

in motion:
*Evaluation of a Physical
Activity Health Promotion
Strategy for High Schools*

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ABSTRACT

Recently, the Saskatoon *in motion* physical activity health promotion initiative has worked with educators and high school administrators in the city of Saskatoon to develop a targeted physical activity strategy for high school students. The *in motion* high school strategy was implemented in each school by an *in motion* high school champion. In each school *in motion* could incorporate such things as announcements, bulletin boards, posters, physical activity clubs and physical activity challenges. The strategy was piloted in a Saskatoon high school previously and had positive impact on student's activity levels. **Purpose:** To investigate the effectiveness of the *in motion* strategy at impacting the physical activity behaviour of a large sample of Saskatoon high school students, and to uncover how *in motion* could be better supported in the school environment. **Method:** *in motion* was implemented in eight Saskatoon high schools from October to June of the 2005/06 school year. Study participants were male and female students, from grades 9-12, attending the eight schools. The Godin Leisure Time Exercise Questionnaire was administered in October 2005 (n = 4395), and May 2006 (n = 3299) to assess self reported physical activity, and analysed using independent t-tests and ANOVA with Tukey post hoc tests.

In June of 2006, questionnaires were administered to the *in motion* champions (n = 8). Questionnaires inquired into the specific activities and events that comprised the *in motion* intervention in each school and champion experiences with *in motion*.

Information obtained led to the classification of dose of intervention implemented at each school. Schools were separated into high, moderate, and low dose categories, and a dose-response relationship between dose of intervention and change in physical activity level was investigated. Qualitative data was analysed using typological analysis, and represented as summary of responses. **Results:** An overall increase in self-reported physical activity was found after the implementation of the *in motion* physical activity intervention ($t(3920.355) = -21.15, p < 0.0001$). Increases were observed in all genders, grades, and schools. Two schools were deemed high dose, four moderate dose, and two low dose. No dose-response relationship was found between dose of *in motion* and change in physical activity or students' opinion of how *in motion* impacted personal activity levels. Dose-response relationship was found between dose of

intervention and recognition of *in motion*. Additionally, through champion questionnaires, multiple supports and barriers for the *in motion* intervention, and suggestions for how *in motion* could be improved, was given by *in motion* champions.

Conclusions: Student opinion of *in motions* impact on their personal activity level indicates that *in motion* is a promising tool for increasing physical activity in students. Lack of dose-response relationship between intervention and physical activity change, and student opinion of how *in motion* has affected activity level suggests that the definition of dose is too narrow. To further support *in motion* in schools, more staff involvement and appropriate activities for different demographic groups are needed.

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1. INTRODUCTION

1.1 General Background

In the past few decades research has shown that physical activity is an important aspect of growth and development for youth, conveying multiple health benefits (1) and protecting against disease. Unfortunately, a large proportion of youth in our communities are not meeting Canadian recommendations for daily physical activity. For instance, 48% of youth are not active enough to receive health benefits (2) and it is estimated that as little as 18% of Canadian teenagers (ages 12-18) are active enough to reach optimal growth and development (3). Adolescence is a critical time for developing activity patterns that carry through into adulthood (2). A trend of inactivity established in youth has been shown to be a strong predictor of adult inactivity, surpassing the influence of social status (4) and family background (5). Adult inactivity is known to have a strong impact on many serious health conditions (6), including heart disease and some cancers (7). It is estimated to be a contributing cause to 21,340 deaths per year (8).

Youth inactivity has been linked to a wide range of negative health consequences, the most notable being obesity. Between the ages of 11 and 21 adolescents reach the final 15-20% of height; gain 50% of their adult body weight, and gain 40% of their adult skeletal mass (7). If sedentary patterns are adopted during this critical time, this growth may not stay within healthy limits (7). Currently in Canada, 29% of youth aged 12 to 19 are overweight, and 9% are obese (9, 10). This represents a doubling of youth who are overweight, and a tripling of those who are obese, in the past 30 years. Obesity has been linked to numerous chronic health conditions and is a major cause of disability and death nationwide.

Perhaps a more important reason to be active is to receive the proven benefits of being physically active during youth. Muscular strength gained through physical

activity can help prevent the occurrence of childhood back and overuse injuries and helps youth meet their full growth potential (1). Physical activity has a positive effect on bone growth in adolescence, helping to prevent osteoporosis in adulthood (1, 11). Physical activity improves cholesterol ratio, reducing the likelihood of future development of chronic conditions; and increases oxidative capacity, reducing the chance of heart failure (1).

There has been short-term evidence of improvements in energy levels (12), concentration, mental performance, mood, and overall emotional well-being (13) for youth who are physically active. Moreover, a reduction in tension, anxiety, and depression are also associated (12). In an American study of adolescents in grades nine and ten, it was found that students who participated in physical education (PE) at school three to five times per week were significantly less likely to feel sad as compared to those who participated in PE zero to two days per week (14). As well, those adolescents who engaged in six or more bouts of physical activity per week, were significantly less likely to contemplate suicide (14). There is growing evidence that all types of physical activity can improve cognition (1). A recent review found that increases in PE might contribute to increases in academics, and does not impede classroom learning (15).

Participation in physical activity also has an impact on the frequency that youth partake in some health risking behaviours (16). Engaging in a variety of activities, ranging from skateboarding to organized activities with parents, can reduce the chance that youth will participate in potentially risky behaviours, such as: sex, cigarette smoking, alcohol consumption, truancy, drug use, and not wearing seat belts (12).

In general, literature shows that inactivity in youth is detrimental throughout the life span, while being active can offer multiple health benefits. Even so, a high proportion of Canadian youth do not meet the minimum recommendation for physical activity. Therefore, developing and evaluating targeted strategies for increasing activity in youth is an important area of study.

1.2 Study Rationale

When delivering youth-targeted health promotion, schools are a popular and proven effective venue. When it comes to physical activity, promotion in schools is ideal for many reasons. Youth attend school on a regular basis (17, 18) and spend more time in school than in any other activity (19). Schools are often a safe place to engage in physical activity, provide access to facilities, and can often provide materials and supports required to run programs (19). School staff is comprised of skilled educators, many of whom are seen as credible sources for information (19), and the social aspect of the school environment can promote physical activity through peer influence, a determinant of physical activity in youth (16). Perhaps most importantly, those youth who are physically active during school are more likely to be active outside of school, and therefore more likely to meet recommendations for physical activity (20).

There are a few examples of evaluated physical activity promotion programs running in schools in the United States, including: Lifestyle Education for Activity Program (LEAP) (21, 22), the Trial of Activity for Adolescent Girls (TAAG) (23), and “planning to be active”(24). These interventions have been proven to increase activity (22, 24). Unfortunately, none of these strategies targets the entire school population; most of the interventions only target one gender (21, 23), or a few grades (24). Though the literature shows that some demographics, such as females (25, 26), are more inactive than others, inactivity affects all grades and genders. Therefore, a strategy is needed that can apply to all students.

An example of such an intervention exists in Saskatoon, *in motion* high schools. *In motion* high schools is a physical activity health promotion strategy that is part of a larger community wide strategy, Saskatoon *in motion*. The *in motion* physical activity health promotion campaign has been running in the Saskatoon Health Region since 2000, and contains a targeted strategy for children and youth. The children and youth strategy aims to increase physical activity levels of children and youth in the Saskatoon Health Region primarily through school-based physical activity health promotion. There are two streams of schools-based strategies, one for elementary schools and one for high schools. The goal of *in motion* high schools is to have all Saskatoon high schools become *in motion*, meaning that “the school values and actively promotes the health

benefits of physical activity, and supports opportunities for staff and students to become physically active on a regular basis”(27). The *in motion* high school strategy can use avenues such as announcements, bulletin boards, school newspapers, school calendars, and community action fairs, to promote physical activity. There is also incorporation of various initiatives and challenges to provide opportunities for students to be physically active. At a minimum, schools are asked to commit to using weekly announcements and bulletin boards.

A member of the school staff coordinates the strategy, schools are free to use the communication methods and activity opportunities they feel best suited their students, creating an intervention that is tailored to their school’s strengths. This strategy was developed with input from inactive students, and school staff, with the aim of making it more applicable to what students and staff need and want.

There had been no evaluation of the impact of the *in motion* high school strategy on the physical activity levels of a large sample of students in Saskatoon high schools. Therefore, the need for such an evaluation was high. To this end, 10 schools were recruited to participate in a two-phase self-report survey to evaluate change in activity levels during the first year of *in motion* in each school. Additionally, school champions were asked to participate in an in-person questionnaire, aimed at assessing what each school did during their *in motion* intervention.

1.3 Study Objectives

The objective of this study was to evaluate the impact of the *in motion* high schools physical activity health promotion strategy on student physical activity levels.

This objective was met by answering the following four research questions:

1. What is the impact of a community-school-based health promotion strategy, on physical activity behaviours of high school students in Saskatoon?
2. Is any change in physical activity level observed in participants consistent across all schools, grades, and genders?
3. Do the different doses of *in motion* implemented by schools result in different changes in physical activity behaviours and student recall of *in motion*?
4. How can teachers and administrators be supported in their efforts to implement *in motion*?

2. LITERATURE REVIEW

2.1 Current Status

Inactivity Levels

Physical inactivity is high among Canadians. In 2002, 51% of adults, 54% of 15 to 19 year olds, and 48% of 12 to 14 year olds were considered inactive. In 2005, through pedometer monitoring it was found that 91% of children and youth did not accumulate enough steps throughout the day to meet the recommendations of the Canadian Physical Activity Guidelines (28). Furthermore, in the youth population (12 to 19 years) it is estimated that as many as 82% are not active enough to reach optimal growth and development, defined as half an hour of running and one hour of walking a day (3). When the statistics are broken down by gender it can be seen that only 27% of teenage boys and 14% of teenage girls are active enough to gain health benefits. For youth, inactivity is highest in those aged 15-19, with age by gender inactivity levels being 63% for girls aged 15 to 19, compared to 55% for girls aged 12 to 14, and 44% for boys aged 15 to 19, compared to 43% for boys aged 12 to 14 (3).

In the 2001/2002 Health Behaviour in School Aged Children Study it was found that 45% of youth reported spending less than one hour per week in physical activity during class time; furthermore, 51% reported spending less than one hour per week in physical activity outside of class time. Moreover, 48% of youth reported spending at least six hours per day in sedentary activities, such as using a computer, watching TV, and doing homework, outside of class time.

On June 27, 2007, Canada's Report Card on Physical Activity for Children and Youth -2007 was released by Active Healthy Kids Canada (29). For the third year in a row, the overall grade for Canada's children and youth was a D, with an F being received specifically for physical activity levels. This indicated that Canada is failing to

provide adequate activity for its children and youth, and highlighted the importance of addressing the issue of youth inactivity.

National Recommendations

The amount of recommended physical activity for youth, according to the Canadian guidelines, has changed over the past few decades. In 1993 the recommendation was 20 minutes of moderate to vigorous activity at least three times a week (30). Shortly thereafter (1996-99) the United States and other developed countries drafted guidelines that suggested at least 30 min of moderate to vigorous physical activity all or most days of the week. Following this, in 2002 Canada raised their recommendations for youth. Instead of setting firm guidelines, (eg: youth must achieve 60 minutes of moderate to vigorous activity a day) Canada expressed their requirements in terms of increases in moderate to vigorous activity and decreases in sedentary activity. The guidelines state that youth should try and achieve an increase in moderate to vigorous activity of 30 minutes per day, eventually reaching 90 minutes or more of increasingly vigorous activity, while at the same time decreasing sedentary activities by 30 minutes per day, eventually reaching 90 minutes per day of decreased sedentary activity (31). Most recently, in a comprehensive review of the impact of physical activity on the health of children and youth, a recommendation was made for youth to achieve 60 minutes of moderate physical activity every day. This amount was thought to be sufficient to convey the multiple health benefits of physical activity (32).

Unfortunately, while our recommendations for physical activity are similar to those in other developed nations, Canadian inactivity levels are higher than most. Canada ranks 24th out of 27 developed countries in percentages of boys exercising more than twice a week and 20th out of 27 for girls exercising more than twice a week (33). The Canadian government has recognised the need for change in our national level of youth inactivity, and has created a goal throughout federal, provincial, and territorial governments to increase physical activity levels by 10% by 2010.

Physical Activity in Schools

Achieving recommendations is greatly impacted by the frequency of physical education (PE) in schools, and access to recreational facilities (32). In a Swedish study, 30% of 16 year olds used PE to obtain all of their moderate to vigorous physical activity (34). Similarly, high levels of Canadian youth and their families rely on school-based PE to meet daily needs for physical activity. When surveyed in 2000, more than half of Canadian parents thought that their children got enough physical activity in school, mainly through PE (35). Furthermore, parents of adolescents were more likely than those of younger children to hold this belief (35). The reality is one in five adolescents report no PE at all in school, and only one in four reports daily PE (35). Additionally, participation in PE declines as youth move through school (36), and there are higher proportions of boys than girls enrolled. A recent assessment of physical activity in schools in the United States revealed that only 5.8% of high schools were supplying daily PE or provided the recommended amount of PE per week (225 minutes) (19). Moreover, in observing those engaged in PE, less than 40% of class time was spent in moderate to vigorous physical activity.

Concerning school-based opportunities outside of PE, in a study of Ontario schools only 22.8 to 28.7% of students participated in intramural or interschool sports (34). The assessment found that sport programs, such as school teams, were much more popular than intramurals (19). In 2005, the overall proportion of youth who participated in sport, either in or out of school, was found to be 72%. Though this proportion seems high, the same assessment found that only 11% of children and youth who participated in sport were meeting the recommended guidelines for activity.

Those who have the opportunity to participate in PE or are active during school time have a higher chance of achieving recommended amounts of physical activity compared to those who do not (37). However, the proportion of students who participate in sports and PE and meet physical activity guidelines is low. It appears alternate strategies are needed to encourage activity participation in youth. The strong reliance parents have on school-based activity points to schools being a good avenue to provide these opportunities.

2.2 Determinants of Youth Physical Activity

Participation in physical activity in youth does not seem to be a straightforward phenomenon; there are many contributing and inhibiting factors. Many of the contributing factors can be placed into three categories: biological (e.g. gender, age), behavioural (e.g. school attendance, PE, community centre use, participation in team sports), and environmental (e.g. traffic safety, availability of facilities, availability of equipment), all of which can impact activity participation in the school environment.

Biological Determinants

A frequently identified determinant of physical activity in youth is gender. Research constantly shows that boys are more active than girls (26, 38). One explanation for this occurrence is that boys encounter fewer barriers to being active than girls, such as comfort in open activity times (such as open gym) (39), perceived ability to perform physical tasks, and enhanced self perception (12). Girls tend to have a lower self-perception, and a lower perceived confidence in sports, reducing their involvement (40, 41). In one qualitative study, females reported barriers to participation such as seriousness of the activity, dislike of performing physically active tasks in front of others, and perceived incompetence in the task (42).

In both genders, age affects physical activity participation. As youth get older their physical activity levels fall (38, 43). Studies have found a 10% drop in physical activity levels between students in grades 9/10 and 11/12 (20), and a three times lower rate of physical activity in youth who are 17 years old as compared to those who are 12 years old (37). In the United States it is estimated that there is a decline in physical activity levels of 2.7% per year for boys, and 7.4% for girls (44). In a ten year study in the United States involving females aged 9/10 to 18/19, it was found that physical activity decreased by 83% between these ages (45). Upon analysis of the types of activities engaged in, the greatest decline was found in non-organized sports and vigorous physical activity.

The literature indicates that girls are less active than boys, but both genders experience a significant decrease in activity level as they age. Therefore, attention must

be paid to increasing levels of activity in females, as well as older youth of both genders.

Behavioural Determinants

Behavioural determinants of physical activity are those aspects of the youth's patterns of behaviour that impact their participation in physical activity. Previous participation in physical activity is a correlate to current participation; those who were inactive children are more likely to be inactive youth.

Better school attendance as well as higher school involvement is associated with higher levels of physical activity (12). This may be due to increased social support within the school environment, which is correlated to increased participation (12). Participation in PE is associated with higher overall activity (37); having PE one to four times per week is correlated with a higher chance of participating in high levels of moderate to vigorous physical activity and is not correlated to high levels of inactivity (37). Similarly the use of community recreation centres is correlated to high levels of activity (37), and not correlated to inactivity. Additionally, engaging in extracurricular physical activity, has been found to increase overall activity by 30 minutes a week (34).

Surprisingly, time spent in sedentary activities is not consistently correlated to overall levels of physical activity (46). Within the literature published on the interaction of physical activity and inactivity, there were no consistent results as to any reduction in physical activity with increasing time spent in sedentary pastimes. It seems that bouts of sedentary activities are not indicative of whole day, week, or month long activity patterns. In the widely cited review of determinants of youth physical activity by Sallis et al. (38), only one study found that adolescent physical activity was inversely correlated to after school and weekend sedentary activity.

The literature indicates that overall physical activity levels of youth are correlated to their ability and interest in taking part in school- and non-school-based activity opportunities. There is a lack of consistent evidence linking time spent in sedentary activities to overall activity levels. Thus, encouraging youth to be more active inside and outside of school may be more effective at increasing activity levels compared to discouraging sedentary behaviours.

Environmental Determinants

Environmental determinants that affect physical activity are those aspects of the youth's physical and social environment that can influence participation. Traffic safety to and from school is associated with perceived ability of students to adopt active modes of transportation (39). When active transportation is achieved it is associated with higher levels of activity throughout the school day (47). Having the facilities to engage in physical activity is important (48), and the activities that are offered in those facilities impact who will participate (39). For example, in a qualitative study on physical activity behaviours in middle school students, when primarily basketball was available for open gym time it was almost only males who participated; if other activities such as volleyball were offered then females were more likely to engage (39). Linked to this, the amount of equipment and supervision available for activities has been found to impact participation for males but not females (34). In an intervention by Sallis et. al., increasing supervision and equipment for physical activity in school resulted in higher activity for male students but had no effect on female students (49). As mentioned earlier there is a positive association between the availability of PE and overall participation in physical activity (37); those students who participate in PE are more active overall.

These studies indicate that issues such as safe streets, having nearby activity facilities, availability of equipment, and availability of PE, all mediate the ability of youth to obtain sufficient levels of physical activity. Not providing the above resources may decrease the amount of physical activity that youth can obtain, standing in their way of meeting physical activity recommendations. Focusing on increasing the presence of these variables may be an important strategy for increasing youth activity.

2.3 Physical Activity Health Promotion for Youth

Recommendations for promoting physical activity to adolescents

Upon review of factors associated with physical activity in adolescents, there were suggestions for physical activity promotion to youth presented by Lotan et al (7). The suggestions highlighted that physical activity could potentially be increased upon the removal of real and perceived barriers. The suggestions were:

- ❑ Setting an example: Having influential adults such as parents and teachers speak to adolescents about the importance of physical activity, and participate themselves.(7)
- ❑ Individual Adjustment: Not all adolescents are interested in the same forms of physical activity, therefore there must be room for personal preference in selection of organized and personal activity.(7)
- ❑ Using peer influence: Peers have a strong influence on behaviour patterns in adolescents; most youth will state the importance of the involvement of friends in activities (12, 42, 48).
- ❑ Promoting physically active habits: Activity does not become routine unless it is integrated into life as a habit (7)
- ❑ Combined Efforts: All of the separate groups involved in influencing adolescent behaviours should work together to promote physical activity. These groups include health professionals, families, communities and schools. (7)

These suggestions indicate that if one were to target youth physical activity through health promotion, a multifaceted strategy would be most effective. Therefore an effective strategy might include: teachers to model an active lifestyle, many varied and voluntary activity opportunities, peer involvement in promoting and participating in activities, promoting regular daily activity, and partnership with other groups (for example, schools, parents, and communities). This type of strategy might be more effective at increasing youth activity levels as compared to one that implements only one or a few of these ideas in isolation.

Using Schools to Promote Physical Activity

The promotion of health behaviours tends to be well received in the school setting (34). Using schools to promote physical activity for youth is important for many reasons: most youth attend school on a regular basis (18); youth spend more time in school than in any other activity (18); schools are a safe place to engage in physical activity; schools have access to facilities and can often provide materials and supports required to run programs (18); and school staff is made up of skilled educators, many of whom are seen as credible sources for information (18). Moreover, modelling of physical activity by PE teachers has been found to have an influence on activity rates even after the student have left school (34).

Additionally, the social aspect of the school environment can promote physical activity. Peer influence is a determinant of individual physical activity in youth (12, 16, 38). By promoting physical activity in the school environment one has the opportunity to use peer influence. Furthermore, schools can encourage intramural sport activities and active commuting, which are both related to higher overall physical activity.

Through the study of trends in youth physical activity, it has been found that those youth who are active in school are more likely to be active outside of school, and more likely to meet recommendations for physical activity (12). Therefore using schools to promote physical activity to youth is promising. A school-based physical activity promotion strategy that uses the above guidelines by Lotan et al, has the potential to be very successful in impacting the activity levels of students.

High School-Based Physical Activity Health Promotion Strategies

When attempting to engage in health promotion in school settings, simultaneously improving the environment of the schools, providing social and individual opportunities to be active, and educating students on benefits and opportunities to be active, has been proven to effect change (50). Specific to physical activity, research suggests that in schools there should be encouragement to adopt a more active lifestyle while not making participation compulsory; this allows students to incorporate activity into their daily lives in their own way (50).

In a review of school-based physical activity health promotion campaigns published prior to 1998, Stone et al. found four strategies that were targeted to high schools: One in Australia, *Australia School Project*; and three in the USA: *Slice of life*, *Stanford Adolescent Heart Health Program*, and *Project Active Teens*. These interventions focused primarily on, or had as a component, promoting increased physical activity levels (51). The interventions were composed of changes to existing PE programs and classroom-health curricula, and promoted some sort of out of school activity (for example active commuting, or community sports). Most of the interventions involved training some school staff to implement the program. Generally, an increase in knowledge of the benefits of physical activity, improved attitudes towards activity, and higher in-schools activity levels were reported for those students who participated in the intervention PE classes (51). These programs tended to be low cost and utilised existing school resources, making them feasible for schools to maintain. Unfortunately, the increases in activity seen in students only pertained to in-school activity, and did not translate into increases in out of school activity levels. Additionally, there was no benefit for those students not engaged in PE, limiting the reach of these programs.

In a review of health promotion in high schools published shortly after this review, it was recommended that further programs developed incorporate the following: health and wellness of school staff; physical activity options which are not compulsory; parents; peers; and small amounts of the school budget for developing the initiative(50). Developed from existing evidence, these recommendations were intended to make future school-based interventions more effective at impacting physical activity levels in and out of school settings, reaching more students.

Since 2000, there have been three published high school-based strategies: Trail of Activity for Adolescent Girls (TAAG) (23), Lifestyle Education for Activity Program (LEAP) (21), and “Planning to be Active” (24). The LEAP and TAAG interventions focused on adolescent females, and planning to be active reached primarily grades nine and ten. All strategies combined amendments of the current PE curriculum and environmental influences to promote physical activity.

The TAAG intervention was created according to an ecological model, and included: community access to physical activity opportunities; school-based physical activities; developing behavioural skills related to activity; and developing interpersonal skills to increase female confidence levels(23). So far there has not been an assessment of the impact of this intervention. The LEAP intervention was also created according to an ecological model. LEAP schools focused on: individual skill development in PE; incorporating messages about physical activity into the school environment; administration support and the formation of a LEAP team in the school; and linking with the community to provide activity opportunities(22). The LEAP intervention was found to increase vigorous physical activity in the program participants. Interestingly, the LEAP intervention was also linked to increased physical activity in non-program participants of the same gender and age, potentially through exposure to the promotional elements of the campaign(21). An intervention champion from the school staff led both interventions in the schools. This aspect of the strategy was thought to make the intervention more conducive to the school environment, since the champion had more knowledge of the school as compared to an outside “expert”(21-23).

The “Planning to be Active” intervention focused on increasing moderate and vigorous exercise gained in leisure time in rural students through community, school-based or individual activities, by instruction given once a week in PE classes (24). The intervention did not specify gender or age of target audience but did state that the majority of students were in grades nine and ten. The strategy used Social Cognitive Theory (SCT), specifically, self-regulation, social situation, outcome expectancies, and self efficacy(24). This strategy was not led by a school-based champion, but by the program developer. The classes were offered for eight weeks and focused on common mediators of physical activity such as: the knowledge of the health benefits of physical activity, principles of fitness, goal setting, and identification of barriers (24). The intervention was found to increase moderate physical activity during leisure time by 2.05 days per week, and had the strongest effect on those students who reported no physical activity in leisure time prior to initiation of the project (24). The three above-mentioned health promotion strategies had high compliance rates and increased overall physical activity rates.

In Canada, there is one unpublished school-based physical activity promotion strategy, Ever Active Schools, which has been implemented in some high schools in Alberta, (52). Schools that become Ever Active Schools “contribute to the development of children and youth by fostering social and physical environments that support healthy active lifestyles”. The initiative works on the four E’s: Education (offering inclusive daily physical activities in school), Everywhere (partnering with communities and homes), Everyone (including all students, especially those at risk for inactivity), and Environment (developing physical activity social environments conducive to an active lifestyle) (52). This strategy provides an interested school with resources to support programming, consultation with outside experts, mentoring with other schools, and highlighting “promising practices” that have been implemented in other schools (activities that other schools have undertaken which have been shown, anecdotally, to affect physical activity levels of students). This program has been initiated in many schools in Alberta but has not yet been evaluated.

Additionally, in Canada there are some nationwide resources available to interested schools wanting to increase physical activity in their students. One such resource is the “Voices and Choices” program for high schools (53). This resource is a do-it-yourself tool targeted at getting students involved in choosing what health related topics are important to them in their school. The Voices and Choices program allows students to prioritise what matters to them in their school by polling for the top five things they would like their school to focus on. The program is not specifically geared towards physical activity but it allows students to indicate if increasing physical activity is important to them, and provides resources for supporting schools to do so. This tool can be accessed by all secondary school in Canada, but has not been evaluated for its effectiveness in impacting physical activity or other health behaviours in students.

Similarly, the Canadian Association for Health, Physical Education, Recreation and Dance (CAHPERD) offers guidelines for offering “Quality Daily Physical Education” in schools for students from kindergarten to grade 12 (54). This program encourages schools to offer “daily curricular instruction for all students (K-12) for a minimum of 30 minutes, with well planned lessons incorporating a wide range of activities, and a high level of participation by all students in each class.” CAHPERD

also advocates for quality intramural programs, safe facilities, and equipment for students (54). As with “Voices and Choices” this program is voluntary and offers a do-it-yourself guide for school who wish to follow their program. This program has been evaluated, but not in terms of its impact on overall student activity levels.

In summary, only two of the above-mentioned physical activity promotion strategies for high schools have been evaluated for their effectiveness at impacting activity behaviour. Of the two evaluated strategies, they share as their major limitation their applicability to only a subgroup of the school population (females or younger grades). Additionally, as with the evaluated strategies in the review published in 1998, their reliance on PE may limit their ability to increase out of school activity. Moreover, they do not encourage voluntary participation as has been suggested in the literature. If one wanted to implement an evaluated strategy for increasing physical activity in high school students that was applicable to the whole school population, they would find no evidence of such a strategy in the literature. Therefore, a need exists to develop and evaluate a strategy for increasing physical activity in high schools that can be used to increase physical activity in the whole school.

2.4 *In motion* High School Physical Activity Health Promotion Strategy

The above literature shows that there is a need to develop a high school physical activity promotion strategy that can target full school populations and evaluate its impact on the physical activity behaviours of students. The strategy described below, *in motion* high schools, is one such strategy that has been developed for high schools in the Saskatoon Health Region, SK. It is low-cost and designed to be easy to implement by school staff. If found to be successful at impacting physical activity behaviours of students, *in motion* high schools will be a promising resource for increasing activity in high schools in the Saskatoon Health Region, and in other areas.

The in motion High School Strategy

In 2000, the Saskatoon Health Region, the City of Saskatoon, the University of Saskatchewan, and ParticipACTION came together to launch a comprehensive physical activity health promotion initiative called *in motion* (27). *In motion* encourages citizens

of the Saskatoon Health Region to incorporate physical activity into their daily lives. Provincial, national and international recognition has been received for the *in motion* campaign, due to its success in getting large segments of the population to be more active. The *in motion* strategy involves building partnerships, public awareness, education, and motivational strategies, through targeted interventions (27). One of the targets is children and youth. Since 2000 Saskatoon *in motion* has been working with Saskatoon elementary schools to increase physical activity levels of elementary school students. So far 100% of regional elementary schools are considered *in motion*, indicating they are committed to providing 30 minutes of physical activity every day for every student (27). To achieve the *in motion* goal, elementary schools can participate in activities such as daily walks, free or organized play time, and can include PE in their daily 30 minutes. Since the implementation of *in motion* in the regions elementary schools, there has been a noticeable increase in activity levels, reports of improved attendance and fewer discipline problems, and an increased overall school morale in *in motion* schools (27)

In 2002, *in motion* started the process to develop an intervention tailored to the high school environment. To develop the *in motion* high school strategy, inactive high school students were consulted. Through focus groups it was found that inactive students did not want to have organized daily physical activity (similar to the elementary strategy), but instead preferred to participate in community programs and school-based activities on a voluntary basis (55). The students expressed a wish to have increased opportunities to be active in the school (such as activity clubs), and wanted more information on what opportunities to be active existed in their communities. Therefore the *in motion* high school strategy deviated from the elementary strategy and a more voluntary, informational approach was taken. Student preferences for communication methods (announcements and bulletin boards), and wishes for more voluntary activity opportunities were used to guide the formation of the *in motion* high school strategy. The result was that *in motion* high schools were treated more like workplaces: participation was voluntary; there was a wide array of opportunities available; and the focus was around communication of opportunities and making activities available to students before and after school and at lunch time.

To be an *in motion* high school the school had to agree to value and actively promote the health benefits of physical activity and support opportunities for staff and students to become physically active on a regular basis. At minimum, schools had to agree to promote the health benefits of physical activity through weekly announcements and a bulletin board in the school. In each *in motion* high school the intervention was coordinated by a staff member who was designated school champion. Champions were given a resource binder(55) with ready-made communication resources (announcements, bulletin board materials, and posters), materials for creating opportunities to be active (activity challenges), information on how to organize and run physical activity clubs, and information on how to build an *in motion* team. This was paired with regular contact from the *in motion* high schools committee, and yearly events and symposiums to give further resources. Part of the strategy for *in motion* high schools was trying to get as much student involvement as possible in planning, organizing and carrying out the intervention in each school. In this way, each school was encouraged to have *in motion* student leaders, and potentially a position on their student council for an *in motion* representative.

In the 2002/03 school year, a pilot study of *in motion* in four high schools in Saskatoon was conducted. This study revealed that over the course of one year of the *in motion* strategy being implemented in the school, there was an increase from baseline of students who reported incorporating physical activity into their daily routine. Moreover, those who rated their health as excellent had increased (56). This indicated that the developed *in motion* high school strategy may be a useful tool to increase adolescent activity levels.

2.5 Common Theories of Behaviour Change in Adolescent Physical Activity Health Promotion

In most of the school-based physical activity health promotion strategies reviewed, Social Cognitive Theory (SCT) was the theory of behaviour change employed to guide program development (21-23, 51). Some interventions also reported drawing concepts from Social Learning Theory (SLT) (50), operant conditioning, and

organizational change theory (23), in conjunction with SCT. Additionally most health promotion initiatives took an ecological approach (21-23).

Social Cognitive Theory

The main postulates of SCT relate to the impact of environment and psychosocial components on behaviour change (57). According to SCT, behaviour change is influenced by: factors external to a person making up the environment; the knowledge and skills one has to perform an activity; the anticipated outcome of that activity; the value given to that outcome; the amount of personal choice one has to reach the prescribed goal; watching the actions and outcome of others; the responses one gets from performing the behaviour; and the confidence one has in performing the behaviour (57).

Using postulates of SCT to guide the creation of a school-based physical activity intervention may result in a strategy that: makes changes to the environment in the school (such as traffic safety to and from school); has positive outcomes associated with participation in activities (prizes and/or peer recognition); has teachers and other staff modelling the activity (participating in events students are involved in); incorporates positive reinforcement (announcements and bulletins concerning the benefits of participation); and builds skills and confidence in the individual (activities of little to no competition so success is individually based).

In one real world example, SCT was used to guide program development of a strategy that: used activities that build self-efficacy relating to physical activity; provided education on the positive outcomes of physical activity; gave positive reinforcements for being active; and involved seeing the behaviour modelled in peers and family members. This was thought to create a psychosocial environment that was conducive to behaviour change in students (23).

Along with using SCT to develop the differing components of the school intervention, most current physical activity health promotion strategies employ an ecological approach(21, 23, 51).

The Ecological Model

Ecological models of health behaviour are based on the belief that there are multiple factors which affect health related behaviour, including: individual factors, interpersonal factors, community factors, organizational factors, and public policy (57). Factors in each aspect of the environment need to be conducive to carrying out the behaviour in order for the behaviour to be adopted successfully. It is thought that by addressing multiple factors that affect health behaviour in one intervention, individual and group behaviour change will be more probable.

An ecological approach to physical activity health promotion would have multiple components integrated into one strategy. The strategy would target all or some of the following correlates to activity participation: individual correlates, interpersonal correlates, community correlates, organizational correlates, and public policy correlates. In the literature there is evidence of factors that have been found to impact youth physical activity in each one of these areas (38). This makes an ecological approach to health promotion in the school environment relevant to producing real behaviour change.

The use of SCT within an ecological approach to guide development of a health promotion program may mean that any resulting strategy will be more able to target mediators of adolescent physical activity. This should lead to success at increasing physical activity levels in this population. The developed high school physical activity promotion strategy described below fits with the postulates of these models, and thus has a solid foundation to influence adolescent physical activity behaviours.

In motion and behaviour change theory

Similar to the intervention studies previously introduced, the ***in motion*** intervention also fit with the postulates of SCT and took an Ecological approach. The ***in motion*** high school strategy incorporated physical activity promotion at three of the levels of the ecological model: individual, interpersonal, and organizational (the school). Specifically, individual correlates of perceived confidence and self-efficacy were addressed through integration of mainly non-competitive, low skill level activities that can include all students no matter their previous activity experience. Examples of

these activities were physical activity challenges such as hike and bike, where students are challenged to use active transport for travel to and from school for a whole week. Interpersonal correlates of peer and adult participation were incorporated through use of full school participation and staff engaging in activities with students. Lastly, the school environment was influenced through posting of *in motion* slogans around the school, and use of *in motion* announcements and bulletin boards. The integration of these materials onto school walls gave an indication to staff and students that the schools were promoting activity for all members.

Additionally, the promotional materials and activity opportunities used in the *in motion* high school strategy align with postulates of SCT. Specifically, the messages shared with students were those that aim to increase knowledge of the positive outcomes, and the importance of physical activity for health. Positive reinforcement was given for being active through use of incentives and encouragement. Opportunities existed to build self-efficacy through activity challenges and clubs that were minimally competitive and work on basic skill levels. Staff members were encouraged to model physical activity behaviours by integrating workplace wellness and staff physical activity challenges into the school. Therefore, since *in motion* fits with SCT and the ecological model of health determinants, it is reasonable to assume that implementing the intervention in city high schools will have positive effect on student activity levels.

3. METHODOLOGY

3.1 Study Design

This study can be classified as a mixed methods design since both qualitative and quantitative data were collected (58). The quantitative portion of this study can be classified as quasi-experimental due to the lack of randomisation of participants. Moreover, the study did not involve a control group for comparison, therefore was a multiple group pre-test post-test design. The qualitative component can be classified as a preliminary exploration of *in motion*'s impact, employing a typological analysis to draw meaning from responses (58). (Description of typological analysis pg. 47)

According to Johnson and Onwuegbuzie under the mixed methods study design, this study is considered a quantitative dominant design since quantitative data collection, analysis, and interpretation were employed for the majority of the study. A within stage, mixed-model design was used in two areas of data collection (2 quantitative questionnaires with qualitative component as final few questions) (58).

See Appendix A for pictorial representation.

A qualitative component was included due to variations in the implementation of the intervention and the evolving nature of the intervention under study (59). Qualitative inquiry is a useful tool to uncover individual differences in program implementation. Furthermore, qualitative inquiry has the potential to provide more in-depth information than quantitative methods alone (59). The purpose of the qualitative component in this study is to understand the intervention based on the experiences of the people involved in implementation, and how those experiences may affect the outcomes of quantitative analysis. The quantitative and qualitative data will be integrated in the interpretation portion of the study.

3.2 Ethics and Confidentiality

Ethics approval was granted by the University of Saskatchewan Behavioural Research Ethics board, through the ongoing ethics approval of the *in motion* initiative. Every effort was made to conceal the identification of all participants. Refer to appendix B for ethics approval.

3.3 Data Collection

There were four periods of data collection in this study (see appendix A for time line). These periods are described as: pre-survey, post-survey, champion in-person questionnaire and champion in-person follow up questionnaire. The pre- and post-surveys were used to collect physical activity data from participants. The champion in-person questionnaire was used to collect dose information and qualitative data from participants. The champion follow-up questionnaire was used to member check previous data and collect qualitative data from participants. Below is a description of the participants and data collection tools used in the study.

3.3.1 Data Collection Participants

Pre-Survey

In the 2005/2006 school year there were 15 high schools in the city of Saskatoon. All schools were invited to participate in this study except two that had different research projects already underway. Of the 13 schools that were invited, ten agreed to take part in the study. The three schools that did not want to take part in the study decided on their own volition, no formal explanation was sought. Participants were students from the ten remaining Saskatoon high schools.

In regards to the ten schools involved in this study, nine were mainstream high schools and one was an alternative high school. Mainstream high schools cater to the general population, whereas alternative high schools cater to a specialised population group. In this case the alternative high school is geared towards students who are pre- or post-natal, or have attendance or behavioural problems preventing them from fitting in to the mainstream school system. The nine mainstream high schools had enrolments of between approximately 1000 – 1500 students. The alternative high school had an

enrolment of 150-200 students. Three of the ten high schools were designated as community schools, located in lower SES neighbourhoods (lower income levels, and higher rates of unemployment, general crime statistics, young offenders in school, alcohol and drug rates, single parents, transience, and absenteeism (48)). SaskLearning described community schools as trying to incorporate “educational practices and responses that respect and reflect the experience, culture and socio-economic background of the students and the community.” (56) Additionally, there is a focus on family and community partnerships, integrating services between school and community, and community development (56).

The other seven high schools were not designated as community schools and were located in three mid- to high- SES neighbourhoods (higher income levels, and lower: unemployment rates, general crime statistics, young offenders in school, alcohol and drug rates, single parent homes, transience and absenteeism).

All schools were provided with enough pre-surveys to have all students complete. All students who were in class on the day and time of pre-survey administration were eligible for admission into the sample. No students were purposefully excluded from the sample. The *in motion* consultant dropped pre-surveys off to administration in the week of October 11-14, 2005, and asked that teachers administer the surveys to students anytime within that week. It was suggested that all surveys be administered at the same time within the school to avoid duplicate responses.

Post-Survey

The same ten schools that were involved in the pre-survey were asked to administer the post-survey to their students. Similar to the pre-survey, schools were given enough post-surveys for all students enrolled. Again all students who were in class at the day and time of post-survey administration were eligible for admission into the sample. No students were purposefully excluded from the sample. The *in motion* consultant suggested an approximate time frame for administration and that all surveys be administered to students at the same day and time. The *in motion* consultant dropped surveys off to school administration in the week of May 23 – 31, 2006, and asked that teachers administer the surveys to students anytime within that week.

Champion In-Person Questionnaire & In-person Follow-Up Questionnaire

One staff member from each high school was identified as the schools' *in motion* champion. The champion was defined as the single person who was responsible for the majority of the *in motion* strategy in the school, and often was the individual receiving correspondence from the *in motion* high schools team. The champion was identified in one of two ways: they had come forward to the *in motion* team prior to the initiation of the project and expressed their interest in leading the intervention in their school, or they were recruited by the administration and then their contact information was forwarded to the *in motion* high schools team.

3.3.2 Data Collection Tools

3.3.2.1 Physical activity

Pre- and Post-Survey

The Godin leisure-time exercise questionnaire was used to assess leisure time physical activity in students on the pre- and post-survey (60). This questionnaire asked for average times per week that the student performed activities of vigorous, moderate, and mild physical activity for a period of 15 minutes or more. Reported bouts of mild, moderate, and vigorous activity, are multiplied by three, five, and nine metabolic equivalents (MET's) respectively (60), and are combined to form an overall activity score for each student. The number of METs assigned for each category represents the average METs that are expended during that type of an activity. Therefore, the activity score represented the average METs per week that the student achieved. This questionnaire has been evaluated in youth with a test-retest reliability of 0.96 in 11th grade students (61). Validity has not been measured in youth, but, in general, it was found that youth over report vigorous activity by 3.8 bouts per week on self-report surveys, compared to accelerometer monitoring (61).

The advantage of the Godin survey is that it is short and easy to understand, so it can be done easily in class time (62). Due to the self-administered aspect of this survey, it can be administered to large numbers at a low cost, and does not tend to alter future behaviour due to Hawthorn or testing effect (62). The disadvantages of using this survey are: due to the self-administered nature there can be errors in interpretation, and

thus error in filling out the survey; there is evidence of some social desirability bias when the survey is filled out in groups (63); and as already mentioned, there is over-inflation of vigorous physical activity in self reports by youth.

The pre-survey also included four additional questions: grade, gender, school, and if the student recalled encountering the *in motion* health promotion strategy. The post-survey included six additional questions: grade, gender, school, recall of *in motion* similar to pre-test, recall of seeing reading or hearing about physical activity or increasing physical activity in their school, recall of which methods they recall seeing hearing or reading messages about *in motion*, and their opinion of how the schools effort to promote physical activity has impacted their activity rate.

For copy of pre-survey see appendix C, for copy of post-survey see appendix D

3.3.2.2 Dose of Intervention and Qualitative Inquiry

Champion In-Person Questionnaire

In-person questionnaires were administered face-to-face in the last two weeks of June, corresponding to eight months after the initiation of the *in motion* strategy in the high schools. An expert panel that was familiar with high school staff and the *in motion* program reviewed and made recommendations on the content and format of the questionnaire. The questionnaire consisted of 43 questions that were divided into three sections: two quantitative sections and one qualitative section. The questionnaires were approximately 30 minutes in length, and were recorded by hand written notes.

The questions included in the questionnaire were generated from three sources: an *in motion* survey that was sent out to elementary school champions earlier in the year; the high school *in motion* resource guide components (types of activities were available to champions); and consultation with two professors familiar with the *in motion* high school strategy and qualitative methods. The surveys were administered in-person for two reasons. First, if the questions were not understood, they could be clarified and restated to ensure adequate response. Second, to achieve the highest possible response rate (64).

The first section of the questionnaire asked about in-school barriers and supports experienced by the champions. It consisted of closed-ended fixed response questions

pertaining to supports and barriers that had been experienced within the school while trying to implement the intervention components.

The second section asked about what exactly comprised the *in motion* intervention in the school. This section also consisted of closed-ended fixed response questions. These questions addressed all areas outlined in the *in motion* high school resource guide. The questions asked respondents to recall use of the specific communication or activities, and frequency of their use.

The third section of the questionnaire comprised the qualitative portion. This section consisted of semi-structured, open-ended questions about how *in motion* had impacted the school, and lessons that could be learned from the schools' *in motion* intervention experiences (59). The questions were in a standardized format with exact wording of questions fixed. The data gathered is considered qualitative due to the open ended nature of response. This method is best when inexperienced interviewers are involved, and comparison of responses is desired (59).

For an example of the questionnaire see appendix E.

In-Person Follow-Up Questionnaire

After quantitative and qualitative data collection and analysis was complete, a brief (15 minute) follow-up questionnaire was conducted in-person with each champion. The follow-up questionnaires were conducted to allow for member checking of previously recorded data (from champion in-person questionnaire) and to inquire into the champion's interpretation of results from the students' pre- and post- surveys. Specifically, the questionnaire sought the champions' interpretation of what the results could be indicating concerning the activity levels of their students at time of pre- versus post-survey. Questionnaires were in two parts: the first part was a closed-ended verification of information provided in the previous champion questionnaire, and the second part was a semi-structured inquiry into champion interpretation of their schools change in activity level. The semi-structured questions were aimed at gathering two types of information. The first: why students would be more active in the Spring as opposed to the Fall outside of the *in motion* intervention. The second: why the champion believed their school was more/less active than other schools involved in the

study. The questions were developed based on the results from the previous data collection and are included in Appendix F.

3.4 Data Entry

Responses from the pre-survey were entered by hand into SPSS version 14.0. The responses from the post-survey were entered by Scantron and were monitored by experienced personnel. Scantron was used for post-survey instead of by hand entry due to ease and speed of entry, this option was not available for pre-survey. The Scantron entries were converted to an SPSS file. The quantitative responses from the champion surveys were compiled into Excel spreadsheets. The responses from the qualitative questions in the champion questionnaire were put onto queue cards for typological analysis (for further information see section 3.5.4- analysis of qualitative inquiry).

3.5 Data Analysis

3.5.1 Physical activity Rates

Participants were not tracked from pre- to post-survey. Codes were assigned to each participant, but they were not used to compare individual responses from pre- and post-surveys. A physical activity score (PAS) was generated for each participant by using the pre assigned multiples of nine, five, and three, METs for reported bouts of vigorous, moderate, and mild activity respectively (60). These scores were combined and used to generate a mean PAS for all participants. The mean PAS for all participants was compared pre- and post-survey to ascertain any increase or decrease in physical activity. Statistical significance was garnered using an independent samples t-test.

Sub-group analysis of PAS was done on a number of variables, including: grade, gender, and school. A mean PAS was used for each level of each variable. Significant differences between levels of each variable (for example: all grades compared to each other) were investigated for pre-survey, and post-survey separately. This was accomplished using an independent samples t-test for gender, and ANOVA with post-hoc analysis for grade and school. Each level of each variable was then examined separately (example: grade 9's only), significant change in mean PAS from pre-survey to post-survey was determined using an independent samples t-test.

With regards to the t-tests, if Levene's statistic for equality of variances was not significant, the t-statistic for equal variance was used. If Levene's statistic was significant the t-statistic for equal variances not assumed was used. For ANOVA, if homogeneity of variances was observed, then ANOVA with Tukey Post-hoc analysis was used (65). If homogeneity of variances was not observed, then Welch's statistic with Dunnett's C post hoc was used (66). Magnitude of change for each level of each variable from pre- to post-survey was obtained by subtracting mean PAS of post-survey from that of pre-survey. Magnitude of change was also analysed descriptively to determine if any patterns emerged.

3.5.2 Dose of Intervention

The intervention run in each school was categorised into one of three levels: high dose, moderate dose, and low dose. Categorising in-school interventions into differing levels of dose has been done by Felton et al.(22) and Thackeray et al.(67). However, this study differed in one important aspect, the dose of intervention run in each individual school was not determined before implementation, as was done in other studies. The dose of intervention was self-selected by schools depending on what activities each school chose to implement from a supplied implementation strategy (*in motion* high school strategy). Dose was uncovered for each school after implementation had occurred from information gathered during the course of the in-person champion questionnaires. The logic behind the scale used to determine dose is discussed in the following paragraphs.

The strategies used for the *in motion* intervention can be classified as falling into two of the categories of social marketing: promotion, and placement.(57) These are explained here in a physical activity context. Promotion encompasses activities that are intended to convey the costs and benefits of physical activity, and promote increasing activity. An example of promotion would be school announcements highlighting the impact physical activity on school performance. Placement traditionally refers to having a product in front of a customer in the right place at the right time. In the context of physical activity, placement would be having an activity opportunity in the school, at lunch hour for easy access by students. Both promotion and placement are essential for

behaviour change (57). The impact of differing doses of promotion on behaviour change has been evaluated in the elementary school setting (68) and a relationship was found between daily promotion and higher intended behaviour change. Additionally, higher physical activity rates have been correlated with increased activity opportunities in schools (12, 38), or more “placement” of activities in the school. Therefore, the scale developed to assess dose of intervention in each school was formed based on the assumption that more frequent activity promotion and activity placement would have greater impact on physical activity behaviour.

The scale consisted of six areas, and the point value received depended on the frequency of implementation of that area within the school. The scale only considered *in motion*-specific activities, meaning those activities which were conducted purposefully by the champion to comprise the *in motion* intervention in the school (explained in more detail in table 3.1). There is no consideration in the dose tool for pre-existing physical activity opportunities (e.g. sports teams, intramurals and open gym time), as these were found to be similar between most schools in the study. There was only one school that differed in terms of pre-existing activity opportunities and that was the alternative school. This school did not have sports teams, and had less frequent intramurals. The scale was split into promotion and placement activities. Promotion activities included: having *in motion* announcements, having an *in motion* bulletin board, including *in motion* messages in a school newspaper or newsletter, and having *in motion* posters in the school. Placement activities included: stating an *in motion* physical activity club, conducting *in motion* physical activity challenges, and starting a workplace wellness program for school staff.

There was equal weighting given to promotion and placement opportunities. This is because of the research that was performed with inactive high school students during formulation of the intervention (55). Students stated that they felt communication of opportunities to be active outside of school, along with promotion of the benefits of physical activity would encourage them to be active. The students did not favour in school-based activity opportunities, rather expressed a desire to know more about activity opportunities in their communities. Therefore, the communication

has been given equal weighting to activity opportunities because inactive students stressed its importance.

Table 3.1 Scale Used to Determine Dose of Intervention Implemented

Activity	Frequency	Dose points
Promotion		
Announcements	Daily	3
	Weekly-monthly	2
	Once a semester-rarely	1
Bulletin Board	Changed monthly-bi monthly	2
	Changed rarely	1
Newspaper/newsletter	Messages monthly-bi monthly	2
	Messages less than bi monthly	1
Posters	Present in school	1
Placement		
Clubs	Started in school	1
Challenges	1 or more a semester	2
	Less than one a semester	1
Workplace wellness	Present in school	1

The highest score possible on the dose scale is 12. Schools that score between 0-4 points were considered low dose schools, 5-8 points were considered moderate dose schools, and 9-11 points were considered high dose schools. This scale was formed after champion in-person questionnaires had been administered in the schools. It reflects the range of activities implemented in the schools and their frequency (i.e. highest points go to highest frequency actually accomplished in schools, not necessarily highest possible frequency). There are no other examples in the literature of this type of classification of intervention being done (post implementation, equal weighting of communication and activities) and therefore is an original aspect of the study.

Comparison of Physical Activity by dose level

The PASs corresponding to the students in schools in each category were combined and represented as a mean PAS per dose level. The mean PAS of each dose level was compared using ANOVA with post hoc analysis to determine any significant difference between categories pre- and post- intervention separately. Significant change in mean PAS within each dose level from pre-survey to post-survey was determined using t-tests.

Along with analysing mean PAS by dose of intervention, responses to the questions regarding students' recall of *in motion* in school, and opinion of how *in motion* had impacted personal activity rates, were compared between doses. Chi-squared tests were used to determine if a relationship existed between dose of intervention and student recall of *in motion* (in general and in all school mediums in dose scale: announcements, bulletin boards, newspaper/newsletter, posters), and opinion of how *in motion* had impacted personal activity level. Pearson's correlation was used to determine the degree to which dose explained the variations in recognition and opinions of *in motion*'s impact.

3.5.3 Support and Barriers of *in motion* Implementation

As already mentioned, data was gathered pertaining to supports and barriers experienced by the *in motion* champion during implementation. Responses from champions were grouped together by dose level, to represent commonalities and differences of supports and barriers experienced by champions at each dose level. Due to the close-ended, fixed response format of the questions, the responses are not considered qualitative in nature. These responses are presented to help describe the environments of the schools involved.

3.5.4 Qualitative Inquiry

Qualitative data was analysed using typological analysis (64). Typological analysis involves the creation of an a priori assumption and then the application of this assumption to the data under investigation. Basically, the investigator formulates an assumption(s) pertaining to the data under investigation before analysis begins, and then proceeds to analyse the data according to this assumption. For example, in this study, the a priori assumption was that the champion experiences with *in motion* would differ according to dose level implemented in the school; responses were analysed according to the dose of intervention implemented. Specifically, the data was separated according to the dose level of the champions and the similarities and differences of experiences reported by champions at different dose levels were recorded. The representation of the data is a compilation of the response from each category of dose and their similarities and differences. (69)

For analysis of the semi-structured questions from the champion in-person questionnaire, generic codes were created consisting of: *in motion* impact on school life, and lessons learned. These codes were chosen a priori and were generated from two questions used on the champion in-person questionnaire. Champion responses to each corresponding question on the questionnaire were put onto individual queue cards. Queue cards falling under each code were grouped according to the dose level of the intervention run in the school. Responses were compared to look for commonalities and differences within and between dose levels. Commonalities in responses within and between dose levels were used to represent themes. Responses under each theme were grouped together and discussed in terms of commonality between dose levels.

Similarly, analysis of the responses to the semi-structured questions from the in-person follow-up questionnaires was done in two ways, comparable to above. First, an a priori code was generated of: why students are more or less active in your school. This code came from one of the follow-up questionnaire questions. Responses from the corresponding question were grouped according to the amount of change in physical activity observed in the students of the school (higher than average or lower than average), and commonalities were used to represent themes in champion responses. Second, a priori code was from another question on the follow-up questionnaire was

generated; why are students more active in the Spring as compared to the Fall. All responses from the corresponding question were looked at together, and commonalities were recorded. These commonalities were represented as themes.

4. RESULTS

4.1 Participants

Pre-Survey

In total, ten schools were surveyed with 5712 students completing the pre-survey. The students were male and female from grades nine to twelve. If students chose not to participate, it was of their will and no explanation was sought. The total population of the schools who participated in the pre-survey was 10,417 students; the pre-survey sample was 5712 students, giving a participation rate of 55% (for school specific participation rates see table 4.1).

Post-Survey

In total, 3299 students from eight high schools filled out the post-survey. As with the pre-survey, the students were both male and female and from grades nine to twelve. Two schools that were involved in the pre-survey failed to have students complete the post-survey. Pre-survey responses from these two schools were subsequently dropped from all analysis, resulting in 1317 students being excluded from pre-survey (new pre-survey $n = 5711 - 1317 = 4394$).

The total population of the eight schools that completed the post-survey was 8731 students, giving a participation rate of 38%. Total school population is quoted as of September 2005. Thus, discrepancies in participation rate due to decrease in overall numbers of students in May of 2006 are not captured.

School specific participation rates are listed in table 4.1. They vary from a high of 64% to a low of 26% of the student body. Pre- and post-survey participant demographics are displayed in table 4.2, data is only shown for those schools that administered surveys at both time points. There is a fairly even distribution of grades and genders, but a consistent over-representation of public school students. This is most

likely due to there being more Public school students, as compared to Catholic school students, enrolled in the eight schools included in the study. Additionally some schools (one and three in pre-survey, one and four in post-survey) are underrepresented in the overall sample. In school one; this is due to the low enrolment at the school. For schools 3 and 4 it is not known why the response rates were low in the pre- and post-survey. As a result, comparing participation rates does not reflect the comparative enrolment rates for the ten schools in the city.

Champion In-person Questionnaire

In total ten champions were administered the champion in-person questionnaire, including: three members of administration and seven staff members (5 physical education teachers, one homeroom teacher, one science/math teacher). Two of the champions surveyed were from schools that did not complete the post-survey, therefore their responses are not included in analysis (one member of administration and one staff member).

Champion follow-Up Questionnaire

Seven of the eight champions who were included in final sample of *in motion* champions from the champion in person questionnaire, were included in the champion follow-up questionnaires. One champion could not be reached due to being on maternity leave.

Table 4.1 School Specific Participation Rates for Pre and Post-Survey

School	School Population	Participation rate pre-survey	Participation rate post-survey
1	247	39%	32%
2	997	64%	39%
3	1031	30%	61%
4	1526	40%	16%
5	1479	42%	26%
6	1240	54%	28%
7	1244	68%	56%
8	967	62%	55%

Table 4.2: Participants of Pre- and Post- Surveys

	Variable	Category	Number of participants	% of total
Pre-Survey	Grade	9	1117	25.6
		10	1303	29.9
		11	984	22.5
		12	960	22.7
		Not Reported	23	
	Gender	Male	2135	49.0
		Female	2222	51.0
		Not Reported	30	
	School	1	96	2.2
		2	637	14.5
		3	308	7.0
		4	617	14.1
		5	619	14.1
		6	668	15.2
		7	847	19.3
		8	595	13.6
		Not Reported	0	
System		Catholic	1400	32.0
	Public	2980	68.0	
	Not Reported	7		
Post-Survey	Grade	9	1059	32.6
		10	914	28.1
		11	664	20.4
		12	611	18.8
		Not Reported	51	
	Gender	Male	1538	48.6
		Female	1625	51.4
		Not Reported	136	
	School	1	79	2.4
		2	391	11.9
		3	625	18.9
		4	238	7.2
		5	390	11.8
		6	349	10.6
		7	691	20.9
		8	536	16.2
		Not Reported	0	0
System	Catholic	819	24.8	
	Public	2480	75.2	
	Not Reported	0	0	

4.2 Sensitivity Analysis

Due to the presence of many outliers in the post-survey responses on the Godin questionnaire, sensitivity analysis was performed for all statistical tests. All tests were run with all PASs, and with the top 1%, 2.5%, and 5% PASs removed. Outcome of all statistical tests were compared to see if removing proportions of the sample impacted statistical significance.

Removing differing portions of PAS scores did not impact significance when comparing scores across pre- and post- surveys, but it did change the number of significantly different pairs within pre- and post-survey variables. Therefore, it was decided to report the results from the tests excluding the top 5% of the data set from pre- and post- surveys. Removing the top 5% of the data will give the most conservative results, thus lessening the chance we are reporting false positive results due to over inflation of responses on the Godin questionnaire.

4.3 Physical Activity

4.3.1 Overall Impact of the *in motion* Intervention on Self-Reported Physical Activity

3886 students' completed Godin leisure time physical activity questionnaires were included from the pre-survey, and 3102 from the post-survey. A significant increase in mean PAS was observed from pre- to post- survey.

See table 4.3.

Table 4.3: Comparison of Godin Physical Activity Score Pre- and Post- Surveys.

	Number	Maximum Score	Mean Score (SE)	T-Score	P-Value
Pre test	3886	156	69.2 (0.51)	$t(3920.355) = -21.15$	$p < 0.0001$
Post test	3102	450	98.6 (1.40)		

4.3.2 Impact of Recall of *in motion* on Physical Activity

The percentage of students who recalled *in motion* increased from pre- to post-survey. Students who recognised *in motion* had a significantly higher mean PAS before initiation of *in motion* in their school, which continued into the post-survey. Changes in mean PAS from pre- to post-survey for those who recalled or did not recall *in motion* were both significant at $p < 0.0001$. Students who recalled *in motion* reported significantly higher activity than those who did not in both pre- and post-survey. See results in Table 4.4

Table 4.4 Mean PAS of Students Who Recall *in motion* as Compared to Those Who Do Not

Recall <i>in motion</i>	Number	Mean PAS	t-statistic	p-Value
Pre-survey				
Yes	3191	68.5 (0.50)	-5.315	0.000
No/Unsure	673	61.4(1.26)		
Post- survey				
Yes	2559	105.9(3.83)	2.122	0.034
No/Unsure	500	97.2(1.50)		

4.3.3 Impact of *in motion* on Self Reported Physical Activity by Subgroup

Changes in mean PAS for all levels of gender, grade, and school were significant from pre- to post- survey. The mean PAS for each level post-survey was significantly higher than the mean PAS pre-survey. Activity levels rose in participants regardless of grade, gender, or school.

Magnitude of change in mean PAS for each level of each variable was different. For gender and grade, those levels that had higher mean PAS at pre-survey, had greater change from pre- to post-survey (males and grades 9 and 10). For the subgroup of school, the two levels with the lowest mean PAS at pre-survey (one and eight) had the highest magnitude of change, with the rest of the schools not following any discernable pattern.

Within variables, the number of significantly different pairs changed from pre- to post-survey. Grade and school had multiple pairs with significantly different mean

PAS in the pre-survey, but fewer differences at post-survey. Gender remained significantly different in pre-survey and post-survey. This indicates that the levels of the variables grade and school were becoming more similar in activity from pre- to post-survey, but differences by gender were remaining. Pre-survey results are displayed in Table 4.4; post-survey results are displayed in Table 4.5; comparison of pre- to post-survey is displayed in Figure 4.1 and 4.2

Table 4.5: Godin Physical Activity Score from Pre- Survey Responses by Subgroups of Gender, Grade, and School

Variable	Number	Mean Score	Test statistic	p-Value	Post hoc: Significant pairs*	p-Value
Gender						
Male	1853	72.4(1.41)	t(3720)=-9.597	p<0.0001		
Female	2007	62.5(1.01)				
Grade						
9	981	73.7 (0.99)	F(3,3863) = 43.357	p<0.0001	9&11	p=0.0001
10	1146	70.9(0.91)			9&12	p=0.0001
11	861	63.4(1.09)			10&11	p=0.0001
12	879	59.2(1.03)			10&12	p=0.0001
					11&12	p=0.022
School						
1	75	53.9(4.39)	F(7,885.251) = 8.021	p<0.0001	1&2	Mean Dif is Significant at 0.05 level.
2	566	70.6(1.34)			1&5	
3	280	62.8(1.77)			1&6	
4	509	64.5(1.40)			1&7	
5	556	69.6(1.40)			2&3	
6	612	71.0(1.31)			2&4	
7	750	68.1(1.11)			2&8	
8	538	62.1(1.28)			3&6	
					4&6	
					5&8	
					6&8	
					7&8	

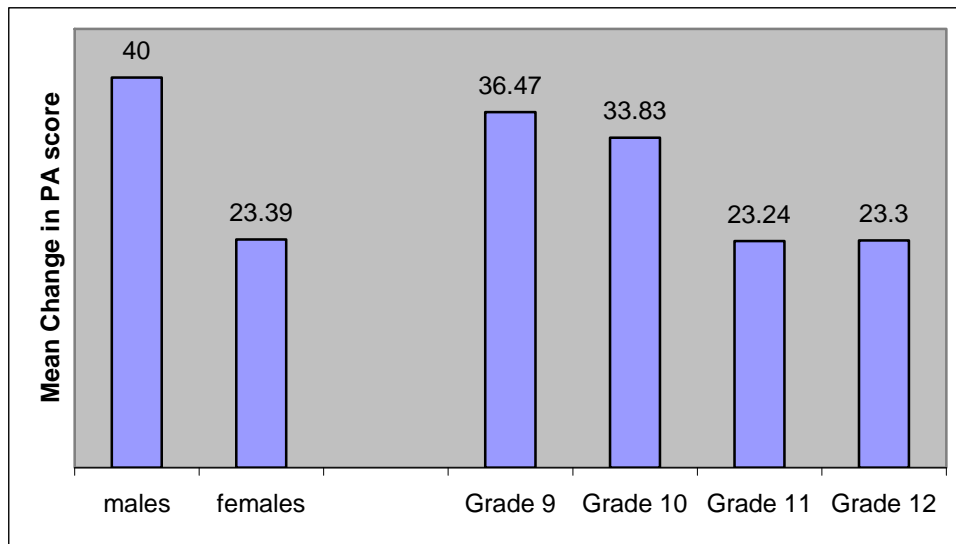
**Numbers represent the either the grades or the schools of the two groups involved in the significant pair. Ex: 1&3 = school 1 and school 3 OR 9&12 = grade 9 and grade 12*

Table 4.6: Godin Physical Activity Scores from Post-Survey Responses by Subgroup of Gender, Grade, and School

Variable	Number	Mean	Test Statistic	p-Value	Post Hoc: Significant Pairs*	p-Value
Gender						
Male	1426	112.4(1.72)	t(2724.82)=-9.453	p < 0.0001		
Female	1551	85.9(2.25)				
Grade						
9	1002	110.2(2.53)	F(3, 1593.286) = 24.634	p < 0.0001	9&11	Mean difference is significant at 0.05 level
10	850	104.7(2.79)			9&12	
11	627	86.7(2.82)			10&11	
12	578	82.5(2.86)			10&12	
School						
1	68	100.1(11.62)	F(7, 734.734) = 2.499	p = 0.015	2&4	Mean Difference significant at 0.05 level
2	367	110.5(4.53)			2&7	
3	590	98.5(3.22)				
4	213	88.4(4.66)				
5	374	101.8(3.99)				
6	333	96.7(4.26)				
7	646	92.4(2.87)				
8	511	101.2(3.43)				

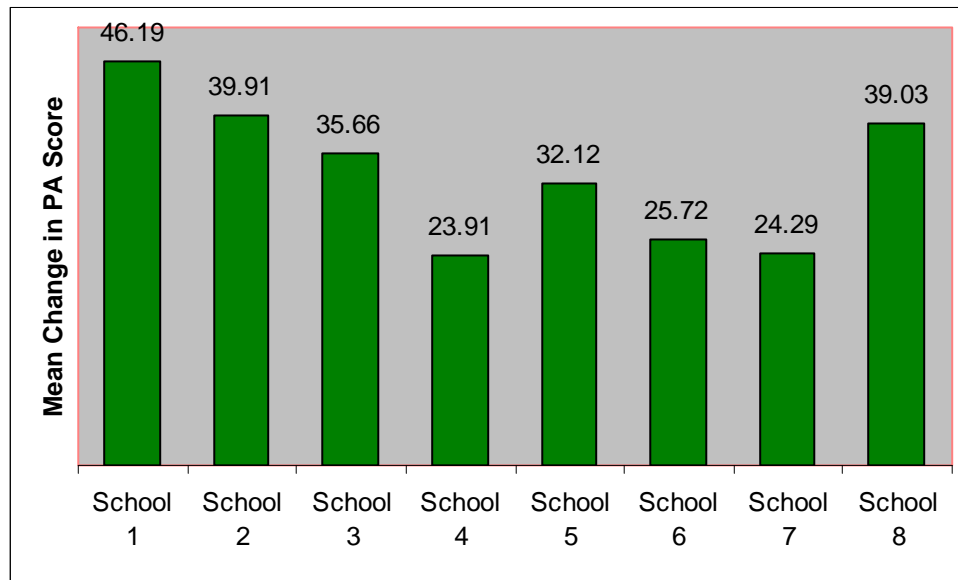
*Numbers represent the either the grades or the schools of the two groups involved in the significant pair. Ex: 1&3 = school 1 and school 3 OR 9&12 = grade 9 and grade 12

Figure 4.1 Graph of Magnitude of Change in Mean PAS for Gender and Grade



**All changes significant at p<0.0001

Figure 4.2 Graph of Magnitude of Change of Mean PAS for Individual Schools



** All changes significant at $p < 0.0001$

4.4 Dose of the *in motion* Intervention.

4.4.1 Description of High, Moderate, and Low Dose Schools

The developed scale for the assessment of dose of intervention was applied to data from the in-person champion questionnaires and resulted in two schools being classified as high dose (schools seven and eight), four schools being classified moderate dose (schools one, two, five and six), and two schools being classified as low dose (schools three and four).

The two low dose schools were fairly similar, they were both mainstream community schools in the public school division, located in low SES neighbourhoods. The four moderate dose school were less similar. One of the moderate dose schools was an alternative school in the catholic system, the other three were mainstream, one being Public and the other two being Catholic schools. Two of the mainstream high schools were in moderate to high SES neighbourhoods and one was in a low SES neighbourhood and was a community school. The high dose schools were both located in moderate to high SES neighbourhoods, and were classified as mainstream high schools within the public school system.

As mentioned in the methods section, most schools were similar in terms of the pre-existing activity opportunities in the school. The only school that was not was the moderate dose alternative school.

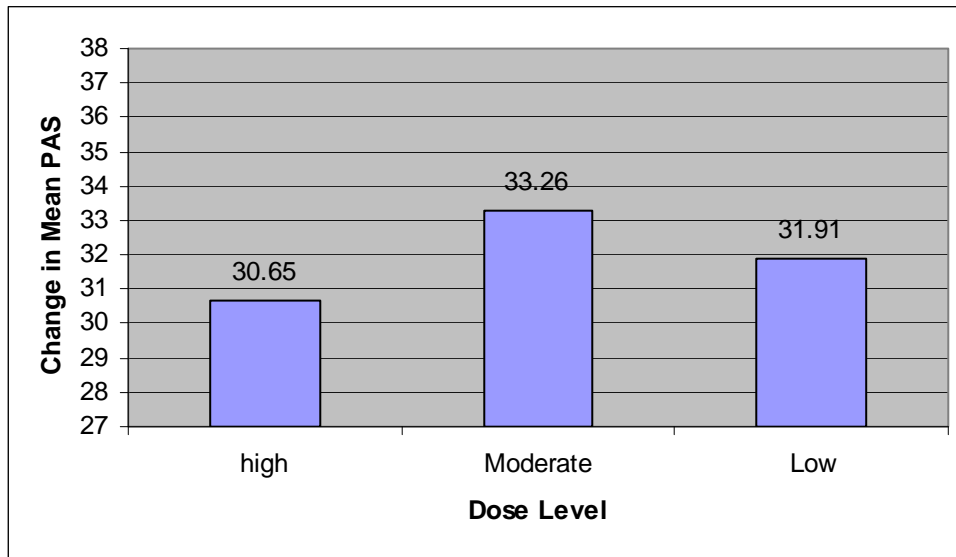
4.4.2 Impact of Dose Level on Self-Reported Activity

Activity levels corresponding to schools in all dose levels underwent significant increases in mean PAS from pre- to post- survey, $p < 0.0001$. At the time of the pre-survey, the mean PAS for what would be moderate dose level schools was significantly higher than the mean PAS for what would be considered high or low dose level schools. At the time of post-survey there was no significant difference between the mean PAS for any dose level. An increase in activity was found for all doses of *in motion*. No significant dose-response relationship was found between dose of *in motion* implemented and change in physical activity. For pre- and post- survey dose level relationships, see Table 4.6. For magnitude of change from pre- to post- survey see figure 4.3.

Table 4.7: Comparison of Self-Reported Physical Activity By Dose Level

	Number	Mean PA Score	Test Statistic	p-Value	Post Hoc: Significant Pairs	p-Value
Pre-Survey						
High dose	1288	65.6(0.8423)	F(2,2068.928) =11.703	P<0.0001	2&1 2&3	All differences significant at p = 0.05
Moderate dose	1809	69.7(0.7705)				
Low dose	789	63.9(1.0997)				
Post-Survey						
High dose	1157	96.3(2.2052)	F(2,3099) =2.872	p=0.057	N/A	N/A
Moderate dose	1142	103.0(2.4207)				
Low dose	803	95.8(2.67090)				

Figure 4.3: Change in Mean PAS of Different Dose Levels



**** All changes significant at p< 0.001**

4.4.3 Impact of the Dose of Intervention on Student Recognition of *in motion*

The relationship between dose and general recognition of *in motion* was significant with $\chi^2 = 32.881$, $df = 6$, $p < 0.0001$. The relationships between dose and all specific medium recalls was significant at $p < 0.0001$. Dose was able to explain approximately 7-16% of the variations in general and medium specific recognition. The higher the dose of *in motion* in the school the more likely the students were able to recall *in motion* in general and in specific mediums (announcements, bulletin boards, posters, newspapers/newsletters, challenges). Refer to Table 4.8 for these findings.

Table 4.8: General and Medium Specific Recall of *in motion* by Dose Level

Level	General recall of <i>in motion</i> (%)			School specific avenues (% of students who recall)				
	Yes	No	Unsure	Announcements	Bulletin Boards	Posters	Newspaper/ Newsletter	Challenges
High	77.8	7.0	13.7	46.4	45.2	44.1	21.3	23.8
Moderate	71.3	8.3	19.0	36.5	38.6	38.2	21.0	20.1
Low	68.6	10.3	20.5	26.5	34.5	35.7	15.2	15.1
	$\chi^2(6)=32.881$ $p < 0.0001$ $r^2 = 0.103$			$\chi^2(2)=80.832$ $p < 0.001$ $r^2=0.161$	$\chi^2(2)=24.098$ $p < 0.001$ $r^2 = 0.088$	$\chi^2(2)=15.622$ $p < 0.001$ $r^2=0.071$	$\chi^2(2)=39.56$ $p < 0.001$ $r^2 = 0.113$	$\chi^2(2)=22.310$ $p < 0.001$ $r^2 = 0.085$

4.4.4 Impact of Dose of Intervention on Student Opinion of *in motion*'s Impact on Personal Physical Activity

The relationship between dose and opinion of how physical activity promotion has impacted personal physical activity was significant with $\chi^2=124.180$, $df = 12$, $p<0.0001$, $r^2 = 0.200$. Dose was able to explain approximately 20% of the variations in student opinions of benefits of physical activity promotion in their school. The dose of *in motion* implemented in the school was significantly correlated to how the students felt their school's efforts to promote physical activity impacted their personal activity level. See results in Table 4.9

Table 4.8 Student Opinion of How School-Based Physical Activity Promotion has Affected Their Activity Level by Dose.

Response	High Dose	Moderate Dose	Low Dose
Yes, it has helped me become physically active (%)	9.3	17.4	11.6
Yes, it has helped me maintain my physical activity (%)	22.2	30.4	26.2
No, I have always been physically active (%)	51.0	34.4	43.0
No, I am not interested in being physically active (%)	10.7	5.9	7.1
No, I am unable to be physically active due to illness/disease (%)	0.9	1.2	0.9
Unaware that our school has been promoting physical activity (%)	4.3	8.8	9.5

4.5 Supports and Barriers for *in motion*

The opinion of champions, in terms of supports and barriers they experienced during implementation of *in motion* in the 2005/2006 school year, were believed to have an impact on the resulting dose level that was run in each school. Reported barriers to the *in motion* interventions were similar across all dose levels and these included: limited participation from other staff, constraints on how much time could be allocated to *in motion*, and student commitment to the intervention activities. In terms of supports, there were differences between dose levels. Specifically, higher dose levels schools had more involvement from other staff and administration with planning and implementing the intervention components.

*Barriers to the **in motion** Intervention*

All champions mentioned limited participation from other staff as a barrier. They found it was hard to get people to volunteer and/or give up class time for events. Some champions mentioned staff would have liked to be more involved in the intervention but other commitments prevented them from doing so. In some schools lack of involvement from administration was especially noted, with one champion reporting that there was a lack of encouragement for implementing *in motion* in the school, but this was not consistent across all schools.

Many champions mentioned time restraints as a barrier. All champions were involved with other activities that took precedence over the *in motion* intervention. One champion said “ [there is] always a time restraint of how much you can do, when you can be there”. The champions were all full time teachers or administrators in the schools and had other curricular (e.g. classroom planning) and non-curricular (e.g. coaching a team) commitments, which they often felt had to take precedence over the planning and implementation of the *in motion* intervention. To this end, all champions said they would welcome other staff to help plan and implement the intervention, which may help limit the personal time they needed to commit. This time constraint most likely exacerbated the lack of other staff involvement in the intervention.

Many champions, for a number of reasons, mentioned student commitment to the intervention activities as a barrier. One champion noted that those students who were participating in the intervention activities were often involved with other activities, which limited how much they could participate. Another champion noticed it was hard to get grade nine and ten students to participate in the activities, as compared to grade eleven’s and twelve’s, but did not offer a reason as to why this might be. Furthermore, another champion mentioned that students who did come out at first stop participating early into the programs/events. Lack of student commitment was an obstacle in implementing intervention activities, as one champion noted: “a good percent of students do not perceive physical activity as the most desirable thing to do”.

Support for the in motion Intervention

Inquiry into supports experienced for the planning and implementation of the *in motion* intervention revealed some important differences between dose levels. The most common difference between high and moderate/low dose schools was that the intervention in the high dose schools was run by a group of teachers, a wellness committee, of which the champion was the head. Moderate/low dose school interventions were planned and implemented by only the champion. In high dose schools, the wellness committees were composed of teachers, and sometimes students, who were involved in planning and implementing activities in the schools to promote healthy lifestyles. These committees all pre-existed the *in motion* intervention and thus, *in motion* was taken on as an additional activity planned and implemented by the group. In conjunction with these wellness committees, high dose champions mentioned staff helping more often with the planning and implementing of the intervention components as compared to champions at other dose levels.

In moderate dose schools, one person, the *in motion* champion, generally ran the school's intervention. There was help from other staff in passing along information to students and participating in events, but not in planning or implementation. Similarly, one staff member was responsible for running the *in motion* intervention in both the low dose schools as well. No staff support was mentioned in low dose schools, with one champion noting that other staff was too busy to help. Both low dose champions mentioned that administration indicated that they would have been supportive if they required release time to run the intervention, but this was not needed.

There appeared to be a gradient of staff involvement in the intervention, with high dose schools having the most, followed by moderate dose schools and then low dose schools. The higher level of support from other staff may be contributing to the greater amount of activities that comprised the *in motion* intervention in high dose schools as compared to moderate and then moderate as compared to low.

Some champions also mentioned how they themselves were going to further support the growth of the intervention in the future. Champions from all dose levels mentioned activities they were planning to integrate into the intervention in the coming year. Champions mentioned that they did know there was more they themselves could

do to promote *in motion* in the school, and they planned on integrating more of activities in the coming year. This was not more or less common in any dose level.

4.6 Qualitative Inquiry

4.6.1 *In motion* Impact on School Life

Two main themes emerged under impact of *in motion* on school life: the positive aspect of *in motion*, and intention to grow the initiative. First, champions of all dose levels thought that *in motion* was a good campaign to have in the school. They thought that it was good that there was a program starting in the school that was focused on getting students to be active, and acknowledged the importance of physical activity in students' lives. Champions felt it was hard to discern the effect it was having on students. One high dose champion noted that *in motion* was directly in-line with their school's goal of increasing activity levels in their students, but it was hard to tell the impact *in motion* was having: "it's hard to tell if [*in motion*] is making a difference, you always want more [change] all the time". One moderate dose champion mentioned that there was lots of research that proved that increasing physical activity in youth was important, and thought that it was easy to prove that *in motion* was a beneficial program for students. Another moderate dose champions thought the effect of *in motion* would not be evident at this time, but it would impact students in the long-term. Low dose champions saw the importance of *in motion* in their schools, with one champion noting that *in motion* could be used as a safe alternative to other detrimental lifestyles. One low dose champion thought that *in motion* was really only beneficial for those who choose to participate. This champion felt *in motion* would have more impact if participation in challenges and events increased, reaching more of the student body.

Many champions highlighted the schools intention to grow their school's initiative in the coming school year. Specifically, high dose champions highlighted the efforts they made to incorporate *in motion* into as many events as possible. One champion said that the strategy for the next school year was going to be to get staff more involved in *in motion*: "we are focussing next year on staff, getting staff to buy-in [to *in motion*], it makes it easier for students to buy-in". Low dose champions also had the intention of making *in motion* a bigger presence in their school, with one champion

mentioning multiple strategies that are going to be employed to do so, such as getting new materials for the weight room and promoting the intervention more and creating a fit club. This champion stated, similar to the high dose champion: “we want to make wellness important to students, and we want staff to model it”. Moderate dose champions were less forthcoming for plans for the intervention, but their intention to continue implementation was evident.

Though the champions felt it was hard to tell definitively the kind of effect *in motion* was having on the student body, they viewed the *in motion* intervention as a positive aspect of their school. Many were prepared to increase the activities they incorporated into their *in motion* intervention in the coming school years, and were hopeful that impact of *in motion* on students physical activity levels would be seen in the future.

4.6.2 Lessons *in motion* Could Learn From Champions’ Experience

Different themes emerged from champions in terms of lessons learned from their experiences in implementing *in motion* in their school. These lessons could help *in motion* to better support the implementation of the intervention in future schools. Each of the themes emerged from champions at different dose levels and included: the need to uncover adolescent motivations to be active from high dose champions; the process of *in motion* in the school from moderate dose champions; and the need to tailor the intervention to different demographics from low dose champions.

The theme of needing to uncover adolescent motivation for physical activity was seen as important to increase the intervention’s success in high dose schools. The high dose champions believed that student motivation had to be better understood to get students to participate in activities. They highlighted their successes throughout the year, but acknowledged that many of the students who participated in the *in motion* events are those that are already active. The champions thought that if *in motion* could provide them with more information on how to motivate their students to take part in activities it would help increase the success of the intervention in their school. The champions felt that knowing more about what motivates students to be active may increase participation in events.

Moderate dose champions stressed that *in motion* was a slow process that was anticipated to grow through a few school years. One champion said, “keep getting information out and eventually it will work its way into the fabric of the school, [it is a] slow transition, but baby steps are ok until you get there”. They added that it takes creativity and time to implement, as one champion offered: “keep slugging away, there is always resistance to something new, but if [*in motion*] keeps providing resources and different ideas, it helps”. It was acknowledged that someone in the school had to make *in motion* a priority to implement. One champion thought that the *in motion* message of increasing physical activity needed to come from another source, other than a phys-ed teacher since they already encouraged physical activity. The opinion of the moderate dose champions was that announcements were the best way to reach students, and e-mail was the best way to reach staff.

The theme from low dose champions was that *in motion* had to tailor to different demographic groups (lower SES, ethnic minority youth). These champions indicated that more strategies were needed to reach students from different backgrounds. The two low dose champions acknowledged that they had multiple demographic groups in their school, in terms of culture and SES, and one champion thought that the *in motion* intervention was not tailored to all of them. This champion thought that students from some demographic groups might not be as drawn to the activities as others due to SES or cultural factors, in terms of preferences and barriers to activity. Another champion noted that it was often hard to have one program that was adapted to the needs of students from different backgrounds, but thought more resources were needed in order to achieve this.

Though the themes were different from champions of different dose levels, the lessons *in motion* could learn from their experiences all centred on how *in motion* could increase its success in the school environment. As a result, providing more information to champions on how to motivate students, prioritising and providing ideas on how to implement the intervention, and having aspects of the strategy that can appeal to all student groups would most likely increase the impact of *in motion* in the high school environment.

4.6.3 Semi Structured Questions From In-Person Follow-Up Questionnaires

When champions were asked to interpret the results from the students in their schools, they were asked to comment on why students may be more active at the time of the post-survey as compared to the pre-survey. The champions were also asked why their schools may have had a greater and/or lesser change as compared to other schools. Their responses to these questions were thought to be indicative of factors that worked in conjunction with the *in motion* intervention to increase activity levels of students. Their responses are explained in more detail below.

Why Students Would be More Active at Time of Post-Survey as Compared to Pre-Survey

Three themes emerged when champions were asked why students would have activity levels increased at post-survey as compared to pre-survey: increased availability of community activities, better weather, and greater comfort in the school environment. The most obvious answer, which was given by all champions, was that the weather in spring (i.e. time of post-survey) is warmer and thus more conducive to outdoor activity as compared to fall (i.e. time of pre-survey) (weather was warmer in the spring of 2006 as compared to the fall of 2005). Students have been observed to be more active outdoors, and use active commuting more frequently in the spring as compared to the fall. Additionally, one champion noted that after a long winter of having to stay indoors, students are more willing to be active outside on their breaks, compared to days with comparable weather in the fall.

Many champions mentioned that community activities, especially sports teams, are more plentiful at the time of post-survey (May) than pre-survey (October). Furthermore, most community sports that students were engaged in were occurring in the spring and not the fall. Particularly popular activities such as soccer, rugby, basketball and softball/baseball were mentioned as having high proportions of students involved, and were only available in the spring. One champion noted: “Lacrosse, ultimate, ball, rugby, there are so many different things in the community that are offered. In school there is more in fall, but in spring in community there is much more; minor basketball, BSI basketball, lots of opportunity”. The amount of students

involved in these activities was thought to have an impact on overall activity level at the time of post-survey and would not have had a similar influence at the time of the pre-survey.

Lastly, the comfort level of students in the school environment was mentioned as possibly increasing activity level at the time of the post-survey compared to the pre-survey. Multiple champions mentioned that they noticed more students engaging in school-based activities as the year went on and thought this was related to the students feeling more comfortable in the school environment as the year progressed. The champions thought this was most applicable to younger students. It was thought that as they became familiar with the school schedule, made some friends and felt more a part of the school community they were more apt to participate in the activities that were available to them. One champion said: “as kids get comfortable they do get involved more (those who were inactive), if they get more friends, all of a sudden the guys are starting to hang around in the gym more. And phys-ed does a good job at getting kids out and making it a good atmosphere to be in.”

Another champion said in response to why kids would be more active in spring as compared to fall: “I would say it was a comfort zone, the first few months of school is stressful for a lot of kids, they don’t feel that comfortable”. Since the pre-survey was in mid-October, the champions felt that some students would not be taking full advantage of the school-based opportunities yet, as they were not fully comfortable in the school. In May, the time of the post-survey, it was thought that all students who were going to be using school-based activities would be doing so since they had been in the school for many months and would feel more comfortable participating.

These three factors: better weather, increased community sports, and higher comfort level in the school environment, were thought to be increasing activity rates in the spring over the fall, regardless of the *in motion* intervention.

Why your School is Exhibiting a Greater and/or Lesser Change Than Other Schools

When analysing responses to the question of: why students in the champion's school would be more or less active than students in other schools, the responses were split into two groups. Responses from champions from schools with a higher than average changes in physical activity were in one group, and responses from champions from schools that had experienced a lower than average changes in physical activity were in another group. Five schools fell into the higher than average category, and three schools fell into the lower than average category. One of the high than average schools will be discussed separately, due to its extremely high change compared to other schools and its alternative environment.

One of the higher than average schools was an alternative school with a fairly different learning and teaching environment as compared to the mainstream schools. This school had the highest change in physical activity. The opinion of this school's champion as to why the students in the school had such a large increase in physical activity was two-fold. The first reason was that the school often had a large turnover of student within the year. Therefore, students who were surveyed for the pre-survey may not have been the same students who were surveyed in the post-survey. Secondly, the champion thought that the students at the school might be more dependent on the weather for their activities of choice as compared to other students, especially since there are no team sports and less organised activity as compared to other schools. Thus, in the spring (post-survey) the students at this school would be much more active as compared to fall (pre-survey) due to the conditions being favourable for their activity of choice (commonly skateboarding and field sports).

Opinions of champions from the remaining schools with higher than average change were fairly consistent. The remaining champions felt that the strength of the phys-ed team (phys-ed staff) in their school would lead to a higher change than other schools. It appeared that even though the champions were mentioning lack of staff support for *in motion* activities there was a strong staff team promoting activity in their school outside of the *in motion* intervention. In the higher than average category, three out of the four champions commented that their phys-ed team was very engaged with the students and there was modelling of an active lifestyle by school staff. Many

champions noted how successful phys-ed staff was at getting many students to try out for school sports and felt the students responded well to them. One champion commented:

“Quite a few teachers are active themselves, and really promote the extra curricular opportunities. They go walking up and down the hallways saying – hey are you coming out for wrestling, track, basketball, football. The phys-ed teachers and just teachers in general do a really good job of recruiting [the students]. [The students] see people who are very visibly identifiable as people who are involved in sports and activity and they walk it and talk it”.

Correlated, the champions thought that the PE team was influencing all grades, even though only grade nines and tens have mandatory PE, as their interaction with the students was not limited to only those in their PE classes. The one champion that did not mention modelling by staff did mention a strong community association in the area. The champion said there were a huge amount of activities that were available in the spring for students.

Two out the three schools that fell into the lower than average group had a common response in the follow-up interviews. Champions noted that they thought their students might be working in jobs outside of the school, more than students in other schools, which was getting in the way of being physically active. One champion said: “the kids work as many if not more hours than kids in other schools to pay for their cars, phones, and money for activities on the weekend; then they are driving to school/work, and that is decreasing from their need to bike or walk to school”. The champions were under the impression that time spent working outside of school was time spent not being active. Additionally, the money gained through working was thought to be going towards things such as cars, which were further decreasing activity by reducing the active commuting by these students.

These two variables: engagement and modelling by phys-ed and other staff, and the amounts of students that work, emerged as the predominant themes as to why there was a difference between the schools as far as activity change.

5. DISCUSSION

The purpose of this study was to answer four questions: 1. What is the impact of a community-school-based health promotion strategy on physical activity behaviours of high school students in Saskatoon? 2. Is any change in physical activity observed in participants consistent across all schools, grades, and genders? 3. Do the different doses of *in motion* implemented by schools result in different changes in physical activity behaviours and student recall of *in motion*? 4. How can teachers and administrators be supported in their efforts to implement *in motion*?

5.1 *in motions*' Overall Impact on Physical Activity

The first study question to be answered was: what is the impact of a community-school-based health promotion strategy on physical activity behaviours of high school students in Saskatoon? In response: a 42% increase in the overall level of physical activity was observed during an eight-month period of *in motion* implementation in schools. This increase represents approximately, 3 additional bouts of vigorous activity per week, or 6 additional bouts of moderate activity a week, or 9 additional bouts of mild activity a week, across the study period.

Increases in physical activity levels have been observed with other high school-based physical activity health promotion initiatives, such as LEAP and “planning to be active” (PTBA). Studies of these initiatives found an 8% increase in vigorous leisure time activity (21) and 2.05 day/week increase in moderate leisure time activity (24), as compared to control schools. The increase observed in our study was greater than the increases found in these other studies. This could be due to the whole school approach taken in the *in motion* intervention or the nature of *in motion* being voluntary and strongly informational. Logically, an intervention that targets a whole school population and not solely a subset of the population would result in a larger overall change in physical activity, as all students are receiving the benefits of the program.

Additionally, voluntary approaches have been suggested in two separate reviews of school-based physical activity promotion (38, 50) as it allows students to integrate physical activity into their lives in their own way.

Unfortunately, there were no control schools involved in this study, leading to the question of whether or not the increase observed is more than would be expected in a non-intervention school. Without a control school, comparing these results to the literature can help show the increases observed are more than would be expected in a non-intervention school. Generally, studies of yearly trends in adolescent activity report declining physical activity levels in all genders and grade levels (44, 70). Specifically, adolescent activity levels have been found to decline in grades 9 and 10 overall, and in boys overall, over the course of one year (70). Females overall, and those in grades 11 and 12 overall seem to remain stable (70). Furthermore, another trend analysis done estimated a decline of 2.7% in physical activity per year for boys, and 7.4% in girls (44). In our study, we observed an increase in activity across the time period for both genders and all grade levels. This contradiction to the literature may indicate that the *in motion* intervention helped to increase student activity levels. One discrepancy that must be mentioned is that yearly trends reported in the literature are measured over one calendar year (ex: October – October), whereas our data was collected over 8 months (October – May). The shorter time frame may be impacting the change in physical activity observed if there is a natural influx of activity in May due to factors external to *in motion*.

To this end, though it is fairly certain that *in motion* has contributed to the increase in physical activity levels seen in this study, consideration must be paid to possible influences on activity levels at time of post-survey (May), that may not have been present at pre-survey (October). These influences may have increased physical activity levels in students independent of the *in motion* intervention. In talking with *in motion* champions at each school, differences between data collection periods such as: weather; increased community sports opportunities; and comfort level of students in the school environment were mentioned as variables that could have increased activity levels independent of *in motion*.

In terms of temperature impacting observed increases in physical activity, seasonal variations in activity have been documented. These studies report higher levels of leisure time activity in spring as compared to fall (71), and in summer as compared to winter (72). Moreover, in conversations with champions in the high schools they mentioned that as the weather warms up in the spring the students are more apt to go outside at lunchtime and actively commute. Active commuting is correlated to higher overall activity levels in adolescents, (39, 47) and therefore, if students were actively commuting more often at the time of the post-survey relative to the pre-survey it would correlate to a higher overall activity level. The temperature in Saskatoon in October 2005 (pre-survey) ranged from -7 C to 18 C , and specifically for the week of the pre-survey varied from -1.5 C to 18.5 C , while the temperature in May (post-survey) ranged from 2.8 C to 23.2 C , and specifically for the week of post survey varied from 2.8 C to 23.1 C . This shows that there was warmer weather at time of post-survey.

On the self-report questionnaire, students were supposed to be reporting habitual activity (as is stated in the question), but it is most likely they are recalling their level of activity over the previous weeks. Therefore, the differences in weather between pre- (October) and post- (May) survey could account for a portion of the increase in physical activity level seen.

In terms of the availability of community activities impacting observed change in physical activity, there were several community activities mentioned by school champions that were very popular with students in the spring that were not available in the fall that. These included fastball, basketball, soccer, rugby, and lacrosse. Champions had notices that many students (upwards to half of the student population, as estimated by one champion) participate in sports in their communities that are only available in the spring. Participation in community sport has been correlated to higher overall activity levels (37). If spring community sport is the only activity a student participated in it could have increased their activity level in May over October, as they would not have had access to it in October when the season was not in session. Interestingly, one champion mentioned that there are more school-based as compared to community –based activities in the fall, whereas the reverse is true in the spring. One might assume that these would balance out in terms of impact on students' activity

levels. There may, however, be important differences between the level of participation and the level of physical activity achieved in community-based versus school-based activities. If this is true, it could lead to a greater impact of community activities in the spring, outweighing the greater number of school-based activities in the fall. There was no way for this study to determine this objectively, and therefore champion opinions of the impact of community activities on students activity levels in the spring had to be considered. Increased opportunity for community sport during time of post-survey as compared to pre-survey may have been responsible for a portion of the increase in activity level seen in the study.

Finally, in terms of the impact of the comfort level of students on increases seen in activity level, school champions noted that students became more active as their comfort level increased in the school environment. Champions who were members of the phys-ed staff noticed that students at their school were more likely to participate in school activities such as intramurals, sport teams and the weight room, once they had made some friends, and were familiar with school activities. This increase in activity was reported to be most relevant for those in grades 9 and 10. A few champions noted that due to lower economic level of their students, they thought that activity opportunities present in school were most likely the only the students received. Therefore, they thought once students were more comfortable participating in activities their activity level increased quite a bit. Champions felt that students would have had a higher comfort level in May as compared to October, and thus may have been more likely to participate in school activities in May. This would have increased their activity level independent of *in motion*. Increased comfort level of students in the school environment may also have been partially responsible for the increase in activity level seen in this study.

Without the presence of a control school we cannot definitively say what portion of the observed increase in physical activity is due to the presence of the *in motion* intervention or due to other factors such as weather, community activities, and comfort level of students. *In motion* could have worked in conjunction with these factors by increasing the amount of students who: actively commute when it is nice out; take advantage of community activities; and go out for teams when they feel comfortable.

An indication of the impact of *in motion* was derived from the post-surveys. On the post-survey approximately 13% of students reported *in motion* had helped them increase their activity level, and 26% reported *in motion* had helped them maintain their level of activity. Therefore, we can assume *in motion* was at least a partial contributor to increases in activity levels observed. Additionally, there was a large magnitude of the change in activity levels, and a trend of decreasing activity in the literature studying non-intervention students. If *in motion* was having no impact on student activity levels it is doubtful that we would have seen such a large increase in activity levels.

5.2 Impact of *in motion* on physical activity by subgroup

The second question to be answered by this study was: is any change in physical activity level observed in participants consistent across all schools, grades, and genders? Breakdown of participants by gender, age, and school showed an increase in physical activity levels in all subgroups during the *in motion* intervention. There were differences in the magnitude of change within subgroups, specifically: males had a greater change than females (55% vs. 37%); grade 9 students had the greatest change of all grades (49%), followed by grade 10's (48%) then 12's (39%) then 11's (36%); and individual school changes varied from 35.6% to 85.7%. The differences observed between subgroups are discussed below.

Male and female participants entered the study with significantly different activity levels. Males were more active than females, achieving an additional bout of vigorous activity per week. Furthermore, during the course of the study males had a larger increase in activity (40 points or 4-5 bouts of vigorous activity per week) as compared to females (23 points or 2-3 bouts in vigorous activity per week). Gender differences in physical activity are common in the literature; multiple studies have shown that males tend to be more active than females (12, 26, 38-41). Therefore, finding a larger initial activity level in males was expected. The literature shows that boys are more apt to participate in open activity times(12), PE, and organised sports (40) as compared to females. This encompasses most activity opportunities in schools and the community. Additionally, females report more barriers to organised sport participation as compared to males (14, 34). School staff has noticed the differences in

activity level by gender, and some schools were attempting to organise more female orientated activities. These included, bringing in fitness instructors and having women's only fitness session. These changes were just beginning for many schools and thus their impact was most likely not observed in this study.

Finding a larger increase in activity level in males as compared to females in this study was not a surprise. As indicated above, the literature continually shows gender differences in activity level in adolescents. The larger increase in activity for male participants during the course of the study may point to activity options included in the *in motion* intervention being more conducive to male activity choices. The fact that both genders did experience an increase in activity in this study indicates that *in motion* was beneficial for both, but presently may be more conducive to male activity preferences.

The differences observed between grades in pre- and post-survey responses are consistent with the literature: activity level decreases as grade increases (20, 37, 38, 43-45). Though there was a trend of decreasing activity level as grade increased, all grades increased in activity over the study period. Grades nine and ten achieved an increase in activity equating an extra four bouts of vigorous activity a week, and grades eleven and twelve achieved an increase equating 2.5 more bouts of vigorous activity a week.

The difference in increases in physical activity between grade levels may have been due to a few different factors: mandatory PE in grades 9 and 10; increased competition in community activities as grade increased; and decreases in active commuting as grade increased. Literature has shown that large portions of youth attain the majority of their activity in PE classes (34). Therefore, regulation of mandatory PE for students in grades 9 and 10 in all schools in the study, but not for those in grades 11 and 12, may have been partially responsible for the observed grade differences. Grade 9's took PE all year and 10's were required to take PE in one of the two semesters, PE was voluntary for 11's and 12's and had fewer students enrolled. An unpublished study on the effect of full year PE on activity levels has shown higher levels of activity in students who are enrolled in full year PE, as compared to those who are not (73). This supports the results from our study where those students who had to take PE for the full year, grade 9's, had the highest activity level and activity change. This was followed by

those who had to take PE half year, grade ten's, and then those who did not have to take PE at all, grade 11's and 12's.

Additionally, in terms of out of school activity, competition in community sport and eligibility for drivers licenses may have decreased activity level in those in grades 11 and 12 as compared to those in grade 9 and 10. One champion mentioned that for those students involved in community sport, the level of competition increased as students age. He thought that fewer students were involved in community sports as they increased in grade because they were not able to compete at the higher level. Since participation in community sports is correlated to higher overall activity level (37), if fewer students in grades 11 and 12 were participating in community sports due to increased competition, this could have contributed to a lower activity level in these grades. Moreover, as students get old enough to drive, they are able to drive to school instead of actively commute. Active commuting is correlated to higher overall activity levels in students (39, 47). If older students had lower rates of active commuting this could correlate to lower overall activity level. Since students are eligible for their driver's license at age 16, 11th grade, it would make sense that more students in grades 11 and 12 were driving to school instead of actively commuting. A decrease in community sport participation as students increased in grade and a lower percentage of students who were actively community to school in grades 11 and 12 as compared to 9 and 10 may have been partially responsible for grade differences seen in increases in activity level.

Inter-school differences in change in physical activity over the study period are harder to explain than gender and grade results. The eight schools varied in their initial (by 18 points) and final (by 22 points) overall activity levels. The change observed among the eight schools varied from 23.91 to 46.16 points, two to five bouts of vigorous activity per week. Frequent determinants of activity level such as SES (48) and activity opportunities in school (49) did not predict higher or lower activity level changes between the schools. Follow-up in-person questionnaires with *in motion* champions in each school helped with interpretation of these findings.

The school with the largest change (five bouts of vigorous a week: school one) was the one school that was classified as an alternative school. It was much smaller and

more individually focused than the other schools. The alternative school is a referral school for students who are having trouble fitting into the mainstream school system, and often students have behavioural and/or academic issues. The change seen in this school was tremendous, 82% increase in activity level, and far exceeded other schools in the study. When speaking with the school champion, he thought that the large change might have been due to the change in seasons. He stated that many students were dependent on weather for their activity of choice: skateboarding and ball sports. Additionally, this school had much fewer organised activity opportunities for its students but much more freedom to engage in unorganised activity on personal time as compared to other schools. The large change in this schools' activity may point to the advantage of unorganised activity for these students. Moreover, the champion mentioned that the school population was very transient, there is usually a change of about 50% of the school population over the course of the school year. This means that more active students in general may have been filling out the post-survey as compared to pre-survey. Since we did not track students from pre- to post-survey, we do not have a way of finding out if this was the case.

There were four schools that had an increase equivalent to three-four bouts of vigorous activity per week (schools two, three, five, and eight). These schools were similar in terms of in-school activity opportunities (same number of teams, all had daily intramurals, and all had access to a weight room) but varied greatly in the SES level of the surrounding neighbourhood (one low SES school, one mid level SES, and two high SES level schools). When champions were asked why their students may have had a greater increase in activity level than those at other schools, there was a common response: the strength of the phys-ed team in the school, and modelling of a physically active lifestyle by staff. The champions at these schools mentioned that the phys-ed team at their school was very engaged with the students. Champions spoke about active recruiting from all demographics of students for sports and activities, and the modelling of activity behaviours such as active commuting. Modelling of physical activity behaviours by staff is consistent with increased activity levels in students (38). Moreover, PE teachers have been shown to have specific impact on current and future levels of student activity. It has been suggested that modelling done by PE teachers

grows in importance for adolescents, as compared to younger children, as the former obtain more role modelling from sources outside the home (34). Additionally, positive opinions of school PE teachers have been shown to be related to higher activity rates in adults(34). If the staff in a higher than average change school was more active and engaged with their students as compared to staff in a lower than average change school, this could be increasing the activity level of their students.

There were three schools that had a lower than average change, two-three bouts of vigorous activity per week (schools four, six, and seven). These schools all provided the same amount of activity opportunities as those schools that had a higher than average change, and differed in the SES level of their students (two low SES schools, one high SES school). When champions were asked about why their school might have experienced a lower change as compared to other schools, there was one common response: their students worked more than those in other schools to pay for the luxuries that they wanted. These included such things as cell phones, cars, and money for recreational activities. Champions thought that the proportion of students that worked after school was high, as compared to other schools. This was thought to prevent many students from being active in their spare time. Interestingly, literature on the interaction of hours worked per week and leisure time physical activity shows that students who work up to 20 hours per week have higher leisure time physical activity than those who do not (74). This indicates that even though champions thought that the proportion of students who work was lowering their school activity level this may not be true.

We were not able to capture differences between schools concerning modelling and engagement of school staff and proportion of students who work. Therefore, we are not sure if any differences exist between schools in these domains, which may be resulting in the differences in activity level change seen in this study. The literature does support that modelling by school faculty increases activity in students (38). Therefore, if there is a more active staff population in one school over another, or a more engaged phys-ed team, this could explain some of the differences seen between school activity levels in this study.

5.3 Impact of Dose of *in motion* intervention

The third study question to be answered in this study was: do the different doses of *in motion* aspects implemented by schools result in different changes in physical activity behaviours and student recall of *in motion*? In this study, we found that the pre-survey activity levels at each dose level were significantly different but the post-survey activity levels were not. Moreover, the magnitude of change was very close; low dose schools had the highest increase in physical activity (50%), followed by moderate dose schools (48%), and finally high dose schools (47%). Dose of intervention was not significantly correlated to change of self-reported activity of students. Dose of intervention did however correlate to student recognition of *in motion*, in general and in all specific mediums; specifically, the higher the dose level of the intervention the greater percentage of students who were able to recall coming in contact with the *in motion* message. Students' opinions of how *in motion* impacted their personal activity level were also significantly correlated to *in motion*. Interestingly, it was not those schools with the highest dose of intervention, and highest recall, which had the highest proportion of students reporting that *in motion* had helped them to increase or maintain their activity level; moderate dose schools had the highest proportion of students reporting that *in motion* helped them increase or maintain their activity level, followed by low dose schools and then high.

These results show that a more in-depth *in motion* intervention was not translating into greater physical activity change. This result may indicate that the impact of *in motion* is not dependant on the amount of *in motion* activities that were carried out but in how they were carried out. This may include: if the communications in the schools were done in a creative and engaging way; the publicising of activity opportunities present in schools; and the staff involved in activities and spreading of *in motion* messages. These factors may have been impacting the change in activity level seen in students and would not have been captured in the surveys leading to dose classification. This may have contributed to the lack of dose-response relationship between *in motion* and physical activity change, and *in motion* and student reported impact of *in motion*.

Another closely related factor may have been the leadership potential of the individual champions. Through interviews with school champions it was noticed that some champions might have had more leadership potential with students, as compared to others. Increased leadership potential may have lead to more students being engaged in *in motion* activities. Some champions seemed much more passionate about engaging their students in physical activity and seemed to have more ideas and aspirations for the initiative. This may be indicative of a stronger leader who is more likely to inspire change. Evaluations of health promotion in high schools have shown that intervention leader effectiveness was dependent on their enthusiasm and commitment (75). The leader was said to be important to the success of the intervention. Furthermore, this concept is supported by the influence of adult authority figures on adolescent activity (38). A teacher modelling and encouraging physical activity correlates to higher activity in interacting students. The fact that many of the champions are members of the school phys-ed teams may increase their influence. They would not only be coordinating the intervention but would also be involved in most of the activity opportunities students had available to them. The leadership ability of the *in motion* champion is a variable we were unable to capture with our dose classification in this study. We do not know if a low or moderate dose champion had stronger leadership potential within the student body, as compared to a high dose champion. If this was so, it may be a reason that moderate and low dose interventions were correlated to greater change in physical activity levels and greater student opinion of *in motions*' impact as compared to high dose schools.

Inability to capture details such as: creativity in communication and publicising of events; staff who were involved in individual activities; and other intervention aspects, points to the need of having a more day to day recording of *in motion* activities. Perhaps if there were champion logs of what and how activities were carried out the study would have captured more of this contextual information. Additionally, some measurement of champion leadership potential would have been helpful. This measurement may have captured differences that could be affecting the overall impact of the *in motion* intervention. Dose classification of *in motion* seems to have been too

narrow, lacking the ability to capture differences in activity delivery and influence of individual champions.

5.4 Supports and barriers of *in motion* and qualitative inquiry

The final study question to be answered was: how can teachers and administrators be supported in their efforts to implement *in motion*? Experiences of the *in motion* champions revealed that there was one difference between them that could be impacting *in motion* implementation in schools. Regardless of dose classification, most champions were experiencing the same barriers to *in motion*: lack of time for planning and implementing activities; co-workers having a lack of time to help with initiatives; and lack of student interest in the activities that were run. Differences between dose levels emerged when talking about support for the *in motion* intervention in the school. There seemed to be a gradient of staff involvement with the planning and implementing of the intervention. High dose champions had the most assistance and low dose champions had the least. High dose champions reported that *in motion* was run by a group of teachers of which they were the head, most commonly a wellness committee. Moderate dose champions reported being the only planners of the intervention but having some help implement initiatives. Low dose champions reported no help in planning or running of initiatives.

Previous studies have found that effective health promotion in school requires multiple staff (75). From this studies results, it appears that with more staff involvement in the intervention, more activities were carried out. The *in motion* strategy does suggest having a committee of staff and students to plan and run the intervention in the schools (76). If it is desired to give *in motion* a larger presence in the schools, involvement from multiple staff and students will be needed. It is hoped that as the *in motion* intervention grows older in schools, more staff and students will become involved in the planning and running of the initiative.

Qualitative inquiry into *in motion* impact on school life revealed that all champions agreed that *in motion* was a good campaign to have in the schools. Champions thought that any focus on increasing physical activity in the student body was positive. This was even despite the limited time that could be spent on the

initiative. Many champions mentioned that they were going to have more activities and events integrated into their *in motion* intervention as the years went on. *In motion* was viewed by many as a strategy that would grow in the school, and they anticipated more activities in the next school year. This notion of growth throughout the years is one which is supported by the *in motion* initiative.

However, the champions felt it was hard to tell what impact *in motion* was having on their school. One champion thought that more participation was needed from the students to have greater impact. This finding is not surprising as *in motion* is new in the school environment, and it will likely take a few years to see a real impact on students.

When asked about lessons *in motion* could learn from the champions' experiences with *in motion*, there were a range of responses. Most commonly: the need to understand what motivates adolescents to be active in school; the slow process of implementing *in motion* in the school; and the need to tailor the initiative to different demographics. These responses indicated that champions continually require new information and resources to engage students in the *in motion* intervention. Specifically: *in motion* activities should be based on known motivators of adolescent activity in school settings; *in motion* ideas and resources need to be developed and disseminated; and different strategies that fit with all students need to be integrated into the intervention. If this can be done, champions indicate that *in motion* may be able to have a greater impact on student activity levels.

This fits with the postulates of SCT, in that if *in motion* was able to create activities for schools that were more fitting with adolescent motivation it would most likely be an activity that students felt more personal reward from engaging in. It may also result in the students being able to watch peers and teachers model the activity more often due to increased participation. Additionally, providing more resources, in the way of more material for communication to students would help to increase the presence of *in motion* in the school environment. These suggestions point to resources that need to be developed and research done, to increase the ability of *in motion* strategy to impact students' activity levels.

5.5 Conclusions

According to the data collected, there was an increase in activity level across the time period that *in motion* was implemented in the eight high schools. A portion of this increase can be attributed to *in motion* due to the magnitude of change, the trend of declining activity throughout the year in current literature, and student reports that having *in motion* in their school helped them increase or maintain their current activity level. There was an increase in activity level observed in all levels of gender, grade, and school, although magnitudes of change differed within each group. This difference was consistent with current literature showing that males are more active than females, and activity level is inversely related to grade. Some of these differences in activity level may have been propagated by activity opportunities in schools, if they were more conducive to the activity preferences of one demographic as compared to another. Furthermore, there is mandatory physical education for those in grades 9 & 10 but not those in grades 11 and 12. School differences in observed increases in activity level were potentially related to staff modelling and engagement with students.

The lack of a dose-response relationship between *in motion* and physical activity level, as well as students' reports of how *in motion* has impacted their activity, indicates that unmeasured variables were affecting the impact of *in motion* on student activity. Variables such as the way *in motion* activities were conducted and champion relationship to students, may have mediated how *in motion* impacted student activity levels. It seems that it was not the amount of *in motion* activities implemented in schools but how they were implemented that was important.

To support *in motion* champions in their efforts to implement *in motion*, there should be increased staff involvement in the intervention. Champions themselves should also be encouraged to do all they can to support the intervention by implementing as many aspects of the strategy as possible. At the same time, to ensure that effort of the champions is maximally effective, there should be a greater emphasis on the creation of activities and communications that address factors known to motivate student participation in physical activity. There should be an attempt to incorporate more activities that are geared towards diverse student groups, particularly those of

lower SES and non-European backgrounds. New ideas and resources need to keep flowing to schools to ensure champions have materials to stimulate student interest.

As highlighted in the review of literature, there are multiple determinants of physical activity in adolescents that can increase or decrease participation in physically activity. While there has been an attempt to highlight where variables outside of *in motion* may be increasing activity level during our study period, it is impossible to control for all of the possible influences that could be affecting activity levels. These extraneous variables cannot be fully excluded through the methodology of the study due to the complex environment of the school in which this study takes place. Therefore, it cannot be said with certainty the extent to which *in motion* impacted activity. None the less, we believe that *in motion* was having some impact on activity as 17% of students reported that *in motion* was helping them increase their activity level. Moreover, 30% of students reported that *in motion* helped them to maintain their activity level. Thus, *in motion* is a valuable program in the regions high schools.

From this study there are a few recommendations for future action that should be considered. Perhaps most important, *in motion* consultants should attempt to increase the in-school support for *in motion* champions. Recruiting more students and teachers to help organize and implement the intervention would help to ensure champions do not burn out, risking the loss of *in motion* in the schools. Further, frequent communication with champions by the *in motion* consultants should be continued; potentially electronic resources could be constructed for champion-to-champion support. In terms of resources for the *in motion* strategy, more activities should be created that are reflective of known motivators of adolescent physical activity. Additionally, making sure these activities fit with the postulates of SCT, such as having high personal reward, being seen as desirable by the target audience, and having teachers and peers engaging together, may make them more effective. Effort should be made to create activities and communication resources that are suitable for all demographic groups in the school. Cultural and SES differences in terms of needs and preferences related to physical activity should be reviewed when creating resources in the future. Lastly, teachers and students should continue to be involved in development of the strategy. The valuable input of these members is sure to make the intervention

more applicable to the school setting, and more in line with the needs of the target group(s).

5.6 Limitations and Recommendations for Future Research

The largest limitation in this study was the lack of a control school for comparison. The lack of a control school hampered our ability to conclude that the increase in activity level observed in the *in motion* schools was due to *in motion* and not outside factors. The lack of control school was not intended; it was hoped that a control school would be self-selected from the schools involved through lack of implementation of the intervention. All schools involved in the study ended up implementing *in motion* in the school, and therefore no control could be identified from this group. Future studies should pre-determine a control school to insure more concrete evidence of *in motion*'s impact on activity levels.

Another limitation was the need to use self-report measures for the estimation of activity levels. As mentioned in the methods, self-report measures are susceptible to over inflation of activity. In adolescents, it has been estimated that vigorous activity is inflated by about 4 bouts per week on self-report questionnaires (61). This inflation prevented the ability to infer actual activity levels of participants, as it is quite likely that the reported activity is quite a bit higher than the actual. Moreover, it is not certain what types of activities students were including in their report of physical activity. The wording of the tool says 'leisure time' physical activity, implying PE should not be included, but it is not clear if all students were aware of this detail. Therefore, in interpreting the results one cannot rule out the potential impact of PE on the observed increases in physical activity. Additionally, if some students were including PE and other were not, there could be further problems with accuracy of the resulting overall activity level of the students.

Another limitation related to post-surveys, was the potential for inherent bias in some of the study questions. There is the possibility that the wording of the questions used to garner student opinion of *in motion*'s impact on their activity levels was not inclusive enough to allow all students to answer honestly. The only three possible responses for *in motion* not impacting personal activity level were: 'already being

active, not being interested in being active, and not being able to be active due to health'. The question did not incorporate the possibility that students wanted to be active but did not feel that *in motion* had provided the right opportunities for them. Moreover, the question did not touch on other personal barriers to activity, such as self-efficacy or being self-conscious, which may have kept students from participating in activities. This most likely limited the depth of understanding of this issue. In future, a more inclusive question should be used.

Self-reports were used as opposed to objective measures of activity (such as accelerometers) due to the size of the sample desired for the study. With sample sizes in the thousands it is not feasible to have objective measures of activity. The human and financial resources required to complete data collection would be beyond the scope of this study. Additionally, it was wished to keep study participation as unobtrusive as possible to students and staff. Therefore, the short time and instruction required to complete self-reports adhered to this goal.

Limitations around the classification of dose in this study are related to the fact that this aspect was original. No other studies could be found where dose of intervention was determined after implementation, and dealt with differing amounts of exposure. The major limitation of our dose classification is in how narrowly dose was classified. We only included activities undertaken and frequency of those activities. Variables capturing leadership ability of the champion and students engagement in the intervention were not included. Inclusion of some of these variables into the dose tool may have resulted in different classifications of dose and potentially led to a dose-response relationship between *in motion* and physical activity.

Additionally, the approach of the *in motion* high school strategy may be too flexible. The schools aren't given a clear outline of what things they should do and when, to best impact student activity levels. Champions may be receiving too little direction, leading to lack of implementation of some aspects of *in motion* that are most affective at increasing student activity levels. It may be that a more structured approach is needed, where champions are told what to do and when, so it is certain that all schools are receiving the benefits from various activities. Additionally, there may need to be more communication from *in motion* consultants, as this may help remind schools

of the activities that should be underway, and leave an avenue to discuss problems that may arise.

This study is subject to some biases during data collection. Recall bias is likely to have affected both student and champion data collection. As mentioned above, recall of physical activity on self-reports is not exact and has tendencies to over inflation. Additionally, there was possibility for recall bias in the champion questionnaires since the questions pertained to the previous eight months. It is possible that some champions were unable to recall some events or activities that had taken place, impacting accuracy of the tool. There was an attempt to incorporate questions that would elucidate the most complete description of activities undertaken, but there is possibility that some information was missed. As an alternative, having champions keep a log of activities may have curtailed the impact of recall bias on this study. Champion logs may have resulted in a more full description of the intervention in each school.

Despite the limitations of the current research, there were a number of strengths to this study. The large number of students that were involved in the pre-and post-survey gave the study very high power. The sample sizes seen in this study were much greater than other studies evaluating other intervention programs, thus making the findings somewhat more reliable. The integration of both qualitative and quantitative methods into the study gave the results more depth. The results were able to show not only how students were responding to the program in terms of activity level, but how organisers experienced the program as well. Additionally, to include intervention champions' evaluations through the follow-up questionnaire was unique. Having study participants give their interpretation of study findings is something rarely seen in program evaluations, but led to greater depth of understanding of the results in this study. The inclusion of champion opinions as to what they believe the quantitative results were showing led to possible interpretations that would never have been generated otherwise. Finally, the dose classification in this study was original. Although there are variables that potentially should have been included, the present attempt at dose classification may assist future researchers in this area.

Therefore, in light of the strengths and limitations of this study, it is recommended that future studies to evaluate the *in motion* high schools program use

control schools, objective measures of activity, and champion logs to document events and activities in the school. A design as close to a randomised control trial as possible would be best. In order to do this, the use of smaller scale studies involving only a segment of the school population may increase feasibility. The cost and human resources required would not be as large. These smaller studies could be initiated to explore some of the preliminary differences uncovered in this study, such as those between genders, grades or schools. Additionally, qualitative components should continue to be integrated into the study. These types of investigations may uncover more information about *in motions*' impact on students in different demographics.

Future investigation into natural school year fluctuations in students' activity levels could be done. This would help to identify what changes in activity level are naturally occurring due to changes in such factors as weather, comfort level in the school, and community sports programs. Detailed surveys in each season would help to identify where physical activity and inactivity levels peak. This research would help show with-in year patterns in physical activity, and perhaps lead to targeting promotional programs for different seasons. Moreover, to better equip high school champions, there is a need to develop activities that are based in known adolescent motivations for physical activity in the school environment. There is research that has uncovered some adolescent motivations to be active, this information should be used to develop activities for schools that are specialised for adolescent preferences. Including activities in the strategy that are based in research on adolescent motivations may lead to getting more youth to participate. Therefore, these activities would increase the impact of the intervention on student physical activity levels.

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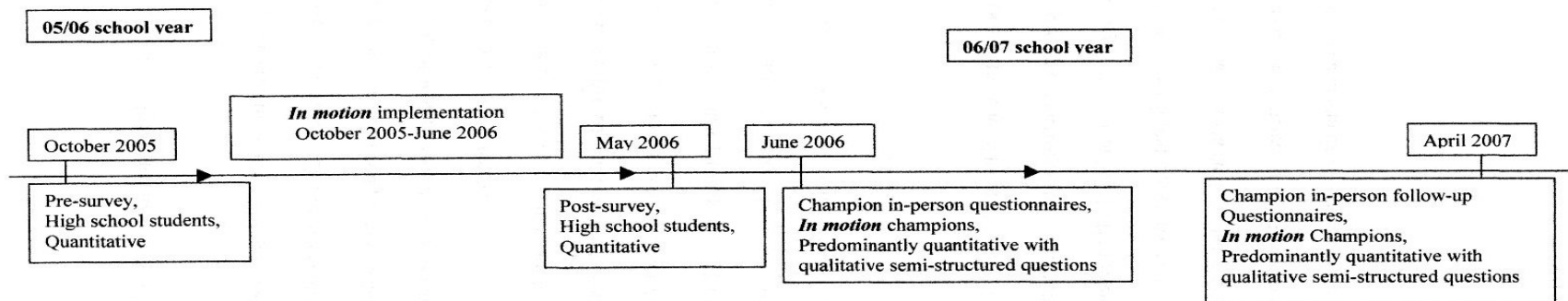
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APPENDIX A: Timeline for study

Figure A1: Time line for Evaluation of *in motion* high school physical activity health promotion strategy



APPENDIX B: Ethics Approval



UNIVERSITY OF
SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB)

Certificate of Approval

PRINCIPAL INVESTIGATOR
Louise Humbert

DEPARTMENT
Kinesiology

Beh #
Beh 04-108

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT
University of Saskatchewan
Saskatoon SK

SUB-INVESTIGATOR(S)
Karen Chad

STUDENT RESEARCHER(S)
Kara Spencer, Christina Southey

SPONSORING AGENCIES
GOVERNMENT OF SASKATCHEWAN - COMMUNITY INITIATIVES FUND

TITLE
Evaluation of the Saskatchewan In Motion Schools Project

APPROVAL DATE
27-Jul-2005

EXPIRY DATE
01-Jul-2007

APPROVAL OF
Have added Christina Shouthey as a student researcher.

APPROVED ON
10-May-2007

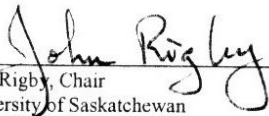
CERTIFICATION

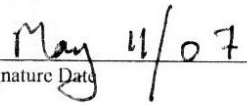
The University of Saskatchewan Behavioural Research Ethics Board has reviewed the proposed revisions to your study. The revisions were found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS

In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: http://www.usask.ca/research/ethics_review/


John Rigby, Chair
University of Saskatchewan
Behavioural Research Ethics Board


Signature Date

Please send all correspondence to:

Ethics Office
University of Saskatchewan
Room 306 Kirk Hall, 117 Science Place
Saskatoon SK S7N 5C8
Telephone: (306) 966-2084 Fax: (306) 966-2069

APPENDIX C: Student pre-survey

Please fill in the questionnaire with **DARK PEN**

ID: _____ / _____ / _____ (eg., AS22/08/1989)
First Initial Last Initial Birthday (day/month/year)

School: _____

Part 1: Physical Activity

- 1.) Considering a **7-day period** (a week), **on average, how many times** do you participate in the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number)?

Times Per Week

- a) **STRENUOUS EXERCISE**
(HEART BEATS RAPIDLY)

(i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

- b) **MODERATE EXERCISE**
(NOT EXHAUSTING)

(i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

- c) **MILD EXERCISE**
(MINIMAL EFFORT)

(i.e. yoga, archery, bowling, horseshoes, golf, snow-mobiling, easy walking)

Part 2: Please circle the appropriate answer.

1. **Saskatoon Health Region is currently involved in a health promotion initiative called *in motion*. Do you recall seeing, hearing and/or reading anything about *in motion*?**

- Yes
 No
 Unsure

2. **What is your average fruit or vegetable consumption on an average day?**

- a) None
b) Between 1 and 4
c) Between 5 and 9
d) 10 or more

3. **In the last month, how often did you eat breakfast before you came to school?**

- a) 5 times a week
b) 3-4 times a week
c) 1-2 times a week
d) seldom or never

4. **Grade:** 9 10 11 12

5. **Gender:** Male Female

APPENDIX D: Student Post-Survey

8418212332

High School Students Physical Activity Estimate

Please fill in the questionnaire with dark pen

/ /

Birthday
 First Initial Last Initial Day Month Year

(e.g. AS22/08/1989)

Part 1: Physical Activity

1.) Considering a 7-day period (a week), on average, how many times do you participate in the following kinds of exercise for more than 15 minutes during your free time (write in each box the appropriate number)?

a) STRENUOUS EXERCISE

(Heart beats rapidly)

(i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

Times per week

b) MODERATE EXERCISE

(Not exhausting)

(i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE

(Minimal effort)

(i.e. yoga, archery, bowling, horseshoes, golf, snow-mobiling, easy walking)

2) Considering a 7-Day period (a week), during your leisure-time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

Often Sometimes Rarely/Never

Part 2. Please shade the appropriate answer

1. During the past school year do you recall seeing, reading or hearing any information about physical activity or increasing physical activity?

Yes No Unsure

2. Saskatoon Health Region is currently involved in a health promotion initiative called *in motion*. Do you recall seeing, hearing and/or reading anything about *in motion*?

Yes No Unsure

3. Do you recall where you saw/received the information about *in motion* or increasing physical activity? (SELECT AS MANY AS APPLY.)

- School Bulletin Boards
- School Announcements
- School newspaper/newsletter/website
- Posters in school
- School In-Motion Physical Activity Challenges
- School Walk/Jog club
- Billboards posted around the city
- On the bus/bus boards/side of bus
- News
- Advertising (TV or Radio)
- Friends and/or relatives
- No
- Unsure
- Other (please print)

4. Do you believe that your school's efforts to promote physical activity to students has contributed to you being more physically active?

- Yes, it has helped me become physically active
- Yes, it has helped me maintain my physical activity
- No, I have always been physically active
- No, I am not interested in being physically active
- No, I am unable to be physically active because of illness?
- Unaware that our school has been promoting physical activity to students

5. What is your average fruit or vegetable consumption on an average day?

None Between 1 and 4 Between 5 and 9 10 or more

6. In the last month, how often did you eat breakfast before coming to school?

Seldom or never 1 or 2 times per week 3 or 4 times per week 5 times per week

7. Your present grade:

9 10 11 12

8. Your gender:

Female Male

School System

- Saskatoon Catholic School
- Saskatoon Public School
- Rural School

High School

- Bishop Murray
- St. Joseph
- Bishop James Mahoney
- City Park
- Other school (please print)
- Bedford Road
- Mount Royal
- Walter Murray
- Nutana
- Marion Graham
- E.D. Feehan
- Evan Hardy
- Holy Cross

APPENDIX E: Questions for high school champions

Name _____

School _____

Position with-in school _____

If teacher, subject _____ , Grade 9 10 11 12

Do you consider yourself to be the *in motion* champion for your school?

Yes No

Are you interested in being the *in motion* champion next year?

Yes No

1. Did you implement any aspects of the proposed *in motion* strategy this school year?

- Bulletin boards
 - Announcements
 - Incorporation into school newspaper/newsletter/website
 - Incorporation into school calendar
 - Posters
 - Community action fairs
 - Other _____
- _____

2. Who was responsible for implementing the *in motion* intervention this school year?

- One teacher (non phys-ed staff)
 - One teacher (phys-ed staff)
 - Member of administration (if so what position?)
 - Group of teachers/committee
- Comprised of _____
- _____

3. How have you been supported in your role as your schools' *in motion* champion?

- a. Administration
- Release time or class coverage
 - Resources
 - Helped with initiatives/activities/components of strategy
 - Other _____
- _____
- _____

b. Staff

- Helped with initiatives
 - Other _____
-
-
-

c. *in motion* staff

- Available for consultation
 - Provided resources
 - Other _____
-
-
-

4. What barriers have you faced as the school *in motion* champion?

a. Administration

- Did not provide release time or class coverage
 - Did not aid in providing resources
 - Did not help with aspects of intervention
 - Other _____
-
-
-
-

b. Staff

- Did not help with initiatives
 - Did not support intervention
 - Other _____
-
-
-
-

c. *In motion* staff

- Were not available for consultation
- Did not provide enough resources
- Other _____

d. Time restraints/lack of school resources

e. Students

- Do not participate in activities
- Do not seem interested in physical activity
- Other _____

5. What grades is physical education required in your school? 9 10 11 12
What grades is it an elective? 9 10 11 12
What grades is it co-ed? 9 10 11 12
Non co-ed? 9 10 11 12

6. Did you find that the resources in the “*in-motion* high school physical activity guide” were helpful in planning/implementing your intervention?

Yes

What aspects were most helpful?

Is there anything that would have made it more helpful?

No

What do you think would have made it more helpful?

Unsure

Did not use resource guide

Did you use the CDROM version

Did you use the Hard Copy Binder

Are there any other barriers that you have felt hindered your *in-motion* intervention?

Announcements

1. Did you use school announcements to promote physical activity and better nutrition?
 Yes
 No (skip to questions 13)

2. If so, how often?
 Daily at least once a week at least once a month
 rarely (less than once a month)
3. Did you have a schedule for using the announcements?
 yes _____
 No
 Unsure
4. Did you use the suggested announcements from the *in-motion* resource guide?
 yes No
5. Did you develop your own announcements?
 yes No
6. Were announcements delivered in an interesting, creative, and original manner?
 yes, if so give brief explanation _____

 No

Bulletin Boards

7. Did you utilize bulletin boards to promote physical activity and nutrition?
 Yes No (skip to question 19)
8. Where was it positioned in the school?

9. Was it changed throughout the year? If so how often
 daily weekly Monthly Rarely
10. What materials did you display on the board
 In motion banners/Posters In motion slogans In motion challenges/initiatives
 information on how to be physically active
 other _____

11. Did you use mainly the provided *in motion* materials?
 yes No
12. Did you develop some of your own?
 yes No
If so, what were they? _____

Newspaper, Newsletter, Website

13. Were ***in motion*** messages, or messages promoting physical activity and nutrition incorporated into the school paper, newsletters, or website?
 Yes no (skip to question 22)
14. How were they incorporated?
 advertisements/banners articles pictures
 Other _____
15. How often?
 weekly monthly semester Other _____
 Unsure

Other Methods

16. Were ***in motion*** messages incorporated into a school calendar?
 Yes No (skip to question 25)
17. Were posters put up around the school
 Yes No
18. Were there any other promotional materials you used to promote physical activity and nutrition?
 Yes, Please explain _____
 No

Is there any thing else about your school's intervention that you would like to share? (comments on back pages) yes (see back) No

Clubs, Challenges, and Events

19. Did your school start any ***in motion*** clubs centred on physical activities?
 The ***in motion*** walk jog club
 Fitness club
 Weight training club
 Intramurals
 Other _____

20. Does your school have any pre-existing fitness or nutrition oriented clubs
 Yes No

21. If so, what are they?

22. Did your school implement any ***in motion physical*** activity challenges, events, or activities?

- Fall ***in motion*** Challenge (September/October)
 100 minute high school physical activity challenge
 5 plus 5 physical activity and healthy eating challenge
 Spring hike and bike challenge

In motion bingo

- Other _____

Are there any other aspects if your schools clubs, challenges, or events you would like to share? Yes (see Back) No

School Staff

23. Does your school have a workplace wellness program for your staff?

- Yes No

24. If yes, what is comprised in the program?

- aerobic activities physical active programs/opportunities
 promotional materials on physical activity and nutrition
 incentives for being active and good nutrition
 Other _____

25. Who is responsible for co-coordinating/implementing the wellness program?

- Administration One Staff member A group of staff members
 A committee of administration and staff

26. If you are not already promoting workplace wellness to staff would you like more information about the *in motion* workplace wellness resources?

- Yes No

27. Where there any staff specific *in motion* challenges or initiatives throughout this school year?

- Yes No

28. If so, what were they?

29. Did staff participate in the clubs/challenges that the students had available to them this school year?

- Yes No

30. Would you consider your staff to be overall

- Not active Mildly active Moderately active Highly active
 Not sure

31. What types of learning opportunities or workshops would help staff with the promotion of physical activity in your school?

- Integrating physical activity into other subjects
 Winter outdoor activities
 Physical education class ideas
 Creating environmental and policy changes in the school
 Workplace wellness
 Creating a school wellness committee
 Nutrition initiatives
 Presentation about in motion at a staff meeting
 Other _____

School Aspects

32. What programs/initiatives does your school participate in to promote nutrition or physical activity, outside of the *in motion* initiative?

- Nutrition _____
- Physical Activity _____
- Smoking _____
- Other Health behaviours _____

33. How many school sports teams does your school have? _____
Which sports? _____

34. Is there opportunity for students in your school to access resources for physical activity:

- Before School
- During school (spares)
- At Lunch
- After School
- No

35. Is there any open gym time in your school?

- Yes No

If Yes:

- Before School
- During School (spares)
- At lunch
- After School
- Other _____

36. In your opinion is it safe for students to bike/walk To/from School?

- Yes No

37. Are there any opportunities to exercise in your school not mentioned earlier

Are there any other aspects of your schools environment which you think impacts on physical activity, which you would like to share? Yes (see back) No

38. Do you feel that in motion has affected any other aspects of school life? eg, management of students, school spirit etc.

39. In the fall when the grade nines come into your school, how will they know it is an in motion school?

38. Has there been any student interest in being involved in your school's *in motion* strategy?

Yes No

39. Would you encourage other teachers/staff to champion this initiative? Why/why not?

40. have you been involved in any other initiatives which tried to influence health behaviours of youth?
How is this similar?

Different?

41. What lessons could *in motion* learn from your experiences in the last year?

38. What can *in motion* do to assist your school with achieving the goal of getting all of the students in your school the opportunity to be physically active every day?

- Provide more planning resources for the champion
- Provide more “ready Made” school physical activity challenges
- More training opportunities for teachers and the champion
- More emphasis on Quality Daily physical activity
- Provide more incentives for schools
- Provide someone to come and speak to our staff and/or students about *in motion*
- Encourage the school division to offer more support
- Other

39. Please provide any further input about *in motion* in your school? (Success stories, activities and ideas that have worked for you, suggestions, etc)

Additional information from questions

Schools Intervention:

School Clubs, events, challenges:

School environment:

APPENDIX F: Champion follow-up questionnaire

Areas of inquiry for champion visits:

1. Clarification of previous information:

- How many sports are there in your school

- how many teams for each sport (male, female, junior, senior etc)

- Are there more teams in May as compared to October?

- Is there more participation in teams in may as opposed to October?

- Intramurals
 - Are intramurals all year long?

 - Number of different activities included in intramurals
 - Fall

 - Winter

 - Spring?

 - Are the intramural heavily used by students?

 - More in one season as compared to another?

- Weight room
 - How many students use the weight room?

 - When it is open?

- Other activity opportunities not mentioned? Exp: clubs
 - What time of year?

- Are they popular with the students? Some more than others?

- Are there opportunities to be active in spring that would not be available in fall? Are they popular? Heavily used?

- For your in motion activities, do you focus on nutrition more? PA more? Equal amount?

2. Phys ed: when do most students in each grade take phys-ed?(what semester)

- 9
- 10
- 11
- 12

3. Are there other community activities that could be increasing activity in the spring?

Popular activities in nearby facilities?

Evening programs?

4. Do a lot of students use active transport to get to school?

DO you think this differs in the spring as compared to fall?

5. Do you do fitness testing in PE?

How do you measure this?

For grade nines is there a noticeable change in PA from September to May?

Why do you think this is?

6. School specific questions:

- Your school had an increase from September to May equivalent to about _____ bouts of vigorous activity a week can you think of any reasons why that is?
- You had a higher/lower change compared to other schools, can you think of why that might be?
- Are there any barriers to PA for students in your school that you think are unique?
- Is there any reason why you think your students would be more active than students in other schools?

APPENDIX G: Outline of schools

School 1:

School one is a non-mainstream alternative school, that specialises in educating students who are having problems in the mainstream school in the city. It is very small (~120 students).

Opportunities to be active:

School one has no sports teams; the school population is not large enough to sustain team sports. There is open gym time before and after school, as well as a weight room that can be accessed before and after school. There are resources for physical activity available to students before and after school, and at lunch, and an intramural program is run at lunch all year. The school has a nutrition intervention running concurrent to *in motion*.

School Specific Considerations:

It is a referral school and has a high turnover of students (sometimes full classrooms can change throughout the year), the students who are in attendance are dealing with academic and behavioural problems that have led to them having to leave the mainstream system. Many students live a fair distance from the school and therefore community opportunities are varied for each student, as they are not drawn from the surrounding neighbourhood.

School 2:

School two is a mainstream high school, it is situated in a mid to high SES neighbourhood.

Activity Opportunities:

School 2 has multiple sports team, 9 sports, with eligibility for male, female, and junior and senior teams for most sports. There is open gym time before school and at lunch (when the gym is not being used for other activities), as well as a weight room that can be accessed before and after school, and at lunch. There are resources available for physical activity before school, during school, after school, and at lunch, and an intramural program for students at lunch hour all year round.

School Specific Considerations:

School gym gets over heated during the first and last few weeks of the year (no air conditioning due to environmentally friendly practices) and it deters the students from being active at these times.

School 3

School three is a mainstream high school located in a low SES, core neighbourhood. It is designated a community school.

Activity Opportunities:

School three has multiple sports teams, 10 different sports, with eligibility for male, female junior and senior students for most sports. There is open gym time at lunch and after school, as well as a weight room open to students all day. There are resources available for physical activity before school, during school, and after school, and at

lunch, and an intramural program that runs every day, all year long. Staff participate in the intramurals with the students.

School 4

School four is a mainstream high school, in a low SES, core neighbour. It is designated a community school.

Activity opportunities:

School 4 has multiple sports teams, 10 sports, with eligibility for male, female, junior and senior students for most sports. There is open gym time before school, during school, after school, and at lunch depending on staff availability to supervise. There is a weight room that is heavily used by students, and available at lunch and after school. Resources are available for physical activity before school, during school, after school, and at lunch, and intramurals at lunchtime all year round.

School 5

School Five is in a mid to High SES neighbourhood, and is a mainstream high school.

Activity opportunities

School 5 has multiple sports teams, 9 sports, with eligibility for male, female, junior and senior students for most sports. Open gym time is available at lunch, along with a weight room that is always open. Resources for physical activity are available before school, during school, and after school, and there is an intramural program that runs every day at lunch, all year. Throughout the year there are staff vs. student challenges, and tournaments, run a few times every semester.

Every Tuesday after school an external group comes in and runs a sports program for students. Participation is voluntary, and has a moderate turnout of students on a regular basis.

School Specific Considerations

Track and field and wrestling teams in the school have very high students turnout, and draw from traditional athlete and non-athlete groups.

School 6

School six is allocated in low SES, core neighbourhood, and is designated a community school.

Activity Opportunities:

School six has multiple sports teams, 9 sports, with male female junior and senior eligibility for most sports. There is open gym time before school, after school, and at lunch, with a weight room available before and after school, and at lunch. Resources are available for physical activity before, during, and after school, and an intramural program is run every day all year long.

School 7

School seven is located in a mid to high SES neighbourhood and is a mainstream high school.

Activity Opportunities:

School 7 has multiple sports teams, 10 sports, with eligibility for Male, female, junior and senior students for most sports. Open gym time is available at lunch, and there is a weight

room that is available before and after school, and during the day with supervision.

There are resources available for physical activity before school, during school, after school, and at lunch. The school has an intramural program that runs at lunch hour, every day, all year long.

Every Tuesday after school there is a fit Tuesday program; an aerobic teacher is brought in from outside the school and runs a class for the students.

School Specific Considerations:

School 7 has developed a health promotion program for its students called “healthy souls”. The program focuses on four areas; 1. Physical activity. 2. Nutrition. 3. Advertising. 4. Other health behaviours. (mind/spirit/body/souls). The most intensive of these is the nutrition component, which consists of a multiphase approach to eliminating unhealthy foods from the school cafeteria and vending machines, and offering healthy alternatives.

The school has a large amount of students in its soccer and volleyball teams, as many as eight teams for each sport.

School 8

School eight is mainstream school, located in a mid to high SES neighbourhood.

Activity Opportunities:

School 8 has multiple sports teams, 10 sports, with eligibility for male, female, senior, and junior students for most sports. There is a new weight room that can be accessed in the morning, at lunch, and after school, it is heavily used with approximately 20% of students, and 25 staff with passes. The gym is available at lunch, but is primarily used to

run intramurals, which are run every day all year long. There are resources for physical activity available before and after school and at lunch.

School Specific Considerations:

The school track team has upwards to 150 students who participate.