ratey, 2008, p.45).

In a study using mice, running has been shown to increase neurogenesis in the dentate gyrus of the hippocampus, a brain structure that is important for memory function. Less fit mice were unable to find an escape route from a pool when compared with those mice who were housed with a running wheel and, therefore, were more active. The more active mice were easily able to find the new escape route, demonstrating an improved ability to learn. Measurements of brain neurons in both groups led researchers to suggest “physical activity can regulate hippocampal neurogenesis, synaptic plasticity, and learning” (Van Praag, Christie, Sejnowski & Gage, 1999).

Colcombe and Kramer (2003) conducted a meta-analytic study on research on the effects of aerobic exercise on the brain with older adults. They discussed controlled studies in which exercising and non-exercising mice were compared and found that exercise caused the frontal lobes of exercising mice to increase in size. This effect was found across their lifespan. While animal studies cannot be confidently extrapolated to humans, the results are interesting. The frontal lobe is the area of the brain in humans believed to be responsible for higher thought processes such as decision making, multi-tasking and planning ahead (Welsh & Pennington, 1988). Similar results have been found in humans - in this case, grade three students (Hillman et

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

al., 2009). This research focused more on intense physical activity than motor movement skills. It involved nine-year old students performing a treadmill walk in the moderate to vigorous range, at 60 percent of the maximum heart rate (Hillman et al., 2009). Students took academic tests 30 minutes after the exercise. Again the results showed better academic performance (increased working memory and processing speed) and improved control of attention as compared to a baseline established by a resting session cognitive test. Brain imagery showed more activity overall in fit children's brains (Ratey, 2008, p. 26).

Physiological Connections

Other studies have drawn connections between aspects of physical activity and academic and/or intellectual engagement (Chomitz, Slining, McGowan, Mitchell, Dawson & Hacker, 2009; Hillman et al., 2009). These aspects include measures of physical fitness, time in Physical Education classes and movement skill programs. These connections are related to this study but are not the primary focus. However, they illustrate other relationships between physical movement and learning. As an infant grows and develops in our modern world, parents watch carefully for the first indications of motor skills in their child such as smiling, rolling over, reaching for objects, crawling, walking, and talking. Society praises "early" development of these milestones as hoped for indicators of intellectual ability. However, by the time these children reach school age in our modern educational setting, they are required to sit in desks for much of their day in order to concentrate on the development of their intellect, even though recent research indicates that 85% of our students are dominantly kinesthetic learners (Hannaford, 2010).

Castelli et al. (2007) tested third and fifth grade students to see if there was evidence of a relationship between physical fitness in children and overall academic achievement. Of the fitness components measured (muscle strength and endurance, flexibility, skin fold measures,

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

and cardiovascular endurance) aerobic capacity, as measured by cardiovascular endurance, was most closely associated with academic scores.

With a preponderance of evidence relating such positive biochemical and neurological responses in the brain to physical activity, other researchers have tackled the issue of whether or not evidence can be found of a relationship between movement skills and academic achievement. In an evidence-based study to measure transfer effects from motor ability programs to cognitive abilities, 75 kindergarten students (three to five years old) participating in a three month physical activity program demonstrated significant increases in concentration when compared to a control group of 20 children who were not given the extra physical activity (Everke, Grzyk, Hubner, & Woll, 2009).

Investigations of an early childhood longitudinal study examined the influence of physical education in US elementary schools on direct measures of academic achievement on standardized tests (Carlson, Fulton, Lee, Maynard, Brown, & Kohl, 2007). Data were collected at five points between 1998 and 2004. The results supported the work of Field et al. (2001) and Ahmed, Macdonald, Reed, Naylor, Ambrose & Mackay (2007) who found that increased time spent in Physical Education classes rather than academic classrooms did not negatively affect academic scores. Instead, a small but significant academic improvement was noted, particularly in females (Carlson et al., 2007, p. 726). An American school program called PE 4 Life combined information on anatomy and body function with physical activity. Students participating in this program demonstrated a 50% improvement in reading levels, increased self-confidence, attentiveness and readiness to learn (Ratey, 2008).

According to Carlson et al. (2007) and Everke et al. (2009), increased physical activity resulted in greater control of student attention during classroom instruction.

Additionally, these authors suggest that there is no decrease in academic scores with less time for

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

academic subjects. Other recent experimental studies confirm that aerobic exercise at moderate to vigorous intensity appears to promote executive functioning – children’s effortful and goal-directed behaviour. (Best, 2010). Interestingly, these effects have been noted immediately following completion of single bouts of exercise (Budde, Voelcker-Rehage, Pietrabyck-Kendziorra, Ribeiro & Tidow, 2008). One hundred and fifteen adolescents (13 to 16 years old) in a high performance sports school were divided into a normal sports lesson group and an exercise group. Both groups were given a test to assess attention and concentration after a regular classroom lesson (pre-test). The exercise group was given a ten-minute bout of bi-lateral (using both sides of the body alternately) exercise while the sports lesson group had a normal sports lesson. Both groups were controlled for heart rate intensity. They then completed the same test (post test). Results indicated a statistically significant improvement in both groups (pre and post test), but the group with bilateral exercise achieved the largest increase. Similar results by Trudeau & Shepherd (2008) led the authors to conclude that a relative increase in performance per unit of academic teaching time was evident after physical activity.

The Institute of Medicine of the National Academies established a panel to examine the effects of lack of physical activity due to sociological changes and educational focus on standardized testing and school performance. The panel recommended that “children not only need exercise for their health – they need it so they can learn better. Children who are more active show greater attention, have faster cognitive processing speed, and perform better on standardized tests than children who are less active.” (Institute of Medicine, 2013) The panel recommended that educators find ways to help students get up and move in the classroom as well as at recess and before and after school.

Student Engagement Research

There has been little consensus amongst educators and researchers over the past two

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

decades on a definition of student engagement. In educational documents in the 1990's, student engagement simply referred to "student participation in school-offered activities" (Natriello, 1984, p.14). However, as educators became increasingly concerned about the negative impacts of disengagement in the educational process by bored, unmotivated and uninvolved students, a more nuanced understanding of engagement came to be recognized as a critical aspect of learning.

Student perspectives and experiences have been recognized as having a significant impact on academic and social outcomes, but researchers have struggled to develop a conceptual model including the multidimensional aspects of engagement (Reschly & Christenson, 2006a, 2006b). A range of aspects of engagement has been considered in the literature including behavioural, academic, emotional, cognitive and psychological. Some key points related to each aspect are as follows.

Initially, engagement was identified as having a behavioural (eg. positive conduct, effort, participation) and emotional or affective aspect (eg. interest, identification, belonging, positive attitude about learning aspects) (Finn, 1989). Recent research studies in this area recognize cognitive aspects such as self-regulation, learning goals, and investment in learning (Fredericks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003). Another sub-type called psychological engagement, has been recognized by Appleton, Christenson, Kim & Reschley (2006). They describe this form of engagement as "having less observable, more internal indicators such as... feelings of identity and belonging and relationships with teachers and peers" (p. 429). Cognitive and psychological engagement are both considered to be less observable than academic or behavioural aspects. Academic engagement has been consistently correlated with time on-task measures of academic learning time for students with and without disabilities (Fisher & Berliner, 1985). The most easily observable engagement component has been

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

behavioural. Most research and discussions focusing on behavioural indicators of engagement focus on observable student behaviours such as whether they are attentive, disruptive, or working hard (Jimerson, Campos & Greif, 2003, p.8).

Student engagement has been defined as “a disposition towards learning, working with others and functioning in a social institution” (Willms, 2003). This would include students’ sense of belonging at school, how much they value school outcomes and their investment in learning. According to the authors of the Tell Them From Me survey prepared by Willms (2012), engagement needs to be considered an important school outcome “as important as academic achievement as a key measure of student success” (Pelligrini, 2007). Engagement results in learning and learning results in engagement in a symbiotic relationship. Students who become disengaged tend to have a low sense of belonging at school, exhibit poor social reactions and tend to lack interest in school outcomes. Students who are socially engaged tend to have a sense of belonging at school and increased academic motivation (Willms, 2003).

Related Studies In Educational Settings

Although many studies have investigated the connections between physical activity and neurological changes in the brain conducive to increased learning and engagement, few studies have attempted to investigate actual student response in a school setting. One example of the application of this research in a school setting is the Naperville, Illinois Central High School Zero Hour PE program (zero hour refers to its scheduled time before first period of the school day). The program was initiated in 1998 to determine whether a regime of physical activity before class helped increase students’ reading ability in the period immediately following physical activity. By the end of the semester, students participating in Zero Hour showed a 17 percent improvement in reading and comprehension, compared with a 10.7 percent improvement among students who did not take part in the program. The Naperville administration was so

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

impressed with the results that they incorporated Zero Hour into the high school curriculum as a first-period literacy class called Learning Readiness PE. In 1999, Naperville's eighth graders competed in the international standards test called TIMSS (Trends in International Mathematics and Science Study) and placed first in the world in science, and sixth in math against thirty-eight countries worldwide. The key component in this program was that it appeared to be most effective in the morning. According to Ratey, (2008) the optimal time for learning occurred in the forty-five minutes immediately following the exercise.

Following the success of this program, the Ottawa Carlton District School Board approved a program for high school students pairing English classes with an aerobic fitness program combining running and muscular strength activities. In two classrooms astounding increase in literacy score averages was reported from the high fifties to mid seventies on English final marks (Payne, 2013).

The greatest benefits of increased physical activity time may be evident for those students with the lowest cognitive abilities (Sibley & Beilock, 2007). These students may be the school population members least able to access the intramural and extracurricular opportunities in schools or in the community. They may include students with physical disabilities or students who have cognitive difficulties in understanding directions. Involving them in aerobic activities takes creativity and perseverance. As noted in the Active Healthy Kids Report Card (2009),

We encourage the reader to pay particular attention to the disparities in physical activity participation highlighted throughout the Report Card (e.g., among children with disabilities, children from low socio-economic status backgrounds, Aboriginal children and youth). Not only are these children and youth not receiving cardiovascular and musculoskeletal benefits from physical activity, they are also not accumulating the

associated cognitive and behavioural benefits (p. 38).

Specific Focus of this Study

This study provides an opportunity to fill the gap in understanding how a morning physical activity intervention affects student engagement in elementary age students in the 45 minutes following exercise through the analysis of both quantitative measures and qualitative observations. Studies in neuroscience suggest that the brain's response to movement can aid in increasing focus, calm, memory retention and executive functioning. Studies relate motor skill and fitness development with academic achievement. Engagement in learning has been shown to be critical to education and classroom behaviors can be indicative of engagement levels in students.

This study is specifically focused on examining the behavioural responses in subsequent academic classes of a number of elementary aged students to a morning walk/run. No similar Canadian studies have been found. Most studies investigating this area focus on a different grade level or use different methodology and instrumentation. For example, the Naperville (Ratey, 2013) and Ottawa Carleton School District (Payne, 2013) studies were conducted with high school age students and report on literacy and math scores. A study of elementary student response to a ten-minute physical activity intervention (Mahar et al., 2008) measured off task behaviors only. The present study provides an opportunity to examine the engagement response of elementary age students in a Canadian school to a physical activity program.

Chapter Three: Methodology

This study provides an opportunity to answer the question: Does a morning physical activity intervention specifically affect student engagement in elementary age students in the 45 minutes following exercise through the analyses of both quantitative measures and qualitative observations? In the school selected, the administration and teachers voluntarily conducted a morning 15-minute physical activity program with their students for three academic years prior to the beginning of the study. However, they did not have specific results to help them evaluate the program, other than informal anecdotes. They were interested in suspending the program for two weeks (eight school days) and then reinstating it in order to provide an opportunity to collect relevant and comparative data.

Research Design

For this study, I utilized a mixed methods design (Greene, Caracelli & Graham, 1989). In mixed methods design, both qualitative and quantitative methods are used to address the research questions. There are several reasons to use a mixed methods design in this study. According to Bryman (2006), “research methods associated with both quantitative and qualitative research have their own strengths and weaknesses so that combining them allows the researcher to offset their weaknesses to draw on the strengths of both” (p.56). The analysis of one type of research may be used to help explain findings generated by the other and to provide clarity and context. As Martin (1987, pp.14-15) suggests, “Any paper-and-pencil task ought to be supplemented by qualitative methods. This would enrich and provide depth to the statistical data obtained”.

Quantitative data collection is described as “the assignment of numbers to indicate different values of a variable” (McMillan, 2008, p. 131). According to McMillan (2008) “the purpose of using quantitative data is to provide a systematic procedure for recording observations, performance or other responses of subjects. The information collected through

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

measurement provides the basis for the results, conclusions, and significance of the research” (p. 132). Upon determination of quantitative design, use of specific statistical techniques can be selected. These mathematical procedures can be used to summarize and analyze data (McMillan, 2008). In this study, the quantitative data were collected from the teachers’ daily completion of the Student Engagement Checklist (Appendix A) adapted for use from the International Center for Educational Leadership (Jones, 2009). This checklist is an instrument utilized for “walk-throughs” to give a quick “snapshot” of engagement behaviours at a particular time. Three to five minute walk-throughs, where the administrator walks through the classroom, are recommended for administrators as an efficient method to gather information on classroom dynamics (Cervone & Martinez-Miller, 2007). I decided to use this checklist as a way to enable teachers to make a quick, precise, targeted but comprehensive observation of their students’ specific behaviors. The checklist scores from the no morning activity period are compared to the scores from the activity period.

According to McMillan, (2008) qualitative research incorporates some or all of the following seven characteristics: natural setting, direct data collection, rich narrative descriptions, process orientation, inductive analysis, participant perspectives and emergent design (pp. 272 - 275). These characteristics can be “strategic ideals that provide direction and a framework for developing specific designs and concrete data collection tactics” (Patton, 1990, p. 59). For this study, the most applicable characteristics are natural setting, narrative descriptions, inductive analysis and participant perspectives. Each characteristic is briefly discussed.

One key characteristic of qualitative research is studying participants in their natural setting (Denzin & Lincoln, 1998; McMillan, 2008). In the present study, school and class routines were maintained during data collection except for the specific intervention of this study. Since human behaviour is being studied, it is important to take into consideration the situational

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

context in which it occurs. Secondly, the researcher acts as primary instrument of data collection in qualitative research (Eisner, 1991; McMillan, 2008). In this case, I received information directly from the teachers and educational assistants through the interview process and thorough examination of daily records and additional written comments.

Qualitative research needs narrative description (detailed record of observations). To help ensure that this took place, I discussed the form and type of records that were to be collected by both the teacher and the educational assistant with the participants. They were encouraged at the preliminary enrollment meeting to include as much detail as possible and were given examples and a Sample Completed Observation Checklist. The brief notes and descriptions supplied by the teachers and educational assistant were not as in depth as narrative description requires but the interviews combined with notes helped to contextually understand the process through which the behaviours occurred. Participant perspectives were important in determining the reality of the engagement process in the classroom.

I reconstructed meaning through both quantitative and qualitative data analyses. The convergent parallel design (also referred to as the convergent design) occurs when the researcher implements the quantitative and qualitative strands during the same phase of the research process, prioritizes the methods equally, keeps the strands independent during analysis and then mixes the results during the overall interpretation (Creswell, & Plano Clark, 2011; Greene, Caracelli & Graham, 1989). The quantitative data measuring student engagement levels by the teacher were merged with qualitative data from observation notes and interviews from the principal, educational assistant and teachers.

Participants

This study involved 28 randomly selected students in seven of eight classrooms (four per class) in a Kindergarten to Grade 6 school. The school is situated in a middle class urban

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

neighborhood. There are a total of 168 students in eight classes in a school built to hold 350 students. The principal, who is new to the school this year, characterizes the school as “a dream” school with experienced, well-trained staff. According to the principal, there are relatively few behavioural issues.

The observers in this study were the teachers and an educational assistant in the classrooms at the 9:50 am assessment time. The teachers were selected as the individuals with the most comprehensive understanding of the students and their behaviours. Eight classroom teachers agreed to participate in the observation and interview process. After the start of the study, one teacher requested to stop collection of quantitative data and provide observation and interview data only because of the timetable. The students had to leave the classroom every day at 10:00 a.m. and so were winding up their academic time in preparation to leave at the observation time. Three educational assistants also agreed to participate, however, two found that their assignments were not in a classroom at this time and so could not participate. Teachers would have the best understanding of nuanced changes in individual student behaviour. They would also have the ability to control the classroom activity to allow for a “snapshot” time to take a look at behaviours at the specific time period. They were asked to complete the Adapted Student Engagement Checklist (Appendix B) and provide their written observations. The educational assistants were also invited to be observers as they were familiar with individual student and classroom behaviour norms. They would have the ability to provide another perspective on student behaviours. Their job requires them to complete regular behaviour write-ups for specific students. The educational assistant who was able to participate was asked to provide daily observations of the individual students selected but did not complete the Adapted Student Engagement Checklist.

Procedures

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

The researcher requested and received permission from the School Division's Senior Administration (Appendix C) and then approached the principal of the school (Appendix D) to conduct the study. As noted in the review of literature, research results (Hillman et al., 2009; Coe et al., 2007) suggest that physical activity will be beneficial for students in focusing on subsequent learning activities. However, the studies closest to the program I have focused on have different parameters (ie. study by Mahar et al., 2006) and Zero Hour programs from Naperville, Illinois.) The current study is more specific to the actual programming in place in the study school at the time.

To begin, the principal, teachers and educational assistants were invited to a preliminary, face-to-face meeting conducted by the researcher after school in the school conference room to discuss the intervention and their willingness to participate in the study. I explained the purpose of the study, the methods of data collection and storage, and the duration of the project. In order to support teachers in recording data most relevant to the current study, a completed Sample Student Engagement Checklist was discussed and a copy provided (Appendix E). Also, examples of observation notes were provided to both teachers and educational assistants to give them a clear idea of the level of detail needed.

All teachers, and educational assistants were then invited to participate. Two copies of the consent forms were handed to each participant, one to be signed and returned and one to keep for reference (Appendix F and Appendix G). The forms indicate that participation in the study was voluntary and that participants could choose to withdraw at any time. Any participant could also ask questions of the researcher by e-mail. Willing participants were asked to place the completed forms in an envelope in the school office within the next three days. All eight teachers and three interested educational assistants completed and submitted the forms, however only one educational assistant's timetable allowed for her participation. The principal was also invited to

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

participate in an interview after the completion of the four-week study to obtain her insight from a whole school perspective. She also agreed to participate and signed and returned a consent form.

Parent (Appendix H) and student consent forms (Appendix I) were given to participating Grade 4, 5 and 6 teachers. The teachers explained the study to their students and sent the forms and an explanation letter to the parents. The researcher met with Kindergarten, Grade 1, 2 and 3 students to explain the study and invite their participation. Consenting students in these grades signed a classroom list. Consent forms and the letter of explanation also went home with these students. The teachers collected all of the letters of consent. They created a list of students who had agreed to participate and whose parents also had signed a letter of consent. They then counted every fifth student from the bottom of that list until they had randomly selected four students from their class.

Those teachers and the educational assistant who agreed to participate in the study were asked to keep daily observation records of the four randomly selected students and to participate in interviews with the researcher after the no morning physical activity time period (two weeks) and morning physical activity time (subsequent two weeks). I had asked several classroom teachers in informal discussions about the optimum number of students they could focus and comment on in such a short assessment time period. The general response was between three and five students, so the research design was built around four students. The teachers had an additional task of assessing engagement using the Adapted Student Engagement Checklist. Each of these data sources is described in more detail in this section.

The educational assistant recorded observational notes. In this school, educational assistants are assigned by the principal to a specified classroom and work with students in that class (where needed) to best support the teacher and the students. Educational assistants are

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

required to keep detailed daily records on students with whom they work. These records could include evidence of behavioural incidents, engagement levels, and perseverance. This routine recording of student behaviours suggests that educational assistants are accustomed to observing students and writing down their observations.

Quantitative data were collected using the Adapted Student Engagement Checklist. This is a five-point Likert scale checklist to be used daily by the teacher for the four randomly selected students from each of the classes. The Educational Assistant was not asked to complete the Likert scale. This assessment tool is part of a Teacher Handbook on Student Engagement and was developed to be a “snapshot” of student engagement during regular classroom activity. According to the representative of the International Centre for Educational Leadership, the Student Engagement Walkthrough Checklist has not been validated or its reliability established through research. The focus of the five questions on student behaviors as indicative of student engagement, however, was the most suited for the purposes of this study of the many tools I located and examined. This particular checklist was also found to be particularly precise and easy to answer in a short time period.

The Adapted Student Engagement Checklist observation questions developed by the International Center for Leadership in Education focus on five indicators of engagement in an activity: positive body language, consistent focus, verbal participation, student confidence and fun and excitement. These behavioural indicators are readily evident in a classroom setting. Positive body language is an external expression of internal engagement levels. Consistent focus is a behavioural measure of executive function, the ability to stay on task. Verbal participation and student confidence are measures of expression of the affective domain and students’ sense of belonging and self-worth. Fun and excitement is also an expression of physical and social confidence and comfort. Teachers were asked to assign a number from 1 to 5 on a Likert scale on

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

each question: 5 Very high, 4 High, 3 Medium, 2 Low, 1 Very low. Accordingly, the minimum score for an individual student for one day was five, and the maximum score per student for one day was twenty-five.

Permission to use the Student Engagement Walkthrough Checklist was requested and granted from the International Centre for Educational Leadership (Appendix J). The format of the checklist was adapted slightly for use in this study. More specifically, I adjusted the format to allow the results from all four students to be recorded on a single page on a daily basis. This made the teacher's recording task more efficient. Space was also added on the opposite side of the page for teacher comments to add context to the observations. The checklist questions remained the same (see Appendix B).

This school was selected as a purposive sample for the study as it was already conducting the 15-minute physical activity. For the past three years, this elementary school had participated in a pilot project which involved scheduling 15 minutes at the beginning of each school day for physical activity, followed by a 60 minute literacy block (uninterrupted time spent on reading comprehension and writing skills) for most classes. The principal of the school agreed to include the 15-minute activity session at 9:05 a.m. in the school schedule. When the program initially began, teachers were offered the opportunity for their classes to participate. All teachers elected to participate, with the exception of one teacher who elected to conduct her own morning activities in the classroom for reasons explained later. She led her class in aerobic, dance and large muscle movements.

When the program initially began, the school Physical Education specialist volunteered to organize the activity. The students walk the hallways on a planned route, enter the gym, run three laps, and then leave the gymnasium to continue walking. This is repeated for the entire 15-minute time frame. Students are encouraged to engage in this activity while talking to other

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

students thus including a social component in the activity. The Physical Education teacher used heart rate monitors randomly with Gr. 4, 5 and 6 students during previous walk/run periods to ascertain the average physiological intensity level of students. A reading of 90 - 140 BPM (beats per minute) is usually classified as in the light-to-moderate range for this age group. Readings of 140-180 BPM would belong in the moderate to vigorous range. 180 BPM and up are in the vigorous range (CDC, 2014). The teacher informed me that the majority of students fell in the moderate to vigorous range.

Data collection for this study occurred during the month of February and early March 2014. In the initial two weeks, students started classes without the morning physical activity initiative. The school resumed this activity for the following two weeks. The four-week total time period was chosen after informal discussion with the staff at the school as a time period allowing for sufficient data collection while providing the least disruption to the school schedule.

Immediately following “O Canada” and morning announcements, for the first two-week period without physical activity, the classroom teachers began to conduct their academic classroom activities. Between 9:50 and 10:00, they took a “snapshot” of student engagement behaviours as listed on the Adapted Student Engagement Checklist. They recorded scores and observations for the four randomly selected students. Teachers then added general classroom observations, if they wished, but this was not required. The educational assistant also wrote observations at that time for the four selected students. Student observations were based on actual behaviors exhibited by the students such as listening/ not listening, participating in discussion/acting out, sitting still/ moving around, etc. as outlined at the initial meeting. The educational assistant had been given a copy of the Sample Observation Page (Appendix D). Classroom work then continued.

For the next two-week intervention period, immediately following “O Canada” and

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

announcements, students began the hall walk/gym run session. They had previously practiced this activity so there was no initial delay with explanations or start up. All staff and students, including the principal and Physical Education teacher, joined the activity. However, one class participated in physical activity in their regular classroom (on most days) as their teacher found that some of the students in that class demonstrated what she referred to as “tactile needs” sometimes involving inappropriate rough pushing and shoving during the walk/run sessions. Staff and students in the rest of the school walked in the hallway and then ran three laps in the gym, continuing the circuit for 15 minutes. Everyone then walked back to his/her classroom. Teachers began their academic activity. Between 9:50 and 10:00, teachers and the educational assistant again recorded observations of the four selected students.

On the basis of the literature reviewed and keeping in mind the parameters of the study, I developed two series of questions to initiate interview conversations. The literature suggested that the questions should focus on clarifying behaviors each respondent viewed as indicating student engagement or disengagement with lessons, what actual behaviors were observed and whether behavior changes were observed. The questions (Appendix K) were designed to initiate discussions of observations from teachers and educational assistants of student behaviours during the eight mornings without initial physical activity. The second set of questions (Appendix L) was discussed in interviews after the succeeding eight days with morning physical activity.

Ethical Considerations

A number of ethical considerations arose during the design and implementation of this study. One particular concern was about the implications for the students of suspending the physical activity. Firstly, a change in routine can be difficult to adjust to for some students, particularly in the primary classes. Secondly, losing the opportunity for extra physical movement was a concern. It was decided that, since the students already receive the number of Physical

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Education minutes per cycle mandated by the Manitoba Department of Education as well as recesses and lunch hours, harm would likely be minimal in suspending the additional activity time for eight days. The results of this study could be used to evaluate the efficacy of this program and aid the school in making decisions about future planning, including planning for indoor activity in circumstances such as extreme weather conditions. In spite of the limitations outlined, I believe that the potential benefits of the study outweigh the possible negative impact of lost physical activity. The ethics review board agreed with this perspective and granted approval for the study.

Regular rules of confidentiality were in place. All Student Engagement Checklist data and notes from each classroom teacher were placed in an envelope each day, sealed, and placed in a locked filing cabinet in the principal's office. I collected these envelopes each week. Eighteen interviews of approximately fifteen minutes each were recorded, transcribed and coded (one principal, 15 teacher and two educational assistant interviews for "no activity" and "activity" conditions). All teachers and educational assistants received a copy of their interview transcription. This member-checking procedure allowed these participants an opportunity to check for accuracy and to clarify points. Transcribed notes and recordings were safely stored in a locked filing cabinet in the advisor's office in the Faculty of Education at the University of Manitoba.

Study protocols stated that data would not identify the individual school, teachers, educational assistants or students in any way. Names do not appear on any documentation. Classrooms, teachers and educational assistants were identified by pseudonyms to ensure confidentiality. The individual students to be assessed were chosen by random selection. Only the teachers and educational assistants knew the particular students in their classrooms who were being assessed. These students were identified to the researcher simply by a pseudonym.

Data Analyses

The two strands of data collection were conducted concurrently. The data were collected and analyzed separately and then merged to construct meaning.

Checklist data (Quantitative strand)

Seven teachers agreed to participate in the quantitative data collection section of the study. The data from the Adapted Student Engagement Checklist were initially analyzed by adding the five scores for each individual student on a daily basis. Total scores for each student were calculated for the first two weeks (eight days of scores) consisting of all of their scores. A mean score was then calculated for each child for the eight-day period. The same calculations were conducted for the second two-week period (10 days of scores). The mean score for the two-weeks without activity was compared to the mean score for the two-weeks with physical activity using a one-tailed paired t-test. The t-test is a parametric statistical procedure used to test the null hypothesis that there is no behaviour change in students after the physical activity intervention. A paired t-test was used since the groups for the “without morning activity” and “with morning activity” were the same students. In addition, a one-tailed test was used because the research hypothesis states that there will be an increase in engagement after morning physical activity. An alpha value of .05 was used to establish significance.

According to Laerd (2013), there are four assumptions for using the paired t-test. One assumption is that the dependent variable is at an ordinal level of measurement. The second assumption is that the data are gathered from the same subjects for both conditions. The third assumption is that the distribution of the differences between the paired scores should be approximately normal. The fourth assumption is that there are no outliers in the distribution of the difference scores. The extent to which the current study satisfies each assumption is presented in Chapter Four.

Observations and interviews (Qualitative strand):

Written observations by the teachers and educational assistant were analyzed by identifying recurrent phrases and themes. Interview transcriptions were also analyzed looking for the same themes. The themes and codes were suggested by research but were supported by mention in observations (ie. behaviour, time on task, focus, attention). I listened for interesting comments and recurring themes and ideas. Complete verbatim transcriptions of the 19 interviews of five to 15 minutes duration were conducted with teachers, the principal and an educational assistant. I created a list of themes first from the interview questions and then added to the list as comments from both the interviews and observation notes suggested new themes. One of the most common themes mentioned in the data sources were descriptions of student behaviors indicating disengagement or engagement in the academic activities. These were coded and counted in both with and without physical activity conditions. As the analysis progressed, commonalities and differences between these two data sources required adding and changing themes.

The last stage of data analysis was to merge the two strands of data collection. These multiple data sources from teacher checklist data, teacher and educational assistant observation notes and interviews provided an opportunity to include a variety of perspectives and provide more detail.

Chapter Four: Results

The quantitative and qualitative data in this study were analyzed separately. The Adapted Student Engagement Checklist mean scores for each student in the two conditions were analyzed using a one-tailed paired sample t-test. The observations from the interviews and comments were organized into themes and coded for analysis. The data results from these sources were merged to infer meaning and then considered in the context of Grounded Cognition Theory. The analysis and results for each data source are presented in this chapter.

Adapted Student Engagement Checklist Scores (Quantitative results)

The daily scores for the 28 randomly selected students from seven classrooms were entered into the data set. One teacher elected to participate in interviews only without collecting qualitative data as her class was regularly preparing to leave the classroom at the assessment time period and she felt that her data at that time period would not be relevant. The sum of the total scores for each student for the no activity (eight days) and activity (10 days) conditions were calculated and then divided by the number of participating days to provide means for each condition for each student. For example, Student F4 scores for the first condition (without morning physical activity) were 13, 11, 14, 16, 13, 18, 10 and 17 for a total of 112 points over eight days. His or her mean score for this condition was 14.0. His or her scores for the second condition (with morning physical activity) were 13, 14, 20, 18, 25, 15, 17, 19, 14 and 16 for a total of 171 points over ten days. The mean score for this condition was 17.1. The minimum possible score for one student for one day was zero and the maximum possible was 25.

Missing data occurred in the data set for one of three reasons: the student was absent for illness or holiday, the teacher was absent for illness or a meeting or the teacher elected not to assign a score for a single element as it was felt that it was not applicable in that particular class context (ie. fun and excitement measure during a quiz). In the full 18 days with a potential of 504

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

data scores, 71 scores (14%) were missing for one of the reasons above. During the calculation of the means, missing data were included in the calculations by ensuring that the average was obtained for only the scores included for each individual subject. For example, a student who was missing data for one day during the “with activity” condition would have their means calculated by summing their score and dividing by nine days instead of dividing by 10 days.

Table 1

Individual Student Means for Both Conditions

Student Pseudonym	Without Activity	With Activity	Difference
A1	13.1 [^]	19.2 [^]	6.1
A2	16.5 [^]	18.5 [^]	2.0
A3	17.6 [^]	20.2 [^]	2.6
A4	15.6 [^]	18.7 [^]	3.1
B1	15.4 [^]	19.7 ⁺	4.3
B2	18.8 [^]	20.8 ⁺	2.0
B3	15.4 [^]	17.8 ⁺	2.4
B4	12.3 [^]	18.3 ⁺	6.0
D1	15.1 [^]	23.1 [^]	8.0
D2	11.7 [^]	22.0 [^]	8.3
D3	11.6 [^]	17.0 [^]	5.4
D4	9.7 [^]	14.3 [^]	4.6
E1	15.7 [^]	12.2 [^]	-3.5
E2	19.3	12.5 [^]	-6.8
E3	22.8 [^]	23.2 [^]	0.5
E4	23.9	23.7 [^]	-0.2
F1	24.1 ⁺	24.3	0.2
F2	25.0 ⁺	24.5	-0.5
F3	20.3 ⁺	21.8	1.5
F4	14.4 ⁺	17.1	2.7
G1	23.6 [^]	24.6 [^]	1.0
G2	21.0 [^]	25.0 [^]	4.0
G3	22.4 [^]	25.0 [^]	2.6
G4	20.3 [^]	23.4 [^]	3.1
H1	19.8	22.1	2.3
H2	21.0	23.7	2.7
H3	18.0	19.6	1.6
H4	21.4 [^]	22.4	1.0

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

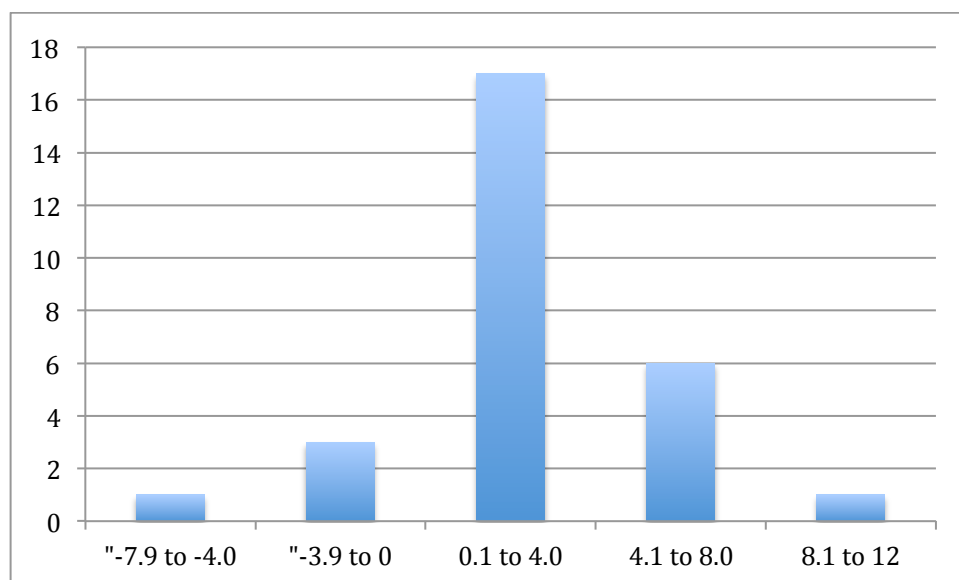
Table 1 contains the individual student means for each condition. Symbols have been added to indicate which individuals have missing data because of absence of student or teacher (^) or because of a missing element (+) from the observation checklist. Scores ranged from 8 to 25 in the without activity condition compared to a range from 6 to 25 in the with activity condition. The overall means score for the no activity condition is 18.60. The overall means score for the activity condition is 20.53.

A paired samples t-test using the SPSS program from IBM was conducted to compare student engagement in the no morning physical activity and morning physical activity conditions. The four assumptions listed by Laerd (2013) necessary for use of a paired t-test in statistical analysis were addressed. Firstly, the scoring system measurement scale utilized needed to be ordinal. The scores from the Adapted Student Engagement Checklist can be considered to be ordinal as teachers are asked to rate students on a scale from one to five. The second assumption is that the data are gathered from the same subjects in both groups. In this study, the same students were observed under both conditions. The third assumption is that the distribution of the differences between the paired scores should be approximately normal. To investigate this assumption, the differences between the without activity and with activity conditions for all 28 students were computed (see Table 1) and a frequency histogram was created (see Figure 2). The resulting distribution appears approximately normal and satisfies this assumption, particularly given that the t-test is known to provide valid results with data that is not precisely normal (Laerd, 2013). The fourth assumption is that there are no outliers in the distribution of the difference scores. An examination of the difference scores (see Table 1) shows that all are within a relatively close range.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Figure 2

Frequency Distribution of Mean Differences



The paired samples, one-tailed t-test revealed a significant difference between the mean scores for no physical activity ($M=18.06$, $SD=4.28$) and for physical activity ($M=20.53$, $SD=3.64$); $t(27) = -3.968$, $p = 0.00024$. Since the p-value from this t-test is smaller than .05, these results suggest that the difference between the means for the two conditions is beyond what would be expected by chance. Specifically, these results suggest that, when students engage in 15 minutes of physical activity, their level of engagement may be positively impacted in the following 45 minute time period.

Observations and Interviews (Qualitative results):

Analysis of the teacher and educational assistant interviews and observations revealed some common themes. Some of these themes were topics mentioned in response to specific questions (such as transition times and academic activities) and other themes were topics often commented on in spontaneous discussion (bias and expectations, socialization, classroom

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

characteristics, etc.) The themes that were identified were 1. bias and expectations, 2. transition times, 3. classroom characteristics, 4. academic activity during the assessment time period, 5. student attitudes towards the activity, 6. other possible relevant factors, 7. socialization and 8. frequency of engaged and disengaged behaviours. Subsets were created for the categories of engaged and disengaged behaviours. Observation comments were of the four selected students in each class, while interview responses often referenced whole class response.

Themes and codes arising from comments and interviews

Biases and expectations

It is important to examine the potential for bias and expectations in staff and in the selection of student participants in this study as revealed in the analysis of the interviews. As stated earlier, the morning physical activity is an already integral part of the school day in this particular school. Teachers may have had a conscious or unconscious bias about the efficacy of the program, which may have colored their perceptions. During interviews, all eight teachers interviewed made references to their expectations of observing measurable change in engagement behaviours of their students. These expectations appeared to be fairly equally distributed. Four teachers indicated that they believed that they might see positive change. Three teachers made comments indicating that they did not believe that they would see a change in engagement. For example, one teacher stated during the first interview that, for the students that were “always engaged”, that “They would always be engaged whether we have morning physical activity or not”. Another teacher stated that “ I don’t see that there would be much differentiation” and that “ It will be interesting if you can pull anything out of it”.

The principal in this school is new to the school this year and to the activity program. She indicated that she does not yet have an opinion as to its efficacy. She noted that the hallways were quieter in the mornings without the activity. She did not notice a change in discipline

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

referrals during the study period, but she suggested that it might have been a function of having fewer outdoor recess times.

One of the teachers' reasons for indicating that they would not see a change was because of the nature of the random selection of student participants. Of the 28 students observed, 17 were characterized by their teachers during the interview process and on the observation sheets as highly engaged, seven as sometimes engaged and only four as rarely engaged. In two classrooms, all four selected students were characterized as "highly engaged". These teachers did not think they would see a change because, even though the selection process was random, the majority of the students were fairly highly engaged most of the time.

Four teachers referenced the fact that, if they had been able to choose the student participants, they would have chosen students whom they felt had more difficulty with engagement in academic activity. As one teacher stated, "I would have chosen ones that I really wanted to see if it was making a difference" and that they were "likely not" to see much change. In this class, the four randomly selected students were identified by the teacher as "very attentive". Another teacher who apologized for having few comments about her four randomly selected students stated in explanation: "there were other kids who were obvious to me, if I could choose whom I was going to comment on, then maybe I could have done it better".

One teacher also raised the issue that, because both parent and child had to sign letters of consent for participation, the sample population itself might be biased towards more highly engaged students. Those parents uncomfortable with having their child's behaviour observed and reported, might be less likely to agree to have them become part of the study. As this teacher stated,

I do have a handful of students, interestingly, that we talked about before, whose parents did not want them to participate in this, which,

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

in itself is very interesting. Those were the key, critical kids for me.

They have a high movement need and that was really obvious.

Some students with difficulty in school might be less likely to agree to have their behaviour examined. More confident, engaged students might be more comfortable with agreeing to participate. This teacher felt that the class population was not necessarily accurately represented by the pool of students to randomly select from, after consent forms were completed. A bias towards more highly engaged students, however, would suggest that there would be a lower threshold of change observed, making the null hypothesis of no change more likely. As one teacher stated regarding the four randomly selected students:

It's interesting as it is subject dependent for a couple of them but they are academically stronger students and they are typically more engaged.

So that, I found very interesting. One of the students does tend to have more need for movement, more need for engagement with social issues, so, that one, I was very glad to see that that student was involved. But on the whole, I'm very disappointed because I was really eager to see some of those other kids.

Differences might also exist in teacher understandings of how engaged students appear in a classroom setting. The researcher asked each teacher to describe what "disengaged" and "engaged" student behaviours looked like in his/her classroom. Three teachers characterized an "engaged" classroom as calm and quiet. One of these three referenced the fact that she expected little movement during the Literacy block period. The common theme in those classrooms at that time period was individual, independent work at their desks. A teacher in such a classroom might characterize his or her students as engaged if they were quiet and disengaged if they talked more. The daydreaming disengaged student might be less noticeable.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Four of the others characterized their classrooms as active with centre or group work more prevalent. One of those teachers characterized her class as very tactile. In these classrooms, increased movement and talk might be more acceptable as indicative of engaged behaviour.

All but one of the observers mentioned that they appreciated the opportunity to focus on four students in particular, even if they weren't the students in whom they expected to observe change.

I think the focus was beneficial for me as a classroom teacher really. It did open my eyes to see exactly what they were doing – to take that quick pause to see what they were doing at 10 o'clock and how one, in particular, that I thought was engaged, really was not. And one who I just assumed would be completely off-task, he was actually more on task than expected, if that makes sense. And then, the other two, were doing what I expected them to be doing.

So it was very good to be able to observe those four.

Transition times

One of the results I anticipated of having students moving from the morning physical activity into their first academic activity was a loss of work time through increased transition times. In the first two weeks, students would go directly to their academic work after announcements. In the following two weeks, they would either be arriving back in their class from the hallway and gym activity or from a physical activity run in the class coordinated by their teacher. Transition times reported by the seven classroom teachers during the interview process are as follows (one classroom did not have data). Two teachers felt that transition times were longer with morning physical activity. As one of these teachers described the transition, "...they stagger back in". One teacher felt that there was no difference. This teacher stated that "they can transition into their activity efficiently both going for the walk or staying in the room"

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

and “ They know they have something to do so they usually get right down to it ”. Four teachers reported that transition times were actually shorter after the morning physical activity.

Another teacher reported that transition within the classroom instructional activities themselves were harder in the time period without morning physical activity. As this teacher observed:

Transitioning from activity to activity was hard for them when we didn't have (sic) morning activity because there was more movement. You know, ‘read to self’ was difficult because they were rolling across the floor and they were doing things to get that need met.

In this case, the teacher identified movement as a need for some students that made it difficult for them to transition smoothly and quickly from one activity to another. The students found a way to get that needed physical movement.

Table 2: Transition Time Comparisons

Classroom	Without Morning activity	With morning activity
1	2 minutes	30 seconds to one minute
3	1-2 minutes	Same
4	Less than 1 minute	5-7 minutes
5	Longer	Shorter
6	Less than 1 minute	2-3 minutes
7	10 minutes	3-5 minutes
8	5 minutes	Less than 5 minutes

Classroom Characteristics

Three of the eight classroom teachers characterized their classrooms as generally quiet and calm. They expressed their own need for calmness. Two mentioned that quiet was important during the assessment time period at 9:50. One mentioned that there was little to no student

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

movement unless invited to the teacher's desk at the assessment time: "Yes, the only time they move is if they need to come to my red table for further instruction".

Five of the teachers characterized their classrooms as active at that time. Students were usually engaged in station or group work. One teacher referenced his/her particular group as generally tactile. This was an important distinction as it allows for a comparison of "active" versus "quiet" classrooms in the context of whether or not morning physical activity made more of a difference for one type of classroom than another. No such pattern seemed to emerge from the analysis of interview comments, but it might be an interesting focus for further study.

Academic activity at the assessment time

This school attempts to, as much as possible, give teachers a scheduled Literacy Block of up to 90 minutes to focus on Literacy activities such as reading and writing. A block of focused subject time is viewed by many educators as extremely productive learning time. Six of the teachers are able to use this time period for Literacy. One teacher does her math work instead at that time because of her half-time schedule.

Student attitudes towards the morning physical activity

Teachers reported that student attitudes towards participating in the Morning Physical Activity were generally positive. They observed that the motivation to take part in the activity was noticeable: that students missed it when it was not offered, that they asked for it, and looked forward to it. All eight teachers referenced the community aspect and that students and staff utilized the time for socializing, chatting and connecting with their peers. One teacher felt that the time filled different needs for different students. Another teacher commented that "For myself, I need it, enjoy it too, walking around... and talking to kids in every class, every grade – having something positive to do and say with them. It is a positive, fun, way to start the day". One teacher noted, "...they absolutely do love the physical activity. They look forward to it

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

every day.” Another teacher observed that, on the other hand, when told that they wouldn’t be having morning activity, students appeared to be “okay” with it.

Other relevant factors

Teachers mentioned other factors that could potentially affect the study results. The time period of this study was during an exceptionally cold winter in which recess and lunch hour breaks which would usually allow students more opportunities for physical activity and fresh air were almost exclusively held inside because of high wind chill values. However, because these time periods were after the assessment time period in the day, it should have had minimal effect on the study itself. Teachers did feel that the lack of activity affected general mood in a negative way. The Winter Olympics were being held in Russia during the time period of the study and contributed to extra excitement and change in routine to watch some events. Changes of routine also occurred because of teacher meetings, illnesses, substitute teachers and vacations.

Engagement/disengagement behaviours:

In looking for themes through the teacher observations and in the interview sessions with teachers, the educational assistant and the principal, it was evident that more engaged behaviours were observed in the time period with the morning physical activity period than without. This impression was verified by coding behavior descriptions as either “disengaged” or “engaged” and then counting their appearances in observation notes and interviews. The total of each of these codes were then compared in the two conditions. In the first interview, after two weeks with no physical activity, disengaged behaviours were mentioned 33 times, while engaged behaviours were related 10 times. In the second interview, after the physical activity intervention, disengaged behaviours on the same questions were mentioned five times, while engaged behaviours were mentioned 35 separate times.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Table 3

Comparison of Incidence of Reported Disengaged and Engaged Behaviours

	Disengaged Behaviours	Engaged Behaviours
Interview 1 (without activity)	33	10
Interview 2 (with activity)	5	35

Disengagement

All teacher and educational assistant observation sheets and interviews were analyzed for references to behaviours indicating student engagement or lack of engagement in both no activity and activity conditions. Comments were counted, categorized and coded for analysis. The following are coded behaviours teachers reported observing indicating lack of engagement by their students: distracted, off task, low energy, disruptive and negative mood:

1. Distracted

The most common distracted student behaviours reported by teachers were a lack of concentration, agitation, restlessness and “fidgety” action. Teachers observed students playing with items in their desk, and having difficulty focusing. One teacher referenced the fact that her class had recently undergone training in a program called “How my engine runs” which makes them more aware of their reactions to stress and anxiety. In this training, students are taught how to effectively control their own stress levels with a number of different strategies. One of these strategies is to use “fidget” tools when they are having difficulty concentrating. The teacher reported an increase in requests for these tools in their two weeks without morning physical activity. Other students were described as more chatty. Squirming, difficulty sitting still, and difficulty with transitions were also noted. One teacher mentioned that the students wanted to continue chatty behaviours once they were back in the classroom after the period of physical activity.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

2. Off task

Off task behaviours suggest a lack of engagement in the information or the process. Teachers and the educational assistant observed students daydreaming and being easily distracted when off-task. Some observed avoidance behaviours such as more frequent requests to use the washroom or get a drink during the non-active condition. The educational assistant mentioned the need for frequent reminders to students in her group to attend to the task or topic.

All of them were “high”, even the two who were normally motivated, who could get down to work. No, none. There was no, surprisingly, there was a lot of, from them...what word am I looking for... causing a lot of stir in the group that normally didn’t. Like, if I’m looking even in a group of kids, you know I see because I’m always looking, even at circle time, everyone, just a lot of this, and this, and this (EA indicated squirming, touching, talking motions). So out of those four, without the activity, it was very difficult. You have no idea. It was constantly... Did you hear what I said? They could not focus on the task at all, even the two who were normally motivated, they could not, just could not. I was surprised about it, I guess, because normally these two are right down to work and they were the ones doing the poking.

3. Low energy

Some students who are not engaged in an activity may appear to be lethargic, tired, and sluggish. When looking at individual reports on student behaviour, one student was observed on three separate occasions in the “without physical activity” condition to be “slouched in a chair”, “showed little participation in the lesson”, and “quietly working, but slouched posture”. The “slouched “ posture could be a physical indication of disinterest and disengagement. One observer noted:

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

There were two different students at two different times, especially near the beginning, one was a girl and one was a boy and they weren't in ear shot of the other person. They both commented on how tired they felt ... they felt quite tired when they couldn't get up and do the activity.

4. Disruptive

Some disengaged students turn their focus to other activities in the classroom. Teachers and the educational assistant observed students poking others to get a reaction. Some students became louder, wilder, and argumentative. Several teachers noted students who blurted out comments and answers without being able to wait their turn – “blurting out stuff that didn't have anything to do with what we were even talking about”. As the educational assistant noted, “They couldn't focus. It made it harder for me to do my job. They didn't hear me, were not looking at me, they just didn't settle, get into it”.

5. Negative mood

One teacher mentioned whiny behaviours and more crying.

Right now they're irritable, they're loud, they're arguing a lot with each other and it's like they're adolescents. You are having to reteach and talk about the rules and routines, a lot of tattling. And they know “Go talk to him” but they forget everything right now.

Students may be irritable and argumentative. The educational assistant referenced a student who was having difficulty in social situations. “ She used to say ‘ I don't like school’ and was crying”.

Engagement

The following are student behaviours observed by teachers indicating engagement in academic learning: focused, on task, high energy level, calm, positive mood.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

1. Focused

One teacher mentioned that there was “a huge shift in overall class ability to focus and sit still” once morning physical activity was reintroduced. Other observed behaviours were decreased impulsivity, less distractibility, and more talk on relevant topics. One teacher referenced the fact that, although there was sometimes more talk following physical activity, it appeared to be more relevant to the topic at hand. The educational assistant working with specific students noted better concentration and improved memory.

They were able to get immediately on task, not as easily distracted by others as they normally would be. They were able to come and get straight down to work without needing to be refocused constantly... Getting down to work was much better. They had improved mood and were able to get down to work better. Yeah, they had improved and, I found, improved memory because, I could explain at the beginning that this was what we were doing on the task and what we were doing. They were able to get through the whole task without me having to re-explain and that was an issue before, whether they couldn't listen or they just couldn't focus or retain what I was saying when I was explaining their job. Then after they could do the whole, entire task. You know, I felt really, we got a lot done. It was extremely productive.

2. On task

Engaged behaviours referenced in relation to specific tasks were that fewer reminders were needed to stay “on task” and there was less chit-chat. Engaged students were described as “extremely productive” and as having “increased participation”. The class itself was described as having better “flow” and as having a “lower class volume” when students were engaged and on task. They were more able to work independently. As one teacher put her observations,

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

I did find that, their attention, in general, not just four students, but I could keep them engaged a little bit longer so they could last longer towards recess. Without it, by a quarter after, I was starting to lose some of them.

Another observer noted “ You saw the difference, that they could control themselves better and they were ready to learn.”, in the morning activity condition.

3. Higher energy level

Engaged students appear more alert, and interested. As one observer stated “There’s more talking but it’s more focused and relevant to what we are doing.” Students “weren’t as tired”, in their words, during the morning activity condition.

I think that it was good for them to have the break where they had the physical activity, the opportunity to socialize and to sort of wake up. You know, that activation of the brain, I guess, and get them oriented to being in school. Instead of wanting to sort of sit and kind of laze around, they were more alert, I would say, with the physical activity.

Another teacher observed:

I found that there were more kids putting up their hand and participating so, whether that was, they were more alert, more engaged but I found that there were two or three more hands in the air than when we weren’t doing it.

4. Calm

Three of the seven teachers mentioned that they valued a calm classroom. Individual students who were able to demonstrate self-control by sitting still were seen as engaged by their teachers. One teacher observed that, after physical activity, the calm in the room could be described as “relaxed”, not “forced”. I believe this is a powerful description of a very different

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

mechanism for individual control of behaviour from external (teacher requirement) to internal (natural physiological response). Another teacher, when asked to describe the classroom climate after morning physical activity responded: “It calmed. You can feel the sense of calm right away.” One teacher noted: “There is more a sense of calm and quiet in the room, that there is more what it should be for the activities they are doing”.

5. Positive mood

Teachers reported that engaged students were respectful of their peers and adults. Students with difficulties in social situations appeared better able to handle “issues”, were more relaxed and appeared less anxious. One interviewee related a story of a child who had significant social issues. The child was described as “crying a lot” and not getting along with the other students during the time period without morning physical activity. The same child was described as calmer, and able to solve social issues during the weeks with physical activity. The educational assistant observed: “The concentration all that was just better ... just improved mood overall. They were just able to focus more and it just seemed to be a better atmosphere all around after morning physical activity”.

Three of the eight teachers interviewed mentioned that engagement in the academic activity after morning physical activity lasted longer. As one said, “But I did find that, their attention, in general, not just the four students, but I could keep them engaged a little bit longer so they would last longer more towards recess.”

Observations in the Context of Grounded Cognition theory:

Body

One of the five questions on the Adapted Student Engagement Checklist asks specifically for teacher and educational assistant observations of body language as an indication of student engagement. Observations of students who were turned away from the speaker or slouched in

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

chairs received low scores on the scale. For example, one student was observed to be “looking off at times when he should have been writing” Another “Asked to use the washroom ... was turned around when she should have been working”. “Student was not overly off task but, when observing, I noticed he distracted himself with pencils and tried to engage others in his group by making funny faces” was another observation by a teacher. Another student was observed to be “quietly working, but posture was slumped”. Low energy levels were noted by some teachers as indicative of a lack of engagement.

So was too much energy. As noted by one observer, “Even “quiet” kids had too much energy, couldn’t settle, focus or listen.” Students exhibited restlessness and lack of engagement by “fidgeting”, “moving, wriggling, blurting out”. One child was noted to be “ Antagonizing peers. Breaking crayons. Completely off task.” Another was observed to be “sticking his tongue out at others”. On the other hand, students who sat up, appeared alert and faced or leaned towards the teacher were characterized as highly engaged.

Motor Processes

Although research suggests that motor processes are involved in cognitive development, there were no references in the teacher observations or interviews related to this topic. The teacher who elected to conduct the morning physical activity in her classroom included motor movements for all major muscle groups in her activities. The other students’ participation was limited to walking and running.

Physical environment

The hallways are wide and classrooms are fairly large in this school, but the gym is relatively small. There is a large open-space library in the centre of the school contributing to its open feel. The décor is bright and colorful. Classroom numbers are relatively small. A teacher mentioned one student “rolling around on the floor” during reading time as an indication of lack

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

of engagement. The winter wind-chill was so severe that for three months, most recesses and lunch breaks were held inside. Three teachers and the principal mentioned that they felt that this lack of expected outdoor activity was unusual and may have contributed to increased restlessness and agitation during the latter part of the day. The principal was unsure whether this was a factor or not in the low numbers of student behaviour referrals to the office.

Modalities (external, internal)

The external modality of touch was mentioned often in teacher observations during this study. Disengaged students were characterized as “very tactile” and were observed pushing and poking other students. Students in one classroom requested stress relief toys (squeeze balls, many-sided objects) more often in the days without physical activity presumably as a means to lower their own stress through touch. On the positive side, one teacher carried her lizard around the school during morning activity encouraging students to pet it during their walk. This is an acceptable form of touch in North American society.

The level of noise was also mentioned often from the teachers and educational assistant. One teacher mentioned that, on one day without morning physical activity, “Students were loud and unable to focus on most simple tasks; lots of tears, angry words, frustration”. Another class was observed to be “wilder, louder, and whiny” without the morning activity. Once physical activity was reinstated, four teachers mentioned that their classrooms during the academic period were calmer and quieter. Three teachers mentioned that there was still talk, but it was more “on-task” and “productive”, in their words. One teacher characterized the feeling as a “relaxed calm rather than a forced calm”.

Interoception is one of the internal modalities listed in the grounded cognition model. Students who were requesting “fidget” tools in one class were demonstrating an awareness of an internal need for a mechanism to calm their internal “racing engine”. They had learned in class

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

that by handling and squeezing a “fidget toy”, they could release stress and alleviate restlessness. By requesting the tool, it seems that they were responding to that awareness of their internal state by meeting that need in an appropriate way.

Socialization:

The embodied cognition theory suggests that one of the five modalities affecting cognitive processes and, in turn, being affected by cognition, is socialization. This includes elements such as self, agents, groups, social interactions, joint attention, mirroring, imitation and culture (Pezzulo et al., 2008). The complex interactions between peers, parents, teachers, principals, siblings and others in complex systems such as families, communities, schools and classrooms have an effect on each individual’s mood, self-concept and ability and motivation to learn.

All eight teachers, the educational assistant, and the principal interviewed in this study commented on their perception of the positive effect the morning physical activity had on socialization for their students and themselves. The fact that the activity was structured as a purposeful walk/run without a defined level of intensity, seemed to have allowed everyone to move at a pace comfortable for each of them. The principal noted that she used the time to connect with some of her “behaviour” students in a positive way. She also commented: “I see siblings connect, I see a kid connect with previous years’ teachers. I see a lot of those connections. So, if you look at restitution, a lot of kids are saying that belonging is one of their needs.”

Staff noted that they had an opportunity to talk with other staff. Classroom teachers were able to walk with students and had time to talk about their individual stories and plans. Staff commented that they noted siblings meeting up with each other and friends from other classrooms connecting. As one teacher stated:

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

The kindergarten kids really struggled because it's such a big part of their daily routine. It's all they've ever known. They also need that socializing, connecting, chatting time with their peers and I know that, for myself, I need it, enjoyed it too, walking around with my lizard and talking to kids in every class, every grade – having something positive to say and do with them and checking in with my friends and colleagues as well. It is a positive, fun way to start the day. We all struggled in kindergarten when it stopped.

Older students would walk and talk with younger ones. Students who were chronically late could slip into the activity without disrupting the classroom. The theme that seemed to emerge from the discussions was the community aspect of the entire school doing an activity together and that the social interactions were valued by students and staff. As one teacher stated, "...they like the social piece. They like to go with the other classes. It's their time to just visit." Another teacher commented on her questions about how effective physical activity was in changing behaviour:

You know, even as a staff, we were like "Well, we've been doing it for so long, we don't know if it makes a difference." It has been a topic of conversation. Do we need to do this anymore? Is this really doing anything other than just being a social time? But my little girl that is hearing-impaired: she needs that social time. That's her time to connect and talk and for the others as well. It does make a big difference coming in and they connect with their friends and then we can stop and get to learning until we get to recess time and then you get back with your peers. So it was very interesting. I saw a big difference.

In summary, the quantitative and qualitative results appear to support the research

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

hypothesis that student engagement in academic activity is increased after morning physical activity. The quantitative data from teacher observations demonstrates that 24 of 28 students had an increase in classroom engagement. There was a statistically significant difference demonstrated between the mean scores for no physical activity and for physical activity. Observations and comments from the teachers and educational assistant mentioned engaged behaviors more often in the activity condition than in the no activity condition. When merged, this data appears to answer the research question from Chapter One that student engagement appears to be positively impacted by a morning physical activity intervention.

Chapter Five: Discussion

The theoretical construct of grounded cognition was utilized for this thesis and draws on the work of Barsalou (2008) and Lakoff & Johnson (1999). This theory purports that all of the domains of classic cognition are grounded in the states of the body and that cognition, in turn, affects the state of the body. Therefore, in my opinion, optimal cognition would occur, not by separating the mind from the body, but in maintaining optimal states for the body as well. When these optimal states for the body are maximized in students, their ability to engage in learning activities is increased and cognition improved. These states are divided into five categories. In the context of grounded cognition, the results and analyses were considered in categories as domains of classic cognition, body, motor processes, modalities (internal and external perception), physical environment and social environment. The observations gathered in this study did not touch on the categories of physical environment and some of the internal modalities; therefore, they are not included in this discussion. The discussion is organized into the relevant states from grounded cognition but also considers the previous research in the area.

Domains of Classic Cognition

Comments have been made by teachers and the educational assistant to suggest that student attention, memory, and knowledge have been positively affected in students after morning physical activity. These attributes are recognized as outward manifestations of internal cognition. Student attention to the topic at hand is a behavioural manifestation of engagement. Observers of individual students scored attributes such as body posture, verbal participation and consistent focus as indicators of attention on the Adapted Student Engagement Checklist. Some observers noted that, after the morning physical activity, some students exhibited better memory and understanding, making work time more productive. These observations support the findings of Sibley and Etnier (2003), whose meta-analysis noted that a significant positive relationship

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

exists between physical activity and cognitive function in children aged 4-18 years. Their study found that physical activity before academic tasks improves a youth's perceptual skills, intelligence quotient, achievement, verbal tests, mathematic tests, developmental level and academic readiness. The concept of increased productivity is critical to the concept of inclusion of physical activity minutes in the school day being seen as an enhancement of academic learning time, not a loss.

Body:

Physical evidence of student engagement or disengagement in academic activities was demonstrated through body posture/language as reported by teachers. Students demonstrated a need for physical movement, when it was not available, by activities such as rolling on the floor, pushing and poking others. Slouching in seats and turning away from the speaker were also classified as disengaged behaviours. Engaged students were perceived by their teachers to be alert and attentive. As reported by six teachers during interviews, students were observed to be raising their hands more often, turned towards, looking at and appearing to listen to the speaker, rather than other students during the morning physical activity condition. These students participated more in discussions and were observed to have conversations more related to the topic at hand. These observations are all examples to infer student engagement from noted behaviours.

In grounded cognition theory, cognition is affected by many variables grounded in the physical – senses, fitness, nutrition, social environment, etc. (Barsalou, 2008). If children were less active, less fit, and less able to participate in indoor/outdoor play, grounded cognition theory suggests that their academic success would be negatively impacted. This is in line with studies from other researchers in which lower academic success could be correlated with lower fitness levels and fewer opportunities for physical activity (Sibley & Etnier, 2003; Chomitz et al., 2009).

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Adding strategically timed opportunities for children to receive more physical activity in the school day would be one of a variety of strategies to positively affect their ability to think and learn.

Motor Processes:

This study has broader implications for the application of embodied cognition theory in education. Studies have demonstrated that motor processes and bodily conditions make a difference in cognition (Best, 2010; Budde et. al, 2007; Castelli & Hillman, 2007). The neuroscience (body) and physiological (motor skills) studies help us to understand the mechanisms by which these positive changes can occur. Other studies connect those physical effects to the affective domain, which includes the critical aspect of student engagement (Field et al., 2001). This study is an examination of one possible method by which classroom academic time can be maximized by harnessing the positive effects of physical activity, which are in the best interests of both students and teachers.

Physical Environment Settings

The physical environment was the same for both parts of this study and, therefore, was not part of the actual study. It may be of interest, however, for consideration in conducting other physical activity programs in school settings. Embodied cognition theory considers the external environment as having an effect on cognitive processes. This study was conducted entirely inside using hallways and gymnasium spaces. It would be difficult for this particular study to be generalized for other schools because of some specific characteristics of this study. First, the school was comfortable and already familiar with the intervention, so there were no difficulties in explanations, start-up and application. Second, this was a relatively small elementary school with space for movement. Schools with larger student populations and less physical space might have difficulty running a similar intervention. However, the commitment by educators to find ways to

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

get students moving during their school day to improve learning could result in many new and innovative ideas. The physical activity intervention should look different in every school depending on individual school goals, capacities, and needs.

Modalities

This study specifically included physical and social aspects of embodied cognition theory in an educational setting in a format that allowed for these modalities to be affected before academic activity to see if there was a corresponding increase in engagement. However, in embodied cognition theory, these aspects are present and interacting along with environment during cognition. The broader implications might be how can these modalities be included in the classroom throughout the day to further promote engagement and learning? Would a “walking classroom” or more active centres in different environments be more effective? With these suggestions, internal and external modalities and the physical environment would be activated as part of the learning process. Both of these would be interesting questions for future research.

The concept of “touch” (haptics) was raised by several teachers. Disengaged students were observed to be touching inappropriately – pushing and poking other students. In order to curb unwanted behaviours, one teacher carried a pet lizard during the physical activity intervention, which invited appropriate student touching. According to several teachers disengaged students exhibited behaviours indicative of boredom, stress or anxiety that were manifested by, for example, breaking objects such as pencils. Some students demonstrated evidence of interoception by choosing stress toys such as squeeze balls to play with to help deal with these negative feelings. These students were demonstrating an awareness of their internal states and the level of their involvement in the learning activity through touch. Touch can be a powerful motivating factor (Kraus, Huang & Keltner, 2010). It can be positively utilized for learning to help students understand through tactile opportunities and for social development to

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

help create feelings of warmth, trust and empathy and to foster communication skills (Kraus et al., 2010). I believe that, in our current teaching and societal environment, touch is often discouraged and underutilized as a positive influence.

Social Environment:

One key domain also included in grounded cognition theory is the relationship between social functioning and cognitive processing. One unintended result of this intervention was the opportunity for social interactions and the perceived positive value by both students and staff. Every staff member including the principal and educational assistant commented in the course of their interviews on how important they felt social interaction was to them personally as well as to their students. The opportunity to walk and talk with others was observed to be a positive start to their day.

Merged Results

Students in this school have been taught that physical activity helps to create a foundation for learning. Their perception of the effects of not being active may have affected their behaviour. Twenty-four of twenty-eight students demonstrated an improvement in their engagement scores during the period with morning activity. Two of the four students with decreased scores demonstrated a very small decrease. However, the other two had fairly large negative changes. The question this raises is, “Why did the intervention appear to affect these two so negatively?” Three of these four were in the same classroom. Did the negative behaviours of one student encourage the others to change? Were there particular aspects of the learning activities/teacher approach that made a difference? One explanation might be that these individual students needed a longer or more intensive period of exercise to have a positive effect. Perhaps physical activity would need to be used in conjunction with other interventions to make a positive difference in their behaviours. Every child is different and every child has different

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

needs. It may be that this intervention is not long or intense enough to elicit an increase in student engagement in some students.

One possible barrier to having other schools try an intervention of this nature is the concern about the loss of class time for learning. Many teachers expressed that the morning was often their most productive learning time and they may be uncomfortable with losing a part of that time for a walk and talk session. Also, some teachers expressed reservations about including another activity and losing valuable learning time in transitions. It is common to hear teachers comment on students with behaviour issues as having difficulty in unstructured transition times. In this particular study, transition times became a non-issue as, while two teachers reported that it took longer in transition times during the no-physical activity intervention when compared with the physical activity intervention, one teacher reported that it stayed the same and four teachers found that the time actually decreased. Transition times may be the best opportunities some students have for the social interactions they need to practice and function effectively in the classroom. Also, the results of this study suggest that, in the time the students participated in academic activity after physical activity, their overall engagement scores increased.

Mental health problems, learning disabilities and anxiety in children have been documented in higher numbers than ever (Grey, 2011). Students are increasingly being diagnosed with earlier onset of symptoms of depression, anxiety, attention deficit disorder, autism spectrum disorder, paranoia and bipolar disorders. One of the most valuable tools recommended by doctors to reduce the severity of many of these symptoms is increased physical activity (Mead et al., 2008). In fact, research has found that in many cases it is as effective as medication. One hour of physical activity a day has been connected with improved social health (increased connectivity), improved psychosocial health (even a ten minute walk decreases stress), improved cognitive

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

functioning and increased self-efficacy. Studies have suggested that physical activity can be a front-line defense against mild to moderate depression (Field, et al., 2001; Mead et al., 2008).

When the information from the Adapted Student Engagement Survey results and interview and observation strands of the study are merged, inferences can be made about the relative effectiveness of the morning physical activity program on classroom engagement as it relates to this school. According to the quantitative data, the null hypothesis suggesting that there will be no change in engagement scores from periods with no physical activity compared to periods with physical activity can be rejected. Data on individual students indicate that there is a positive trend towards engagement in 24 out of 28 students in the period with physical activity.

The statistical results of the twenty-eight randomly selected students, the merged observation and interview results from teachers, principal and educational assistant observations and interviews provide encouraging results to support the hypothesis that, morning physical activity has a positive effect on subsequent student engagement in academic activities. It is interesting to note that, even teachers who, when interviewed about whether they observed a change in engagement with or without the condition, and indicated that they did not, recorded individual student scores demonstrating improvement.

In two classrooms, the four randomly selected participants were classified by their respective teachers as “highly engaged”. Therefore, there is a distinct possibility of a ceiling effect negating improved engagement scores. In fact, several teachers emphatically stated that they did not expect to see changes in engagement levels in many of these students. Yet, individual scores would suggest that, contrary to expectations, in at least two of those classrooms, (and possibly all three), an increase in student engagement was observed and recorded. Therefore, not only was an increase in engagement scores recorded in classrooms by observers who expected to see an increase, increased scores were recorded by teachers who expected to see

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

no change or a negative change as well. This increase in engagement scores held even though the randomly selected pool of students were characterized by their classroom teachers as students who were more “highly engaged” academically.

Teacher and educational assistant observations supported the quantitative scores in one respect but disagreed in another. During the first set of interviews, three of the seven teachers mentioned that they didn’t expect to see much change and two stated in their second interview, that they didn’t think they had observed a change. However, individual student data demonstrated positive change in students being observed in six of the seven classrooms. The coded observations supported the quantitative data in that there were more positive engagement observations after morning physical activity than without and more disengagement observations in the weeks without morning physical activity than with it.

Limitations

During the development of the project, a number of limitations were noted. Firstly, this study is not blind. The teachers and educational assistants were aware of the premise of the study. There may be an inherent bias for or against the perceived value of the program, which may influence perceptions of student behaviours. This may have influenced their completion of the checklist and observations as well as the interviews. If teachers believed that students were more engaged after physical activity that may have had an effect on their teaching and classroom management. If students and teachers believed that students were calmer and more focused after activity, would their perceptions become reality?

Secondly, there are other factors in the school context, which could also have influenced behaviours such as excitement over field trips, coming holidays, etc. These factors were considered in the qualitative analysis of data. For example, in that four-week period, students were only able to go outside three times for their recess break because of the severe cold weather.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Thirdly, there was no attempt to ensure that every student experienced the same level of intensity during the physical activity time period. For example, some students elected to stay and run more than the three laps in the gym and were allowed to do so while others did the bare minimum.

The teachers were scrupulous in applying the intervention and recording scores as requested, as evidenced through the interview process. However, one teacher had a substitute teacher filling out her observations for one week, so fidelity to the process may have been compromised somewhat in that instance. This substitute teacher knew the class well and had often taught the class, but it is possible that a different individual might have different perceptions of engagement behaviours.

Implications for Future Research

These study results were obtained in a short-term condition. Follow up longitudinal studies in larger schools using different age groups would be informative next steps. Middle and high school age students could be part of a study in which applications on their individual phones could measure length and intensity of activity. According to the Canadian Mental Health Association (CMHA), students could be taught to recognize physical signals such as muscle tension, headaches and/or increased heart rate as possible symptoms of anger or restlessness. This interoceptive skill could be used by students to recognize symptoms and to be able to take a movement break to help alleviate them (CMHA, 2014).

Physical activity conducted in different environments (ie. outdoors, summer and winter, etc.) and with differing motor skills and intensity levels would be other interesting subjects to explore in later studies. For example, static and dynamic balance and cross lateral movement skills have been found to help children develop the proprioception and neurological pathways necessary for sitting still, writing shapes and lines and recognizing letters (Johnson, 2007).

Clapping hands, stomping feet, jumping, galloping, skipping and hopping are activities that can

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

stimulate proprioceptive awareness. Skipping rope, gymnastic rolls, dance, cross country skiing, juggling and kayaking activities, for example, help strengthen the bilateral integration important for using both sides of the brain in academic activities (Johnson, 2007).

This study has highlighted a positive connection between physical activity and student engagement. However, the next logical question is: Does physical activity/student engagement translate into student achievement? In order to answer this important question, schools/school divisions would have to be willing to share student academic scores. Additionally, the provincial government would have to be willing to release individual and school wide results of provincial literacy and numeracy assessments. Although this type of quantitative data could assist in determining a relationship between the variables of student engagement, physical activity and student achievement, the release of such data is a political issue highly contested on many levels in some jurisdictions. For example, in Manitoba, academic scores are not released to prevent school to school comparisons relying solely on literacy or numeracy scores. The ramifications of the release of such information have results that are far reaching and well beyond the scope of this thesis.

A future study utilizing more educational assistants' perspectives could provide rich and detailed information. The one educational assistant who participated in this study provided very comprehensive information on what exactly was occurring with the specific students selected in the study as well as classroom incidents. Educational assistants usually work with small groups or individual students under the direction of the teacher. When not actually interacting with students, they may be able to attend to observing student behaviour since they are not directing classroom activities.

The randomly selected participants in this study tended to include a high number of apparently (according to several teachers) already engaged students. Another possibility for

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

future study would be the selection of a purposive sample of students identified as having difficulty with engagement. Many of the teachers mentioned that they would have liked to have been able to select the students in their class as participants in this study. They indicated that they would have chosen students who had difficulty with engagement. Research suggests that these students may be the most likely to demonstrate improved engagement (Sibley & Beilock, 2007).

This study examined only the results of a physical intervention in the morning. Several staff also wondered about including a movement break such as this at different times in the school day. It would be interesting to see what might be found in a study that compared the effectiveness of a morning versus afternoon physical activity time, or frequent physical activity interventions during the school day.

An individual classroom intervention, without whole school involvement, could look very different. The teacher could have control of the optimal time to introduce activity. A case study with such a classroom would also be informative. The teacher could plan physical activities for the whole class when it was most advantageous in his or her schedule or based on observations from previous research suggesting when might be optimal times.

Individual students could have activities planned for times when they were experiencing stress or restlessness or were having difficulty focusing. Some teachers are already implementing similar ideas by installing stand-up desks, balance balls for chairs and treadmills at the back of classrooms. The benefits of physical activity are experienced by each individual differently. The intensity, type and duration of physical activity may need to be individualized for each student. These could be rich areas for future research.

Implications for Praxis

There has been concern expressed by parents, politicians and educators regarding Canada's recent drop in standings in PISA results comparing scores by fifteen year old students

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

world-wide on standardized tests in mathematics and science (Globe and Mail, Dec. 3, 2013).

There has also been, in the same time period, a documented drop in children's physical activity levels and a corresponding rise in obesity and sedentary behaviours. One simple and inexpensive answer could be to strategically increase student physical activity time in schools as one possible intervention.

In several instances, teachers suggested that there would be no change in student engagement with or without physical activity. Yet, as previously stated, for the 28 students observed in this study, statistically significant results suggested that physical activity may have positively impacted student engagement. This result was supported by and is consistent with the qualitative data analyses.

In implementing such a program in a school, it is paramount that teachers receive appropriate professional development in the area of physical activity and student engagement. Results of this study are powerful in gaining teachers' understanding and support for such a program. Additionally, teachers could be an important resource when parents question the allocation of fifteen minutes of the school day to physical activity. Thus, the "buy in" from teachers has far reaching effects for student engagement and parental support.

Conclusions

The results of this study suggest that a physical activity intervention is effective in improving student engagement in subsequent academic activity in an elementary school setting. However, the implementation of such a concept requires that educators reexamine their underlying belief in the most effective way to support student learning. Underpinning many decisions about allocation of time use in schools may be the basic belief in classic cognitive theory of the brain working independently of the body. In this paradigm, the most valuable

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

learning time would be when students are sitting quietly and working independently. More minutes in quiet academic classwork would equal better cognition.

Grounded cognition theory suggests, however, that states of the body have a profound effect on the development of cognition and the expression of that learning (Barsalou, 2008). Neuroscience and physiological research (Diamond, 2000; Draganski, 2004) support this view, as do the results of this study. Engagement in learning occurs differently for each child but this theory would allow for the inclusion of the physical and emotional needs of students to be given more weight in deciding how to spend those valuable minutes in the school day. This awareness of other important variables in optimal learning states for children opens up exciting new avenues for innovative teaching opportunities. For example, physical educators and classroom educators could step outside of their separate silos and collaborate using their specific knowledge and skills to enhance a students' learning experience all day instead of only in their specific traditional times and spaces.

The results of this study support the premise that physical activity before academic activity increases engagement in many students through increased calm, focus and attention. This physical activity intervention is not expensive. The key component to successful program implementation in schools is administrative and teacher support for creative and effective ways to engage students in the learning process through maximizing the benefits of physical activity.

References

- Active Healthy Kids Report (2009). Retrieved from
<http://www.activehealthykids.ca/ReportCard/ArchivedReportCards.aspx>
- Adam, H., & Galinsky, A. (2012). Enclothed cognition. *Journal of Experimental Social Psychology* 48, 918–925. doi: 10.1016/j.jesp.2012.02.008.
- Ahmed, Y., Macdonald, H., Reed, K., Naylor, P. J., Ambrose, T. & Mackay, H. (2007). School-based physical activity does not compromise children's academic performance. *Medicine and Science in Sports and Exercise*, 39(1); 371-376.
- Appleton, J. J., Christenson, S. L. & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools*, 45: 369–386. doi: 10.1002/pits.20303
- Appleton, J. J., Christenson, S. L., Kim, D. & Reschley, A. (2006). Measuring cognitive and psychological engagement: Validation of the student engagement instrument". *Journal of School Psychology* 44, 427-445. doi: 10:1016/j.jsp.2006.04.002
- Barsalou, L. (2008). Grounded cognition. *Annual Review of Psychology*, 59, 617-645.
- Best, J. R. (2010). Effects of physical activity on children's executive function: Contributions of experimental research on aerobic exercise. *Departmental Review*, 30(4), 331-351. doi: 10/1016/j.dr.2010.08.001
- Bryman, A. (2006). Integrating quantitative and qualitative research: How is it done? *Qualitative Research*, 6, 97-113. doi: 10.1177/1468794106058877
- Budde, H., Voelcker-Rehage, C., Pietrabyck-Kendziorra, S., Ribeiro, P. & Tidow, G. (2008). Acute coordinative exercise improves attentional performance in adolescents. *Neuroscience Letters*, 22:441(2): 219-23. doi: 10.1016/j.neulet.2008.06.024.Epub 2008 Jun 13.
- Canadian Mental Health Association webpage, (2014). Anger Management. Retrieved from http://www.cmha.ca/mental_health/feeling-angry/#.U73l8V4rpmA, July 2014.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

- Carlson, S., Fulton, J., Lee, S., Maynard, M., Brown, D. & Kohl, H. (2007). Physical education and academic achievement in elementary school: Data from the early childhood longitudinal study. *American Journal of Public Health*, 98 (4), 721-727. doi:10.2105/AJPH.2007.117176.
- Casey, B. (2004). Mathematics problem-solving adventures: A language-arts-based supplementary series for early childhood that focuses on spatial sense. In D. H. Clements & J. Sarama (Eds.), *Engaging young children in mathematics: Standards for early childhood mathematics education*, (pp. 377-389). New Jersey: Lawrence Erlbaum Associates.
- Castelli, D., & Hillman, C. (2007). Physical education performance outcomes and cognitive function. *Strategies: A Journal for Physical and Sport Educators*, 21(1), 26-30.
- Castelli, D., Hillman, C., Buck, S., & Erwin, H. (2007). Physical fitness and academic achievement in third and fifth grade students. *Journal of Sport and Exercise Psychology*, 29, 239-252.
- Center for Disease Control, (2014). Retrieved from <http://www.cdc.gov/physicalactivity/everyone/measuring/hearttrate.html>
- Cervone, L. & Martinez-Miller, P. (2007). Classroom walkthroughs as a catalyst for school improvement. *Leadership Compass*, 4 (4). Retrieved from [www.naesp.org/resources/2/Leadership Compass/2007/LC2007v4n4a2.pdf](http://www.naesp.org/resources/2/Leadership%20Compass/2007/LC2007v4n4a2.pdf).
- Chomitz, V. R., Slining, M. M., McGowan, R. J., Mitchell, S. E., Dawson, G. F., & Hacker, K. A. (2009). Is there a relationship between physical fitness and academic achievement? Positive results from public school children in the northeastern United States. *Journal of School Health*, 79, 30-37. doi: 10.1111/j.1746-1561.2008.00371.x
- Chugani, H.T. (1998). A critical period of brain development: Studies of cerebral glucose utilization with PET. *Preventive Medicine*, 27, 184-188. doi:

10.1006/pmed.1998.0274

Christenson, S., Reschly, A. L. & Wylie, C. (2011). *Handbook of research on student engagement*, Springer, New York.

Coe, D.P., Pivarniki, J., Womacki, C., Reeves, M.J., & Malina, R.M. (2012). Effect of physical education and activity levels on academic achievement in children.

Medicine and Science in Sports and Exercise, 38(8), 1515-1519. doi:

10.1249/01.mss.0000227537.13175.1b

Colcombe, S. & Kramer, A. F., (2003). Fitness effects on cognitive function of older adults,

Psychological Science, 14(2), 125-130. doi: 10.1111/1467-9280.t01-1-01430.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage.

Denzin, N. K., & Lincoln, Y. S. (Eds.) (1998). *The landscape of qualitative research*,

Thousand Oaks: Sage Publications.

Diamond, A. (2000). Close interrelation of motor development and cognitive

development of the cerebellum and pre-frontal cortex. *Child Development*, 71,

44-56. doi: 10:1111/1467-8624.00117

Draganski, B., Gaser C., Busch, V., Scheuerer G., Bogdahn, U., & May A. (2004).

Neuroplasticity: Changes in grey matter induced by training. *Nature*, 427,

311– 312. doi:10:1038/427311a

Eisner, E. W. (1991). *The enlightened eye: Qualitative inquiry and the enhancement of*

educational practice. New York, NY: Macmillan Publishing Company.

Everke, J., Gryzyk, K., Hubner, R., & Woll, A. (2009). Cognition and physical activity in

kindergarten - development of a physical activity program for the improvement

of cognitive ability and the question of how to assess cognitive control. Poster

presented at the 14th Annual Congress of the European College of Sport

Science, June 24-27, 2009, Oslo, Norway. doi: um:nbn:de:bsz:352-opus-114618

Field, T., Diego, M., Sanders, C. E. (2001). Exercise is positively related to adolescents' relationships and academics. *Adolescence*, 36(141), 105-110.

Finn, J. (1989). Withdrawing from school. *Review of Educational Research*, 59(2), 117– 159. doi: 10.3102/00346543059002117

Finn, J.D., Pannozzo, G. M., & Voelkl, K. E. (1995). Disruptive and inattentive-withdrawn behaviour and achievement among fourth graders. *The Elementary School Journal*, 95, 421-434.

Fisher, C. W., & Berliner, D. C. (1985). *Perspectives on instructional time*, New York: Longman.

Francis, N. & Lu, C. (2009). The conceptual framework of the eastern approach in physical education: Ancient wisdom for modern times. *ACPHER Healthy Lifestyles Journal*, 56(2/3), 23-27.

Fredericks, J. A., Blumenfeld, P. C. & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74(1), 59-109.

Galen (AD 129-216/7). *Selected Works*. Translated with an introduction and notes by Singer, P. N. (1997). Oxford: Oxford University Press.

Ginsburg, K. R. (2007). The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics* 119(1), 184-188.

Greene, J. C., Caracelli, V. J., & Graham, W. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, 11(3), 255-274. Stable URL: <http://www.jstro.org/stable/1163620>

Grey, P. (2011). The decline of play and the rise of psychopathology in children and adolescents. *American Journal of Play*, 3(4), 443.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Hannaford, C. (2005). *Smart moves: Why learning is not all in your head*, 2nd.ed. Salt Lake City, Utah: Great River Books.

Hannaford, C. (2010). *Kinesthetic learners*. Child 1st Publications LLC.

Hillman, C., Pontifax, M. B., Raine, L. B., Castelli, D., Hall, E. E. & Kramer, A. F.

(2009). The effect of acute treadmill walking on cognitive control and academic achievement in preadolescent children. *Neuroscience* 159, 1044-1054. doi: 10.1016/j.neuroscience.2009.01.057

Institute of Medicine of the National Academies Report (2013), Educating the student body; taking physical activity and physical education to school. Retrieved on May 24, 2013 from <http://www.iom.edu/reports/2013/Educating-the-student-body-taking-physical-activity-and-physical-education-to-school/report-brief052313.aspx?page=2>

Jimerson, S. R., Campos, E., Greif, J. L. (2003). Toward an understanding of definitions and seven measures of school engagement and related terms. *The California School Psychologist*, 8, 7-28. doi: 10.1007/BF03340893

Johnson, S. R. (2007). A developmental approach looking at the relationship of children's foundational neurological capacities to their higher capacities for learning. Retrieved from www.youandyourchildshealth.org

Jones, R. D. (2009). Student Engagement Teacher Handbook, Institute for Leadership in Education, Rexford, New York

Klem, A. M. & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health*, 74, 262-273. doi: 10.1111/j.1746-1561.2004.tb08283x

Kraus, M. W., Huang, C., & Keltner, D. (2010). Tactile communication, cooperation, and performance: An ethological study of the NBA. *Emotion*, 10, 745-749. doi: 10.1037/a0019382.

Laerd, (2013). Dependent t-test using SPSS. Retrieved from

<https://statistics.laerd.com/spss-tutorials/dependent-t-test-using-spss-statistics.php>

Lakoff, G. & Johnson, M. (1999). *Philosophy in the flesh; The embodied mind and its challenge to western thought*, New York, NY: Basic Books.

Mahar, M. T., Murphy, S. K., Rowe, D. A., Golden, J., Shields, A. T., and Raedeke, T.

D. (2006). Effects of a classroom-based program on physical activity and on-task behaviour. *Medicine and Science in Sports and Exercise*, 2086-2094. doi: 10.1249/01.mss.0000235359.16685.a3

Manitoba School Nutrition Handbook (2006), Retrieved from

<http://www.gov.mb.ca/healthyschools/foodinschools/documents/handbook.pdf#policies>

Martin, G. O. (1987, October) The use of qualitative and quantitative valuation methods for program evaluation. The California International Studies Project. A case study. Paper presented at the annual meeting of the American Evaluation Association, Boston.

McIlroy, A. (2009, November 8). The link between exercise and more brainpower. *Globe Campus*.

McMillan, J. H. (2008). *Educational research: Fundamentals for the consumer* (5th ed.) Boston, MA: Pearson Education, Inc.

Mead, G. E., Morley, W., Campbell, P., Greig, C. A., McMurdo, M., & Lawlor, D. A. (2008). Exercise for depression. *Cochrane Database of Systematic Review*, (4): CD004366. doi: 10.1002/14651858

Natriello, G. (1984). Problems in the evaluation of students and student disengagement from secondary schools. *Journal of Research and Development in Education*, 17, 14-24.

Newell, A. (1990). *Unified Theories of Cognition*. Cambridge, MA: Harvard University Press.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

- Nixon, W. (2007). Letting nature shape childhood, *The Amicus Journal*, 11.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.) Newbury Park, CA: Sage Publications, Inc.
- Payne, E. (2013, September 30). Fitness class before math adds up to better marks, Ottawa high schools discover. *Ottawa Citizen*. Retrieved from <http://www.ottawacitizen.com/health/Fitness+class+before+math+adds+better+marks+Ottawa+high+schools+discover/8974786/story.html>
- Pelligrini, D. W. (2007). School non-attendance: Definitions, meanings, responses, interventions. *Educational Psychology in Practice*, 23(1), 63-77.
- Pezzulo, G., Barsalou, L., Cangelosi, A., Fischer, M. H., McRae, K., & Spivey, M., (2012), Computational grounded cognition: A new alliance between grounded cognition and computational modeling, *Frontiers in Psychology*, 3:612. doi:10.3389/fpsyg.2012.00612
- Ploughman, M., Granter-Button, S., Chernenko, G., Tucker, B., Mearow, K., & Corbett, D. (2005). Endurance exercise regimes induce differential effects on BDNF Synapsin-1 and insulin-like growth factor after focal ischemia, *Neuroscience*, 136(4), 991-1001. PMID 16203102.
- Ratey, J. J. (2008). *Spark – The revolutionary new science of exercise and the brain*. New York, U.S.A.: Little Brown and Company.
- Reschley, A., & Christenson, S. L. (2006a). Prediction of dropout of students with mild disabilities: A case for the inclusion of student engagement variables. *Remedial and Special Education*, 27, 276-292.
- Reschley, A. & Christenson, S. L. (2006b). Promoting school completion. In G. Bear & K. Minke (Eds.), *Children's needs III: Understanding and addressing the developmental needs of children*. Bethesda, MD: National Association of School Psychologists.
- Schmidt-Kassow M, Deusser M, Thiel C, Otterbein S, Montag C, et al. (2013). Physical exercise

- during encoding improves vocabulary learning in young female adults: A neuroendocrinological study. *PLoS ONE* 8(5): e64172. doi:10.1371/journal.pone.0064172
- Selhub, E. & Logan, A.C. (2012). *Your brain on nature: The science of nature's influence on your health, happiness and vitality*. Mississauga, On: John Wiley & Sons, Canada.
- Sibley, B. A. & Beilock, S. L. (2007). Exercise and working memory: An individual differences investigation. *Journal of Sport and Exercise Psychology*, 29, 783-391.
- Sibley, B. A. & Etnier, J. L. (2003). The relationship between physical activity and cognition in children: A meta-analysis. *Pediatric Exercise Science*. 15, 243-256.
- Thompson, J. (2012). Embodied cognition: What it is and why it is important, *Psychology Today*. Retrieved from <http://www.psychologytoday.com/blog/beyond-words/201202/embodied-cognition-what-it-is-why-its-important>
- Trudeau, F. & Shepherd, R. (2008). Physical Education, physical activity, school sports and academic performance, *International Journal of Behavioural Nutrition and Physical Activity* 2008, 5:10 doi: 10.1186/479-5868 -5-10
- Van Praag, H., Christie, B. R., Sejnowski, T. J., Gage, F.H. (1999). Running enhances neurogenesis, learning, and long-term potentiation in mice. *Proceedings of the National Academy of Sciences of United States of America*. 96(23) 13427-13431. doi: 10.1073/pnas.96.23.13427 PNAS
- Vaynman, S., Ying, Z., & Gomez-Pinilla F. (2003). Interplay between brain derived neurotrophic factor and signal transduction modulators in the regulation of the effects of exercise on synaptic-plasticity. *Neuroscience* 122(3), 647-657. Retrieved from: <http://www.physci.ucla.edu/phycifacultyindiv.php?FacultyKey=8862>
- Welsh, M. C. & Pennington, B. F. (1988). Assessing frontal lobe functioning in

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

children: Views from developmental psychology. *Developmental Neuropsychology* 4, 199 - 230.

Willis, J., (2007). Review of research: Brain-based teaching strategies for improving students' memory, learning, and test-taking success. *Childhood Education*, 83:5:310-317.
doi: 10.180/000940056.2007.10522940

Willms, J.D. (2003). Student engagement at school: A sense of belonging and participation. Paris: *Organization for Economic Cooperation and Development*. Retrieved from <http://www.oecd.org/edu/school/programmeforinternationalstudentassessmentpisa/33689437.pdf>

Willms, J.D., Friesen, S., & Milton, P. (2009). What did you do in school today? Transforming classrooms through social, academic and intellectual engagement (First National report), Canadian Educational Association, Toronto, Ontario.

Willms, J.D., (2012). Report prepared for Belleisle School utilizing the Tell Them From Me Survey. Retrieved from <http://web1.nbed.nb.ca/sites/district6/BES/BES%20Survey%20Results/Belleisle%20Elementary%20School%20Student%20Engagement%202012.pdf>

Wilson, A.D. & Golonka, S. (2013). Embodied cognition is not what you think it is. *Frontiers In Psychology* 4(58). doi: 10.3389/fpsyg.2013.00058

Appendix A

Student Engagement Checklist

Very High High Medium Low Very Low

OBSERVATIONS

Positive Body Language

☐ ☐ ☐ ☐ ☐

Students exhibit body postures that indicate they are paying attention to the teacher and/or other students.

Consistent Focus

☐ ☐ ☐ ☐ ☐

All students are focused on the learning activity with minimum disruptions.

Verbal Participation

☐ ☐ ☐ ☐ ☐

Students express thoughtful ideas, reflective answers, and questions relevant or appropriate to learning.

Student Confidence

☐ ☐ ☐ ☐ ☐

Students exhibit confidence and can initiate and complete a task with limited coaching and can work in a group.

Fun and Excitement

☐ ☐ ☐ ☐ ☐

Students exhibit interest and enthusiasm and use positive humor.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Appendix B

Adapted Version of the Student Engagement Walkthrough Checklist

Date _____

Classroom Letter _____

Student #

OBSERVATIONS

Positive Body Language

Student exhibits body postures that indicate he/she is paying attention to the teacher and/or other students.

Consistent Focus

Student is focused on the learning activity with minimum disruptions.

Verbal Participation

Student expresses thoughtful ideas, reflective answers, and questions relevant or appropriate to learning.

Student Confidence

Student exhibits confidence, can initiate and complete a task with limited coaching, can work in a group.

Fun and Excitement

Student exhibits interest and enthusiasm and uses positive humor.

1	2	3	4	

Scale: 5 Very high

4 High

3 Medium

2 Low

1 Very Low

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Observation Notes:

Student 1

Student 2

Student 3

Student 4

Appendix C



Faculty of Education

230 Education Building
University of Manitoba
Winnipeg, Manitoba
Canada R3T 2N2
Telephone (204) 474-9014
Fax (204) 474-7550

Kathy Isaac
Principal Investigator
Phone: [REDACTED]
isaacc35@myumanitoba.ca

Dr. Catherine Casey
Thesis Advisor
Associate Professor
Phone: 204-474-9481
Catherine.casey@umanitoba.ca

Research Project Title: Relationships Between Morning Physical Activity and Classroom Engagement In An Elementary School Setting

Date: January 19, 2014

Dear (name of superintendant),

I am writing to seek your permission to contact the principal of a school in (name of school division) (name of school) to carry out a MED Thesis Research study in January and February of 2014. The study is titled “Relationships Between Morning Physical Activity and Classroom Engagement In an Elementary School Setting”.

The purpose of the study is to investigate the connections, if they exist, between a 15-minute morning physical activity and subsequent engagement in classroom activities for student participants. The study will take place over 4 weeks. For 2 weeks, students will not participate in the morning 15-minute program of morning activity. They will resume involvement in the activity for the following 2 weeks. Four students from each class will be randomly selected from those providing consent. Participating teachers and educational assistants will be asked to make short observations by surveys and notes at the same time of day for 4 weeks on engagement behaviours of these 4 students in classroom activities. They will also be asked to participate in 2 half hour interviews, one after Week 2 and one after Week 4, to discuss their observations.

All notes and responses in this study remain confidential. Only participating teachers and educational assistants in each classroom will have access to personal identifiers. Individual classrooms and students will be coded with arbitrary number and letter designations. It will be

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

impossible for the researcher to identify specific participants. Names of research participants will be confidential at all points during and after the study. Only the principal researcher will have access to completed surveys and responses. When data collection is complete, all information collected will be kept securely in a locked location in the thesis advisor's office at the University of Manitoba. It will be stored in paper form for up to five years (April, 2019) post-publication of results. Following the research study, you may request a copy of this thesis study and the final research findings.

The data collection methods include:

1. surveys on student engagement by teachers
2. teacher and educational assistant observations
3. teacher and educational assistant interviews

The benefit of participating in the study is an increased understanding of if and how physical activity affects student engagement in subsequent classroom activities. The risk is that a disruption in normal routine may be difficult for some students.

The University of Manitoba may look at research records to see that research is being done in a safe and proper way.

This research has been approved by the University of Manitoba Education Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 204-474-7122 or e-mail Margaret.Bowman@umanitoba.ca.

This study is being conducted under the guidance of Dr. Catherine Casey, Associate Professor in Curriculum Teaching and Learning, Faculty of Education, University of Manitoba.

In closing, please feel free to contact either of us for more information about this study. Your signature below giving permission for the study would allow me to contact the principal of the proposed study school and to initiate the study.

Sincerely,

Kathy Isaac
Principal Investigator
isaacc35@myumanitoba.ca

Superintendent's signature

Date

Researcher's signature

Date

Appendix D



Faculty of Education

230 Education Building
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Winnipeg, Manitoba
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Telephone (204) 474-9014
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Kathy Isaac
Principal Investigator
Phone: 204-[REDACTED]
isaacc35@myumanitoba.ca

Dr. Catherine Casey
Thesis Advisor
Associate Professor
Phone: 204-474-9481
Catherine.casey@umanitoba.ca

Research Project Title: Relationships Between Morning Physical Activity and Classroom Engagement In An Elementary School Setting

Date: January 19, 2014

Dear (name of principal),

I am writing to seek your permission as the principal of (name of school) to carry out a MED Thesis Research study in January and February of 2014. The study is titled “Relationships Between Morning Physical Activity and Classroom Engagement In an Elementary School Setting”.

The purpose of the study is to investigate the connections, if they exist, between a 15-minute morning physical activity and subsequent engagement in classroom activities for student participants. The study will take place over 4 weeks. For 2 weeks, students will not participate in the morning 15-minute program of morning activity. They will resume involvement in the activity for the following 2 weeks. Four students from each class will be randomly selected from those providing consent. Participating teachers and educational assistants will be asked to make short observations by surveys and notes at the same time of day for 4 weeks on engagement behaviours of these 4 students in classroom activities. They will also be asked to participate in 2 half hour interviews, one after Week 2 and one after Week 4, to discuss their observations.

All notes and responses in this study remain confidential. Only participating teachers and

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

educational assistants in each classroom will have access to personal identifiers. Individual classrooms and students will be coded with arbitrary number and letter designations. It will be impossible for the researcher to identify specific participants. Names of research participants will be confidential at all points during and after the study. Only the principal researcher will have access to completed surveys and responses. When data collection is complete, all information collected will be kept securely in a locked location in the thesis advisor's office at the University of Manitoba. It will be stored in paper form for up to five years (April, 2019) post-publication of results. Following the research study, you may request a copy of this thesis study and the final research findings.

The data collection methods include :

1. surveys on student engagement by teachers
2. teacher and educational assistant observations
3. teacher and educational assistant interviews

The benefit of participating in the study is an increased understanding of if and how physical activity affects student engagement in subsequent classroom activities. The risk is that a disruption in normal routine may be difficult for some students.

The University of Manitoba may look at research records to see that research is being done in a safe and proper way.

This research has been approved by the University of Manitoba Education Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 204-474-7122 or e-mail Margaret.Bowman@umanitoba.ca.

This study is being conducted under the guidance of Dr. Catherine Casey, Associate Professor in Curriculum Teaching and Learning, Faculty of Education, University of Manitoba.

In closing, please feel free to contact either of us for more information about this study. Your signature below giving permission for the study would allow me to contact the principal of the proposed study school and to initiate the study.

Sincerely,

Kathy Isaac
Principal Investigator
isaacc35@myumanitoba.ca

Principal's signature

Date

Researcher's signature

Date

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Appendix E

Sample Completed Student Engagement Checklist

Date Mon., Jan. 6

Classroom Letter _D_

Student #

OBSERVATIONS

Positive Body Language

Student exhibits body postures that indicate he/she is paying attention to the teacher and/or other students.

Consistent Focus

Student is focused on the learning activity with minimum disruptions.

Verbal Participation

Student expresses thoughtful ideas, reflective answers, and questions relevant or appropriate to learning.

Student Confidence

Student exhibits confidence, can initiate and complete a task with limited coaching, can work in a group.

Fun and Excitement

Student exhibits interest and enthusiasm, uses positive humor.

	1	2	3	4	
	3	4	3	2	
	3	3	2	2	
	4	4	2	1	
	3	4	3	2	
	3	4	2	2	

Scale: 5 Very high
 4 High
 3 Medium
 2 Low
 1 Very Low

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Observation Notes:

Student 1

Calm, focused, asks questions, quiet

Student 2

Very involved, interested, asks relevant questions, volunteers answers, talking to others but on topic, shows interest in extending learning on this topic

Student 3

Appears interested but distracted by other students' behaviours
Asks relevant questions, may be more attentive than he appears

Student 4

Restless, appears bored, constant movement, talking to neighbor, difficulty focusing, blurting out comments, not on topic, difficulty staying on task

Appendix F



Faculty of Education

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Kathy Isaac
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Phone: [REDACTED]
isaacc35@myumanitoba.ca

Dr. Catherine Casey
Thesis Advisor
Associate Professor
Phone: 204-474-9481
Catherine.casey@umanitoba.ca

Research Project Title: Relationships Between Morning Physical Activity and Classroom Engagement In An Elementary School Setting

Date: January 19, 2014

Dear Teacher,

I am a graduate student in the Faculty of Education at the University of Manitoba. I am conducting a Master of Education Thesis Research study. This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The purpose of the study is to investigate the connections, if they exist, between a 15-minute morning physical activity and subsequent engagement in classroom activities for student participants. The study will take place over 4 weeks. For 2 weeks, students will not participate in the morning 15 minute program of morning activity. They will resume involvement in the activity for the following 2 weeks. You will be asked to complete a consent form for your participation and also to help with distribution and collection of student and parent consent forms. You will be asked to randomly select 4 students in your class from those providing consent to participate. You will also be asked to complete a short daily survey and add notes for all 4 weeks on your observations of the engagement behaviours of these 4 students. You will also be interviewed twice for approximately 30 minutes each time to record your impressions and examples of student responses. You will be provided with a copy of your transcribed remarks to allow you an opportunity to verify your responses.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Your responses in this study remain confidential. Only you and any participating educational assistant in your classroom will have access to personal identifiers. Individual classrooms and students will be coded with arbitrary number and letter designations. It will be impossible for the researcher to identify specific participants. Only the principal researcher will have access to completed surveys and responses. When data collection is complete, all information collected will be kept securely in a locked location in the thesis advisor's office at the University of Manitoba. It will be stored in paper form for up to five years (April, 2019) post-publication of results. Following the research study, you may request a copy of this thesis study and the final research findings.

The benefit of participating in the study is an increased understanding of if and how physical activity affects student engagement in subsequent classroom activities. The risk is that a disruption in normal routine may be difficult for some students.

The University of Manitoba may look at your research records to see that research is being done in a safe and proper way.

You can either give consent or decline participation. Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. If you have any questions or concerns, feel free to contact Kathy Isaac through email at isaacc35@myumanitoba.ca or Dr. Catherine Casey (advisor) Catherine.casey@umanitoba.ca. You can also phone [REDACTED] or request a face-to-face meeting.

This research has been approved by the University of Manitoba Education Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 204-474-7122 or email at Margaret.Bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

I understand that I may choose not to participate in this study. I may withdraw from the research at any time by e-mail, phone or face-to face meeting. I will not be informed of the results until after the research study is finished. I will not be identifiable in any documents resulting from the research. The results of this research will be used only for professional and scholarly presentations and educational manuscripts. I agree that all information about individual students will be kept confidential.

Participant's signature

Date

Researcher's signature

Date

Appendix G



Faculty of Education

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Kathy Isaac
Principal Investigator
Phone: 204-
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Dr. Catherine Casey
Thesis Advisor
Associate Professor
Phone: 204-474-9481
Catherine.casey@umanitoba.ca

Research Project Title: Relationships Between Morning Physical Activity and Classroom Engagement In An Elementary School Setting

Date: January 19, 2014

Dear Educational Assistant,

I am a graduate student in the Faculty of Education at the University of Manitoba. I am conducting a Master of Education Thesis Research study. This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The purpose of the study is to investigate the connections, if they exist, between a 15-minute morning physical activity and subsequent engagement in classroom activities for student participants. The study will take place over 4 weeks. For 2 weeks, students will not participate in the morning 15-minute program of morning activity. They will resume involvement in the activity for the following 2 weeks. You will be asked to complete a consent form for your participation. You will also be asked to complete take short notes for all 4 weeks on your observations of the engagement behaviours at a particular time of day of 4 students identified to you by the classroom teacher. You will also be interviewed twice for approximately 30 minutes each time to record your impressions and examples of student responses. You will be provided with a copy of your transcribed remarks to allow you an opportunity to verify your responses.

Your responses in this study remain confidential. Only you and any participating teacher in the classroom will have access to personal identifiers. Individual classrooms and students will be coded with arbitrary number and letter designations. It will be impossible for the researcher to identify specific participants. Only the principal researcher will have access to completed surveys and responses. When data collection

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

is complete, all information collected will be kept securely in a locked location in the thesis advisor's office at the University of Manitoba. It will be stored in paper form for up to five years (April, 2019) post-publication of results. Following the research study, you may request a copy of this thesis study and the final research findings.

The benefit of participating in the study is an increased understanding of if and how physical activity affects student engagement in subsequent classroom activities. The risk is that a disruption in normal routine may be difficult for some students.

The University of Manitoba may look at your research records to see that research is being done in a safe and proper way.

You can either give consent or decline participation. Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. If you have any questions or concerns, feel free to contact Kathy Isaac through email at isaacc35@myumanitoba.ca or Dr. Catherine Casey (advisor). You can also phone 204-██████████ or request a face-to-face meeting.

This research has been approved by the University of Manitoba Education Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 204-474-7122 or email at Margaret_Bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

I understand that I may choose not to participate in this study. I may withdraw from the research at any time by e-mail, phone or face-to face meeting. I will not be informed of the results until after the research study is finished. I will not be identifiable in any documents resulting from the research. The results of this research will be used only for professional and scholarly presentations and educational manuscripts. I agree that all information about individual students will be kept confidential.

Participant's signature

Date

Researcher's signature

Date

If you would like a summary of the study results, please provide your address in the space below. The summary will be available by April 2014. You may receive results by letter or e-mail:

Appendix H



UNIVERSITY
OF MANITOBA

Faculty of Education

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Telephone (204) 474-
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Kathy Isaac
Principal Investigator
Phone: 204-
isaacc35@myumanitoba.ca

Dr. Catherine Casey
Thesis Advisor
Associate Professor
Phone: 204-474-9481
Catherine.casey@umanitoba.ca

Research Project Title: Relationships Between Morning Physical Activity and Classroom Engagement In An Elementary School Setting

Date: January 19, 2014

Dear Parent/Guardian,

I am a graduate student in the Faculty of Education at the University of Manitoba. I am conducting a Master of Education Thesis Research study. This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your child's participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The purpose of the study is to investigate the connections, if they exist, between a 15-minute morning physical activity and subsequent engagement in classroom activities for student participants. The study will take place over 4 weeks. For 2 weeks, students will not participate in the morning 15-minute program of morning activity. They will resume involvement in the activity for the following 2 weeks. You will be asked to complete a consent form for your child's participation. 4 students from each class will be randomly selected from those providing consent. Participating teachers and educational assistants will be asked to make short observations by

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

surveys and notes at the same time of day for 4 weeks on engagement behaviours of these 4 students in classroom activities.

All notes and responses in this study remain confidential. Only participating teachers and educational assistants in each classroom will have access to personal identifiers. Individual classrooms and students will be coded with arbitrary number and letter designations. It will be impossible for the researcher to identify specific participants. Only the principal researcher will have access to completed surveys and responses. When data collection is complete, all information collected will be kept securely in a locked location in the thesis advisor's office at the University of Manitoba. It will be stored in paper form for up to five years (April, 2019) post-publication of results. Following the research study, you may request a copy of this thesis study and the final research findings.

The benefit of participating in the study is an increased understanding of if and how physical activity affects student engagement in subsequent classroom activities. The risk is that a disruption in normal routine may be difficult for some students.

The University of Manitoba may look at research records to see that research is being done in a safe and proper way.

You can either give consent or decline participation for your child. Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to have your child participate. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to have your child withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your child's continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. If you have any questions or concerns, feel free to contact Kathy Isaac through email at isaacc35@myumanitoba.ca or Dr. Catherine Casey (advisor) Catherine.casey@umanitoba.ca. You can also phone 204-██████████ or request a face-to-face meeting.

This research has been approved by the University of Manitoba Education Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 204-474-7122 or email at Margaret_Bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

I understand that I may choose not to have my child participate in this study. I may have them withdraw from the research at any time by e-mail, phone or face-to face meeting. I will not be informed of the results until after the research study is finished. My child will not be identifiable in any documents resulting from the research. The results of this research will be used only for professional and scholarly presentations and educational manuscripts.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Participant's signature

Date

Researcher's signature

Date

If you would like a summary of the study results, please provide your address in the space below.
The summary will be available by April 2014. You may receive results by letter or e-mail:

Appendix I



Faculty of Education

230 Education Building
University of Manitoba
Winnipeg, Manitoba
Canada R3T 2N2
Telephone (204) 474-9014
Fax (204) 474-7550

Kathy Isaac
Principal Investigator
Phone: 204-[REDACTED]
isaacc35@myumanitoba.ca

Dr. Catherine Casey
Thesis Advisor
Associate Professor
Phone: 204-474-9481
Catherine.casey@umanitoba.ca

Research Project Title: Relationships Between Morning Physical Activity and Classroom Engagement In An Elementary School Setting

Date: January 19, 2014

Dear Student,

I am a graduate student in the Faculty of Education at the University of Manitoba. I am conducting a Master of Education Thesis Research study. This consent form, a copy of which will be left with you, is part of the process of informed consent. It should give you the basic idea of what the research is about and what taking part will involve. If you would like more detail about something mentioned here you should feel free to ask. Please take the time to read this carefully and to understand the information.

The purpose of the study is to understand the connections between a 15-minute morning physical activity and how engaged students are in classroom activities afterwards. The study will take place over 4 weeks. For 2 weeks, you will not participate in the morning 15-minute program of morning activity at the beginning of the school day. Then, after two weeks, you will start it again. You will be asked to complete a consent form giving permission for the teacher and educational assistant in your classroom to make notes about student behaviour in classroom activities after the activity. Only four students will be picked by chance to be observed, but you won't know if you were one of the ones chosen.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

All notes and in this study remain private. Only the teachers and educational assistants in each classroom will know which students are being observed. The researcher won't know the students' names. All of the information will be safely locked away. The researcher will look at all of the observations and notes and write a report about what effect the morning activity is having on students' classroom behaviour, if any. Following the research study, you or your parents may request a copy of this study.

The University of Manitoba is allowed to have people check research records to see that research is being done in a safe and proper way.

The benefit of participating in the study is a better understanding of if and how physical activity affects how students behave in classroom activities. The risk is that it may be difficult to change routine for 10 days and not have morning physical activity.

You can either say yes or no to taking part. Putting your name on this form indicates that you have understood the information about taking part in the research project and agree to take part. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to say no to the study at any time. You should feel free to ask questions at any time. You can ask to speak to your teacher, principal or Mrs. Isaac.

This research has been approved by the University of Manitoba Education Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may also contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 204-474-7122 or email at Margaret.Bowman@umanitoba.ca.

I understand that I may choose not to take part in this study. I may withdraw from the research at any time. No one can tell who I am from reading about this study. The results of this research will be used only for educational uses.

Student's signature

Date

Researcher's signature

Date

Appendix J

Letter of Approval for use of Student Engagement Walkthrough Checklist

Kathy,

Thanks for contacting ICLE with your permissions request regarding the Student Engagement Walkthrough Checklist. We are happy to grant you permission to use this in your thesis. We do ask that you please ensure that we are given proper attribution in both your citations and also under the checklist in the following form: © International Center for Leadership in Education

We do not have data to support reliability/validity as it is a tool that is calibrated with a cohort at a school along with their instructional coach. The WE Surveys, administered by the Successful Practices Network (web: <http://www.successfulpractices.org/spn/page/Surveys> email: info@spnet.us) do have data to support reliability/validity.

Please let me know if you require a formal letter or if you have any further questions.

Thanks,
Kris

Kris Ross | Managing Editor
International Center for Leadership in Education
1587 Route 146 | Rexford, NY 12148
Ph. 518-723-2069 | www.leadered.com

Leadership Academy - Fall 2013
November 8 - 10 | New Orleans
www.leadered.com/leadershipacademy

Appendix K

**Pre-Study Information Session for Teachers, Educational Assistants
and School Administration**

The School Administrator (**School Principal**) and researcher will establish a convenient time for meeting with teachers and educational assistants. At this time, the researcher will explain the study using the following script:

Thank you to everyone for allowing me to speak to you about this proposed study. My name is Kathy Isaac. I am a graduate student at the University of Manitoba and I am conducting a Masters of Education thesis study. You and your students have been participating in a unique 15-minute physical activity program at the beginning of every school day followed by a Literacy block. The activity was started as an opportunity for students to take advantage of the neurological changes in the brain suggested by new research in neuroscience. This study is an opportunity to critically examine student actual response to the physical activity by observation of student behaviours during the subsequent Literacy Block on 2 weeks without the morning activity compared to behaviours in 2 weeks in which the activity is restarted. We will be looking at student engagement behaviours as these have been strongly correlated in research with academic achievement.

If you agree to take part in this study, teachers will be asked to send home and collect Parent/Guardian consent forms. Once all forms are collected, teachers will be instructed to randomly select 4 students in their class by counting every 5th consenting student from the bottom of an alphabetized list. They would assign each of these students a number from 1 to 4. This will anonymize the students so that the researcher will not be able to identify any particular student. The teacher will be given 20 copies of the Student Engagement Checklist with spaces for 4 students. (Samples supplied for each teacher as in Question 3: Instruments) At approximately the same time every day (between 9:50 and 10:00), the teacher will be asked to rate the behaviours of these 4 students on a 1-5 scale of engagement in the current classroom activity. There is a space on the back on each sheet for any observational notes the teacher may wish to add to provide more detail.

Educational assistants in the classroom who agree to participate in the study will be given a recording page to provide short observations of the same 4 students at the same time as the teacher. If either the teacher or the educational assistant decline to participate, the data from the other participant will still be utilized.

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

The Student Engagement Checklist is designed to be a quick snapshot of current behaviours including body language, focus, verbal participation, confidence and excitement. Observation notes could be comments such as provided in the sample: ie. quiet, focused, agitated, interested, asks relevant questions, volunteers answers, talking to others but on topic, shows interest in extending learning on this topic, appears distracted, restless, constant movement, blurting out comments, etc. Teachers, classrooms and educational assistants will only be known by a randomly selected letter or number so that you will be unidentifiable also. The daily notes will be kept in a closed envelope and completed forms will be kept in a locked drawer in the office.

I would also be asking participating teachers and educational assistants to take part in two interviews, which would take about 30 minutes each. The first would be after the first 10 days of stopped activity and the second after 10 days of resumed physical activity. The interviews would be to elicit detail about any observations you have made over the 2-week period which may indicate a pattern of behaviours or which may not have been written in the observation notes. The interviews would be taped and selectively transcribed. You would be given an opportunity to read the transcriptions to make sure that your meaning has been faithfully represented.

All information, data and observations will be kept strictly confidential. Study results should be available by April. Anyone wishing to see a copy is welcome to request one by filling in your name and e-mail on the consent form. Data will be kept in a locked file at the Faculty of Education, University of Manitoba for up to 5 years and then destroyed. Results will only be disseminated for educational and academic purposes.

Are there any questions?

Everyone will be given two copies of the consent letters, one to keep and one to sign and return. You will not have to sign today. Please take the time to consider your participation. If you are comfortable with the proposal, please sign the form and leave it in an envelope in the school office in the following three days. The envelope will be stored in a letterbox in the workroom attached to the office. If there are further questions, you may contact me through phone calls at 204-██████ or e-mail at isaacc35@myumanitoba.ca.

Appendix L

Pre-Study Script for Study Explanation for Kindergarten to Grade 3 students

Kindergarten and Grade 1, 2 and 3 students and some students with special needs would need to have the study verbally explained. The following is a script for the researcher to use to speak to these students:

Hello, everyone. I am happy to have this chance to speak to you. My name is Mrs. Isaac. I know that you have been starting every school day with walking in the halls and running in the gym. I have been wondering if having a chance to be active before classroom work makes a difference in how children take interest in their learning. I would like to try an experiment. What would happen if, for 10 mornings, you started your classes without the walking and running? The adults in your room could check to see how interested you seemed to be in your classes. Then, we would start doing the activity again and, for 10 days, the adults would check again and see if you seemed to be more or less interested in class after you had been running and walking. I would compare the results and see if we could see a difference. I could let you know what we found out. To do this, I would need you to decide if you would agree to be one of the students whose behaviour is being watched. You don't have to if you don't want to. Your parents are getting a paper to sign to say that it is all right with them. If they agree but you don't want to, you don't have to. If it is all right with you, you can sign your name on the consent sheet after I leave. Does anyone have any questions?

Thank you for letting me have this talk with you.

Appendix M

Teacher/Educational Assistant Interview 1 Questions

After 2-week intervention:

1. How long would you say it takes for the students to transition from announcement time to the new academic activity?
2. Can you give some examples of behaviours you see which indicate engagement in the activity?
3. Can you give some examples of behaviours you see which indicate lack of student engagement in the activity?
4. How would you characterize the learning styles of the four selected students in the class in this study? (keen, generally motivated, somewhat engaged, easily distracted, rarely motivated to learn, etc.)

Student A

Student B

Student C

Student D

5. Have you heard any comments from your students that indicate that they are more or less motivated to learn with or without morning activity?
6. How would you describe the classroom climate in general?
7. How would you describe the classroom climate at the assessment time period?
8. Do you have any additional information you can share which will help me better understand the classroom or the selected students' behaviours?

Appendix N

Teacher/Educational Assistant Interview 2 Questions

After resumption of activity:

1. How long would you say it takes for the students to transition from physical activity time to the classroom activity?
2. Can you give some examples of behaviours you see which indicate engagement in the activity?
3. Can you give some examples of behaviours you see which indicate lack of student engagement in the activity?
4. How would you now characterize the learning styles of the four selected students in the class in this study? (ie. keen, generally motivated, somewhat engaged, easily distracted, rarely motivated to learn, etc.)

Student A

Student B

Student C

Student D

5. Have you heard any comments from your students that indicate that they are more or less motivated to learn after the morning activity?
6. How would you describe the classroom climate in general?
7. How would you describe the classroom climate at the assessment time period?
8. Do you have any additional information you can share which will help me better understand the classroom or the selected student behaviour?

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Appendix O:
Table O.1 Adapted Student Engagement Checklist Scores

Classroom	A1	A2	A3	A4	B1	B2	B3	B4	D1	D2	D3	D4	E1	E2	E3	E4	F1	F2	F3	F4	G1	G2	G3	G4	H1	H2	H3	H4	
Feb.10 Q1	N	N	N	N	4	4	3	2	4	3	3	2	4	3	3	5	5	5	3	2	5	4	5	4	4	5	4	4	
Q2	N	N	N	N	4	4	3	2	4	3	3	2	3	4	4	4	5	3	2	4	4	4	4	4	4	5	3	4	
Q3	N	N	N	N	1	2	2	2	4	3	3	3	3	3	5	5	5	5	2	3	5	4	5	5	4	4	3	4	
Q4	N	N	N	N	1	3	3	2	4	3	3	3	3	4	5	5	4	5	3	2	5	4	4	4	4	4	3	4	
Q5	N	N	N	N	2	2	2	2	4	3	3	3	4	4	4	4	5	5	3	3	5	4	4	4	4	4	3	4	
					12	15	13	10	20	15	15	13	15	19	21	21	23	25	15	13	24	20	22	21	20	22	16	20	
Feb.11 Q1	2	4	4	3	4	5	4	3	3	2	2	2	3	5	N	5	5	5	4	4	4	4	4	4	5	3	4	5	
Q2	2	4	3	3	5	5	3	2	3	2	2	2	2	5	N	5	5	5	5	2	4	4	4	4	4	5	3	4	5
Q3	1	3	3	1	1	5	3	3	3	2	2	2	2	4	N	5	5	5	4	3	4	4	4	4	4	4	3	4	
Q4	2	4	4	3	4	5	4	4	3	3	3	2	2	5	N	5	5	5	5	2	4	4	4	4	4	5	3	5	
Q5	2	2	2	2	5	5	4	4	3	3	3	3	4	N	4	N	N	N	N	4	4	4	4	4	4	3	4	4	
	9	17	16	13	19	25	18	16	15	12	12	11	13	23		24	20	20	18	11	20	20	20	23	17	18	23		
Feb.12 Q1	2	3	4	3	N	N	N	N	3	2	2	2	4	5	N	5	5	5	4	3	N	4	4	4	4	4	4	4	
Q2	2	3	3	4	N	N	N	N	3	2	2	2	3	5	N	5	5	5	4	3	N	4	4	4	4	4	4	4	
Q3	3	4	3	4	N	N	N	N	3	2	2	2	3	5	N	5	5	5	4	3	N	4	4	4	4	4	4	4	
Q4	3	4	4	4	N	N	N	N	3	3	3	3	4	5	N	5	5	5	4	2	N	4	4	4	4	4	4	4	
Q5	3	3	4	3	N	N	N	N	3	3	3	3	4	N	5	5	5	5	3	3	N	4	4	3	4	4	4	4	
	13	17	18	18					15	12	12	12	18	24		25	25	25	19	14		20	20	19	20	20	20	20	
Feb.13 Q1	2	3	4	4	4	5	3	3	2	2	2	1	2	4	N	5	5	5	4	4	N	4	4	4	4	5	3	N	
Q2	2	3	3	3	2	4	3	2	2	2	1	1	3	4	N	5	5	5	5	3	N	4	4	3	4	4	3	N	
Q3	3	3	4	3	1	3	3	2	2	2	2	2	3	3	N	5	5	5	4	3	N	4	4	4	4	4	3	N	
Q4	3	4	4	3	1	5	3	3	2	2	2	2	3	3	N	5	5	5	5	2	N	4	4	4	4	5	4	N	
Q5	3	3	3	2	3	3	2	2	3	2	2	2	3	3	N	4	5	5	5	4	N	4	3	4	3	4	3	N	
	13	16	18	15	11	20	15	13	10	10	10	8	14	17		24	25	25	22	16		20	20	18	20	22	17		
Feb.18 Q1	3	3	3	3	4	4	4	3	4	3	3	3	2	N	5	4	5	5	5	4	3	5	5	5	3	3	4	4	
Q2	3	4	2	3	5	4	4	2	3	2	2	1	N	5	4	5	4	5	4	3	5	5	5	3	3	4	3	4	
Q3	3	4	3	3	1	3	3	1	3	2	2	2	N	5	4	5	5	5	4	2	5	5	5	5	4	4	4	4	
Q4	3	4	4	2	3	3	3	2	3	2	2	1	N	5	4	5	4	5	4	2	5	5	5	5	4	4	4	4	
Q5	4	2	4	3	2	4	4	2	3	3	2	2	N	4	4	4	5	5	3	3	5	5	5	4	3	4	3	4	
	16	17	16	14	15	18	18	10	16	12	11	8	0	24	20	24	23	25	19	13	25	25	25	20	17	20	18	20	
Feb.19 Q1	1	3	4	4	5	5	4	4	3	2	2	2	4	5	5	5	5	5	4	4	5	N	5	5	3	5	4	5	
Q2	1	4	4	4	4	4	4	3	3	2	2	1	3	4	5	5	5	5	4	3	5	N	5	4	3	5	4	5	
Q3	3	3	4	3	3	3	3	3	3	2	2	1	3	4	5	5	5	5	4	4	5	N	5	5	4	4	4	5	
Q4	3	4	4	4	4	4	3	2	3	2	2	2	4	4	5	5	5	5	4	4	5	N	5	4	4	4	4	4	
Q5	3	4	4	4	2	3	2	2	3	2	2	2	5	4	4	4	5	5	4	4	4	N	5	5	4	4	3	4	
	11	18	20	20	18	19	15	14	15	10	10	8	8	19	21	24	24	25	25	20	18	24		25	23	18	22	19	23
Feb.20 Q1	3	3	3	3	3	4	2	3	3	3	3	2	5	5	5	5	5	5	5	2	N	N	N	N	4	5	4	5	
Q2	3	4	4	4	4	3	3	2	3	2	2	2	3	2	5	5	5	5	5	2	N	N	N	N	4	5	3	5	
Q3	4	2	4	2	2	4	3	2	3	2	2	1	2	2	5	5	5	5	5	2	N	N	N	N	4	4	3	4	
Q4	3	3	4	3	4	4	3	2	3	2	2	1	3	2	5	5	5	5	5	2	N	N	N	N	4	4	3	4	
Q5	4	2	3	3	3	4	3	2	3	2	2	2	3	3	4	4	5	5	5	2	N	N	N	N	4	4	3	3	
	17	14	18	15	16	19	14	10	15	11	11	8	16	11	24	24	24	25	25	10					20	22	16	21	
Feb.21 Q1	N	N	N	N	3	3	3	3	N	N	N	N	3	4	5	5	4	5	3	4	5	N	5	5	4	5	4	5	
Q2	N	N	N	N	3	3	3	3	N	N	N	N	3	3	5	5	5	5	5	2	5	N	5	4	4	5	4	5	
Q3	N	N	N	N	3	3	3	3	N	N	N	N	3	2	5	5	5	5	4	5	N	5	4	4	4	4	4	5	
Q4	N	N	N	N	4	4	3	2	N	N	N	N	3	3	5	5	5	5	5	3	5	N	5	4	4	5	4	4	
Q5	N	N	N	N	3	3	3	2	N	N	N	N	4	4	5	5	5	5	3	4	5	N	5	4	4	4	4	4	
					17	16	15	13					15	16	25	25	23	25	20	17	25		25	21	20	23	20	23	
Non-Activity Total	79	99	106	94	108	132	108	86	106	82	81	68	110	155	114	191	188	195	158	112	118	105	157	142	158	168	144	150	
Feb.24 Q1	5	5	4	4	4	4	2	3	N	N	N	N	3	5	5	5	4	5	4	3	5	N	5	4	4	5	4	5	
Q2	4	5	3	3	3	5	3	3	N	N	N	N	3	5	5	5	3	5	3	2	5	N	5	4	4	5	4	5	
Q3	3	4	4	3	N	N	N	N	N	N	N	N	4	4	5	5	4	5	4	2	5	N	5	4	4	5	4	4	
Q4	4	5	4	3	2	4	3	2	N	N	N	N	4	5	5	5	4	4	4	3	5	N	5	4	4	5	4	4	
Q5	4	5	4	3	4	4	3	3	N	N	N	N	4	5	5	5	4	5	3	3	5	N	5	4	3	4	4	3	
	20	24	19	16	13	17	11	12	0	0	0	0	18	24	25	25	19	24	18	13	25	0	25	20	19	24	20	21	
Feb.25 Q1	4	4	4	3	4	4	3	3	4	N	3	N	3	5	5	5	5	5	5	4	3	N	N	5	5	4	5	4	5
Q2	3	4	4	3	4	4	2	2	4	N	3	N	3	5	5	5	5	4	5	3	N	N	5	5	5	5	4	5	
Q3	4	2	4	3	2	4	2	2	4	N	2	N	4	4	5	5	5	5	4	4	3	N	N	5	5	4	4	5	
Q4	4	3	4	3	2	5	3	3	4	N	3	N	4	5	5	5	5	4	4	2	N	N	5	5	4	4	4	4	
Q5	4	3	4	3	3	3	3	3	4	N	3	N	4	5	5	5	5	4	4	3	N	N	5	5	4	4	3	4	
	19	16	20	15	15	20	13	13	20	0	14	0	18	24	25	25	25	21	21	14	0	0	25	25	21	22	19	23	
Feb.26 Q1	4	3	4	4	4	N	3	4	5	5	3	2	2	2	5	5	5	5	5	4	N	N	N	N	5	5	4	5	
Q2	3	3	3	4	4	N	3	3	5	4	3	2	2	1	4	5	5	5	5	4	N	N	N	N	5	5	4	5	
Q3	3	3	4	3	4	3	4	5	4	3	2	2	1	4	5	5	5	5	5	4	N	N	N	N	4	5	4	4	
Q4	4	3	4	4	4	n	3	4	5	5	3	2	2	1	5	5	5	5	5	4	N	N	N	N	4	5	4	4	
Q5	5	3	4	4	4	N	3	4	5	5	4	3	2	2	4	4	5	5	5	4	N	N	N	N	4	4	4	4	
	19	15	19	20	19	0	15	19	25	23	16	11																	

Table 0.2:
Individual Student Means Differences from No Physical Activity to Physical Activity
Conditions

Student Pseudonym	Means Difference
A1	6.1
A2	2.0
A3	2.6
A4	3.1
B1	4.3
B2	2.0
B3	2.4
B4	6.0
D1	8.0
D2	8.3
D3	5.4
D4	4.6
E1	-3.5
E2	-6.8
E3	0.5
E4	-0.2
F1	0.2
F2	-0.5
F3	1.5
F4	2.7
G1	1.0
G2	4.0
G3	2.6
G4	3.1
H1	2.3
H2	2.7

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

H3	1.6
H4	1.0

MORNING PHYSICAL ACTIVITY AND STUDENT ENGAGEMENT

Hypothesis test:

Mean of difference:	2.38
Sample size:	n=28
Degrees of freedom:	df=27
Sample Standard Deviation:	3.12
p-value :	< 0.05
one-tailed probability	p=0.000192