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A School-Based Type 2 Diabetes Prevention Program for Canadian Elementary Students

Un programme scolaire de prévention du diabète de type 2 pour des élèves d'écoles élémentaires au Canada

Lindsay Cline
Brock University

James Mandigo
Brock University

Panagiota Klentrou
Brock University

Brian Roy
Brock University

Abstract

The *Everyone Jump Program* raises awareness about the role of physical activity and healthy eating in type 2 diabetes prevention. The purpose of this research was to examine whether the *Everyone Jump Program* met its program objectives and improved health-related behaviours. Participants (N = 296) completed questionnaires to assess self-report nutrition and physical activity behaviour as well as a pedometer physical activity measure. Assessments occurred before and after the 8-week intervention period. Focus groups and knowledge assessments were conducted with program recipients only. Repeated measures 2 x 2 MANOVAs revealed significant interaction effects for: Steps Taken and Physical Activity Time ($p < .01$, $eta^2 = .03$); Self-reported Physical Activity ($p < .05$, $eta^2 = .04$); and Canada's Food Guide Knowledge ($p < .05$, $eta^2 = .02$). Focus groups and knowledge assessments indicated the *Everyone Jump Program* fostered diabetes-related health literacy; however, only physical activity program objectives were met.

Résumé

Le programme Everyone Jump vise à sensibiliser les jeunes au rôle de l'activité physique et de la saine alimentation dans la prévention du diabète de type 2. Cette étude avait pour but d'établir si le programme Everyone Jump a atteint ses objectifs et réussi à améliorer les comportements reliés à la santé. Les participants (N = 296) devaient répondre à un questionnaire qui évaluait leurs comportements auto-déclarés en matière de nutrition et

d'activité physique. Ils devaient aussi porter un pédomètre pour mesurer leur niveau d'activité physique. Les évaluations ont eu lieu avant et après la période d'intervention de 8 semaines. Des groupes de discussion et des évaluations des connaissance ont également été réalisés. Les mesures répétées 2 x 2 de l'analyse MANOVA ont fait ressortir d'importantes interactions entre le nombre de pas et la quantité de temps consacré à l'activité physique ($p < .01$, $eta^2 = .03$), l'activité physique auto-déclarée ($p < .05$, $eta^2 = .04$) et la connaissance du Guide alimentaire canadien pour manger sainement ($p < .05$, $eta^2 = .02$). Les résultats des groupes de discussion et les évaluations des connaissances ont révélé que le programme Everyone Jump favorise l'acquisition de savoirs en lien avec le diabète, mais que seuls les objectifs du programme d'activité physique ont été atteints.

Introduction

The number of Canadians diagnosed with diabetes has increased dramatically within the last two decades. In the 1994/95 National Population Health Survey, 722,000 Canadians (age 12 and over) reported being diagnosed with either type 1 or type 2 diabetes mellitus (James, Young, Mustard, & Blanchard, 1997). In 2005, that number rose to 1.3 million Canadians (Sanmartin & Gilmore, 2006), and in 2012, increased further to 1.9 million Canadians (Statistics Canada, 2012). Within diagnosed diabetes cases, 90% are typically type 2 (Canadian Diabetes Association, 2012). On a global scale, the prevalence of diabetes is expected to increase even further, especially among children; it is estimated to increase by 50% in the next 15 years (Canadian Diabetes Association, 2012). Previously, type 2 diabetes was commonly referred to as 'adult-onset' diabetes based on the typical timing of symptom occurrence. However, with rising rates of childhood obesity, type 2 diabetes now appears more often in children and, therefore, is not solely a health concern reserved for adults (Ludwig & Ebbeling, 2001). The high prevalence of diabetes in Canada resulted from a combination of factors, not one single cause (Millar & Young, 2003; Public Health Agency of Canada, 2011). However, low physical activity levels combined with a high caloric intake are believed to be the largest contributors to the elevated number of overweight Canadians, and subsequently, cases of type 2 diabetes (Amos, McCarty, & Zimmet, 1997; Harris et al., 1997; Public Health Agency of Canada, 2011; van Dam, Rimm, Willett, Stampher, & Hu, 2002).

Living with diabetes has many challenges and health consequences; individuals have to carefully manage blood glucose levels through regular physical activity, nutrition modifications and weight management. Over an extended period of time, the pathological consequences of elevated blood glucose levels is manifested in blood vessels, nerves and other internal structures which put individuals with type 2 diabetes at an increased risk for developing more serious health concerns, such as heart disease, hypertension, stroke, and vision problems (Government of Canada - Healthy Canadians, 2013; James et al., 1997; Millar & Young, 2003).

As type 2 diabetes is currently the sixth leading cause of death in Canada (Statistics Canada, 2011), the need for efficacious prevention programs is critical. Research suggests regular physical activity can be an effective way to reduce the risk of developing type 2 diabetes as it is well established to increase insulin sensitivity and helps to manage body weight (Amos et al., 1997; Public Health Agency of Canada, 2011; van Dam et al., 2002). Physical activity and health promotion intervention programs designed for children and youth have traditionally and predominantly taken place within school systems. School-based physical activity and health promotion interventions allow all children to benefit from the program and prevent 'at-risk' children from being labeled or singled out amongst their peers (Harrell et al., 1996).

The majority of type 2 diabetes research involving Canadian children has focused on Aboriginal Canadian populations, as the prevalence of diabetes is three to five times higher among this group compared with the general Canadian population (Government of Canada - Healthy Canadians, 2013; Harris et al., 1997; Health Canada, 2011; Young, Reading, Elias, & O'Neil, 2000). Interestingly, one school-based health promotion intervention, that specifically looked at type 2 diabetes prevention in Aboriginal Canadian children, significantly improved dietary knowledge, eating habits and self-efficacy but was not able to improve body mass index (BMI; Saksvig et al., 2005). Self-efficacy refers to the belief in one's capability to perform a specific task (Wood & Bandura, 1989). Thus, in this context, children experienced a significant improvement in the level of confidence they had in their ability to make healthy eating choices. Unfortunately, this health promotion intervention program did not include a physical activity component, which may explain why no decreases in BMI levels were observed among the participants.

Other school-based health promotion intervention programs have included physical activity components, in addition to standard physical education class activity. One program, designed to reduce cardiovascular disease risk factors in elementary-school children, demonstrated that participants who received the program possessed greater knowledge of heart health, had higher physical activity levels, and experienced a reduction in body fat percentage compared to participants in the control group (Harrell et al., 1996). As a result, a physical activity component in health promotion intervention programs, in addition to physical activity accumulated in mandated physical education classes, may be a crucial element for knowledge acquisition, behaviour change and physiological improvements.

According to the 2013 Active Healthy Kids Canada Report Card, only 5% of Canadian children and youth are achieving the recommended amount of physical activity (60 minutes per day), based on the Canadian guidelines (Canadian Health Measures Survey, 2013). Given these extremely low participation rates, even with required activity during physical education in school, a focus on physical activity within health promotion intervention programs becomes even more essential, especially considering how efficacious regular physical activity has proven to be in reducing type 2 diabetes risk factors (Amos et al., 1997; van Dam et al., 2002). Furthermore, children's physical activity behaviours also tend to track into adulthood (Kelder, Perry, & Klepp, 1993; Malina, 1996; Raitakari et al., 1994). Thus, developing healthy lifestyle habits in early stages of childhood may be critically important to promote life-long health behaviours.

Based on the current trends and most recent information, type 2 diabetes prevention programs will be essential to the health of Canadian children. In addition to the high rates of type 2 diabetes in Aboriginal Canadian populations (Government of Canada - Healthy Canadians, 2013; Harris et al., 1997; Health Canada, 2011; Young et al., 2000), individuals of African, Hispanic and Asian descent are also at an increased risk of developing type 2 diabetes. Interestingly, 77% of new Canadians are from these ethnic populations, and as such, type 2 diabetes rates are expected to increase rapidly across Canada unless current health behaviours improve (Canadian Diabetes Association, 2012). Therefore, a health promotion intervention program containing an integrated physical activity component delivered in a school setting may be an effective strategy to teach new Canadians the life skills and habits to help maintain good health.

In Ontario, health and physical education are integrated within the curriculum. It is recommended that elementary students receive a minimum of 120 minutes of scheduled instructional time per week for physical education and 30 minutes per week for scheduled healthy living curriculum material (Ontario Ministry of Education, 2010; Toronto District School

Board, 2006). The need for an integrated physical activity and health promotion intervention program, specifically looking at type 2 diabetes prevention, has been previously recognized by the Ontario Physical and Health Education Association (Ophea). This has led to the creation of the *Everyone Jump Program.* Targeting students as well as teachers in Canadian elementary schools, the *Everyone Jump Program* highlighted the importance of healthy eating and regular physical activity as a means to prevent type 2 diabetes. The *Everyone Jump Program* began its pilot phase in 2005 and to date, has reached approximately 75,000 students across Canada. Teacher evaluation surveys have been conducted each school year since piloting in 2005 and asked educators to indicate their satisfaction with lesson materials and the overall program. In general, the responses have been very positive and satisfaction levels increase each year as improvements are implemented. In 2010/2011, 100% of teachers surveyed indicated the *Everyone Jump Program* lessons allowed their students to acquire a better understanding of diabetes prevention in addition to meeting curriculum expectations (Ophea, 2011). However, despite the positive responses from teachers implementing the program, no data existed as to whether the program was able to alter the health behaviour of participating students. Therefore, the purpose of this research study was to examine whether the *Everyone Jump Program* met its program objectives (i.e., raise awareness about the role physical activity and healthy eating play in type 2 diabetes prevention) and in turn, whether the program improved upon those essential healthy behaviours (i.e., physical activity and eating habits).

Methods

This study used a pre/post-test, mixed-method research design. Data was collected at two time points (i.e., *before* and *after 8*-week intervention period) from nine different schools. Participants were elementary school students in grades 3-6 who were randomly assigned by classroom to one of two groups: Program Recipient Group (n = 207) or the Control Group (n = 89). During the intervention period, the seven primary and seven junior classes in the Program Recipient Group received the *Everyone Jump Program* as part of their health and physical education classes, and the three primary and three junior classes in the Control Group continued to follow the regular provincial health and physical education curriculum.

Everyone Jump Program

The *Everyone Jump Program* consisted of four interactive, fun lessons designed to educate students about type 2 diabetes prevention. Program material emphasized the importance of making healthy eating choices and keeping physically active. The program included separate primary (grades 1 – 3) and junior (grades 4 – 6) lesson plans to ensure material was appropriate. The four lessons were cross-curricular, linking health and physical education, language, the arts, and science and technology. Unit overviews and lesson topics are provided in Table 1. Teachers for the classrooms randomly assigned to receive the *Everyone Jump Program* were each provided with a training resource, the *Everyone Jump - Kids Changing Diabetes 2010/2011 Educational Challenge Manual.* The manual included primary and junior unit overviews and detailed lesson plans for each program component, outlining information such as: curriculum expectations; learning goals; facility and/or materials needed; teaching/learning strategies; and assessment/evaluation criteria. Participating teachers, at their respective schools, implemented the *Everyone Jump Program* during regularly scheduled physical education and health class time during the months of January through March. Within our sample, three teachers self-classified

themselves as physical education and health specialists and fourteen teachers self-classified as generalists. On average, it took participating teachers approximately eight weeks to complete all required lesson material for the *Everyone Jump Program.*

Table 1

Everyone Jump Program Overviews and Lesson Plans

	Learning Summary: *Students will…*	Lesson Topics	Assessment
Primary Unit Overview	• Demonstrate an understanding of diabetes • Recognize the impact of regular physical activity and healthy eating choices on the prevention of type 2 diabetes • Describe how to apply Canada's Food Guide and knowledge of the four food groups to make healthy eating choices	Lesson 1: *Understanding Diabetes* Lesson 2: *Everyone Jump and Be Active* Lesson 3: *Healthy Eating Choices* Lesson 4: *Up to the Challenge*	• Informational Poster • Dance • Circuit and Mission
Junior Unit Overview	• Compare type 1 and type 2 diabetes • Recognize the impact of regular physical activity and healthy eating choices on the prevention of type 2 diabetes • Explore ways to raise awareness of diabetes and type 2 diabetes prevention in their classroom and school community	Lesson 1: *One Disease – Two Types* Lesson 2: *Pick up the Ball (and Run)* Lesson 3: *Proper Nutrition* Lesson 4: *Let's Do What It Takes*	• Informational Poster and Information Pamphlet • Physical Activity Creation

Note. Content taken from *Everyone Jump – Kids Changing Diabetes 2010/2011 Educational Challenge Manual*

Measures

Physical Activity Questionnaire for Children (PAQ-C; Janz, Lutuchy, Wenthe, & Levy, 2008). The PAQ-C assesses general physical activity throughout the school year. Participants self-reported their activities from the previous seven days to produce a summary score derived from nine items, each scored on a 5-point scale.

After School Student Questionnaire (ASSQ; Kelder et al., 2005). The ASSQ used was a modified version of the Health Behaviour Questionnaire that assesses the following constructs: dietary intake, food preferences, nutrition knowledge, self-efficacy in healthy food choices, and intentions to choose healthful food options. The ASSQ was modified previously to ensure it was consistent with nutrition guides and nomenclature in a Canadian context (Sharpe, Forrester Mandigo, & Delion, 2009).

Two function pedometer with accelerometer technology (Piezo, StepsCount, Canada**).** The pedometer device was used to measure physical activity levels over a 2-day period, including the number of steps taken and activity time (total moving time in minutes) on two consecutive days during the school week (i.e., Monday to Friday).

Knowledge assessment. Program Recipient Group teachers completed the Provincial expectation rubric evaluations (i.e., marking keys) to assess each participant's diabetes-related health literacy for the corresponding knowledge assessments for the *Everyone Jump Program* (i.e., three for primary; or two for junior). Success criteria for the program assessment activities were specific to the content embedded in the lessons and included: knowledge and understanding; communication and organization; and knowledge and skill application. Rubric evaluations were scored on a 4-point scale ranging from Level 1 *(limited success criteria met)* to Level 4 *(high degree of success criteria met)*. Diabetes-related health literacy was measured by calculating each participant's mean score for the program assessment activities.

Program recipient focus groups. Focus group questions were designed to generate participant feedback about the *Everyone Jump Program* activities and implementation strategies. Focus group data were used to provide converging evidence from participants' descriptions of their experiences to support our quantitative data. The interview guide consisted of five main questions, with supplement probing questions for each one to obtain a deeper understanding about participant experiences. Examples of focus group questions included: "Tell us what you thought about the *Everyone Jump Program*; What did you learn about preventing type 2 diabetes?; What activity did you learn the most from? (and least from)."

Procedure

Prior to data collection, research ethics approval was obtained from all participating school boards and the affiliated university. Next, parental/guardian consent forms were collected. At Time 1 (*before* intervention period), all participants with parental/guardian permission to participate also provided their written assent. Participants completed the self-administered questionnaire package and were provided with their pedometer device. Instructional training was provided for correct pedometer use to all participants in a verbal demonstration at the time of data collection and all participants were sent home with an information sheet detailing correct pedometer use, and outlining *how* and *when* to wear the pedometer. Participants were asked to wear the pedometer for the next two consecutive school-week days, for the entire day, to capture activity time during school hours (i.e., physical education class, recess), recreation activities (i.e., after-school sport participation) and daily life activity (i.e., walking). Once Time 1 (*before* intervention period) data was collected, Program Recipient Group teachers were provided with the *Everyone Jump Program* resource manual and were instructed to implement the program in its entirety over the next eight weeks. Program Recipient Group teachers were also asked to complete the mandatory rubric assessments with participants. During the eight-week intervention time period, Control Group teachers were instructed to continue teaching regular provincial physical education and health curriculum during this time period. At Time 2 (*after* intervention period), all participants completed the same questionnaire package and the 2-day physical activity measure (i.e., pedometer). In addition, 14 focus groups were conducted in total (seven primary classes and seven junior classes) by the same research assistants (one male and one female) with teacher-selected participants from each of the seven Program Recipient Groups (two boys and two girls from each class). Purposeful sampling was used for focus group discussions (i.e., teacher-selected) based on the following criteria: (a) participants selected had parental consent and student's own assent; and (b) represented participants who had fully

engaged in the phenomenon (i.e., *Everyone Jump Program*) to provide an accurate and detailed description of the program elements. Focus groups were approximately 30 minutes in length.

Data Analysis

Repeated measures 2 (Program Status) x 2 (Time) MANOVAs were conducted to examine group differences in changes between Time 1 (pre-intervention period) and Time 2 (post-intervention period) for the following seven variables: Physical Activity (activity time and number of steps taken); Self-reported Physical Activity Levels; Nutrition Knowledge About Canada's Food Guide, Healthy Food Choice Knowledge, Dietary Intake; Healthy Food Choice Behaviour; and Eating Behaviour Self-efficacy. Focus group data were analyzed according to standard qualitative procedures of familiarization, coding, categorizing, and refinement in order to generate higher-ordered themes (Maykut & Morehouse, 1994; Patton, 2002). Descriptive results for the rubrics were analyzed separately, as only the Program Recipient Group completed this assessment.

Results

Physical Activity

Physical activity means for each group can be found in Table 2. Significant within-subject time x program effects were found with pedometer activity time, F (1, 220) = 6.70, $p <$ .01, $eta^2 = .03$ and number of steps, F (1, 220) = 6.71, $p < .01$, $eta^2 = .03$. As seen in Figure 1, participants in the Program Recipient Group showed a significantly greater improvement in activity time and number of steps between Time 1 and Time 2 in comparison with the participants in the Control Group.

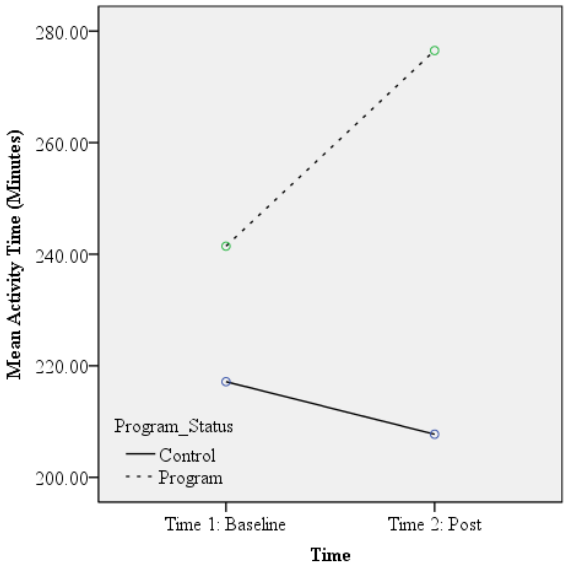

Figure 1. Pedometer physical activity time.

Significant within-subject time x program effects were also found with PAQ-C activity levels, F (1, 251) = 4.35, $p < .05$, $eta^2 = .04$. Participants in the Program Recipient Group reported a significantly greater amount of physical activity participation at Time 2, compared to Time 1, in comparison to the participants in the Control Group.

Table 2
Physical Activity Means by Intervention Group

	Control (*n* = 68)		Program (*n* = 154)	
Variable	Time 1	Time 2	Time 1	Time 2
Activity Time (minutes)	217.15	207.73	241.45	276.52
Number of Steps	25645	24366	28350	32302
	Control (*n* = 74)		Program (*n* = 179)	
	Time 1	Time 2	Time 1	Time 2
PAQ-C score	3.25	3.29	3.04	3.29

Note. PAQ-C = Physical activity questionnaire for children, measured on 5-point scale of 1 = *none* to 5 = *seven or more times a week*.

Nutrition

ASSQ means can be found in Table 3. Significant within-subject time x program effects was only found with Canada's Food Guide Knowledge, F (1, 252) = 5.58, $p < .05$, $eta^2 = .02$. As seen in Figure 2, participants in the Program Recipient Group showed a significantly greater improvement in knowledge of Canada's Food Guide from Time 1 to Time 2 in comparison with the participants in the Control Group.

Table 3
ASSQ Data Means at Time 1 and Time 2 by Intervention Group

	Control (*n* = 74)		Program (*n* = 180)	
Variable	Time 1	Time 2	Time 1	Time 2
Dietary Intake: Vegetable Servings	1.92	2.15	1.91	2.03
Knowledge: Food Guide	0.69	0.67	0.68	0.74*
Healthy Food: Behaviours	1.63	1.55	1.75	1.68
Knowledge: Healthy Behaviours	0.67	0.63	0.58	0.65
Healthy Food: Self-Efficacy	2.62	2.61	2.46	2.52

Note. Dietary Intake = measured on scale of 0 *(consumed 0 times per day)* to 3 *(consumed 3 or more times per day)*. Knowledge: Food Guide = measured by correct response percentage *(%)*. Healthy Food: Behaviours = measured on a scale of 1 *(almost always or always*) to 3 *(almost never or never)*. Knowledge: Healthy Behaviours = measured by correct response percentage *(%)*. Healthy

Food: Self-Efficacy = measured on a scale of 1 *(not sure/confident)* to 3 *(very sure/confident).* $*p < .05$.

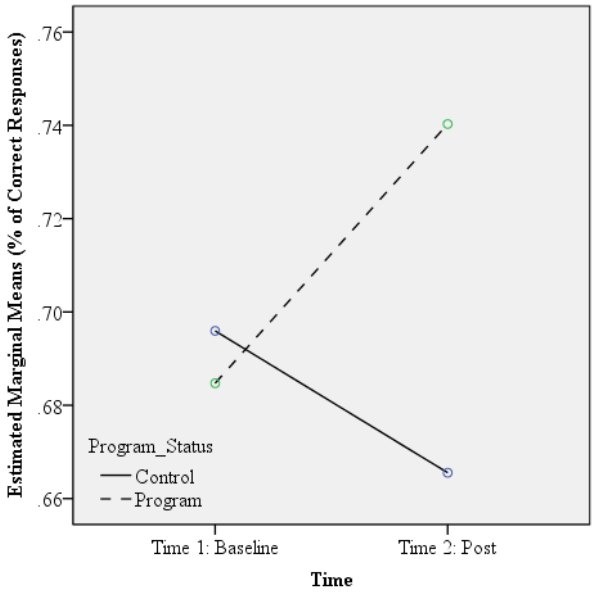

Figure 2. Knowledge of Canada's Food Guide.

Knowledge Assessment

Overall, participants in the Program Recipient Group had mean scores on the provincial expectation rubrics at the recommended achievement level (i.e., Level 3) to suggest diabetes-related health literacy objectives were being met for the program assessment activities. Thus, the *Everyone Jump Program* fostered an adequate level of diabetes-related health literacy pertaining to type 2 diabetes prevention. At both the primary and junior level, mean scores were highest on active-learning activities, whereby participants were learning through movement-based lessons (i.e., Circuit Training Rubric: *Mean* = 3.05, *SD* = .54) compared with traditional classroom-based activities (i.e., Informational Poster: *Mean* = 2.87, *SD* = .57), whereby participants were inactive (i.e., sitting in classroom) during lesson.

Focus Groups

Focus group data were used to enhance our examination of the *Everyone Jump Program* and gain more descriptive insight into the participants' experiences. Several common themes lent support to our quantitative results regarding the *Everyone Jump Program* objectives. First, participants indicated the *Everyone Jump Program* activities were effective in educating them about diabetes. This offers support to performance scores meeting the recommended achievement level on program assessment activities. As one student stated, "I didn't really know there was type 1 and type 2. I thought it was just diabetes, until the song [one of the program activities]." Participants enjoyed how the *Everyone Jump Program* offered new challenges compared to regular physical education classes. "It was much more fun than like learning basketball skills and drills," said one student. This willingness for variety from students in

physical education and health curriculum is promising for not only this current physical activity and health promotion intervention program but future similar intervention programs as well.

Second, participants consistently described how their physical activity behaviour had changed, for example “Ever since we did do this [*Everyone Jump Program*], I’ve been exercising more often which helps," supporting our quantitative results for improvements in physical activity. However, it is worth noting there were also some participants who described engaging in high amounts of physical activity even before the *Everyone Jump* Program so any increase in activity may have been range restricted.

Third, unlike their physical activity, there appeared to a theme of inconsistency surrounding nutrition knowledge and eating behaviour. This discussion-based evidence may provide an explanation for the insignificant effects among the majority of our quantitative nutrition measures. While there were some participants who showed a high degree of nutrition knowledge, discussing how they now opt for healthier fruit and vegetable options and regularly check nutrition labels on food products, the majority of participants did not indicate a change to eating behaviour. As one participant said, “In my family, it sort of stayed the same [since participating in the *Everyone Jump Program*] ‘cause I tell them that’s really not that healthy but they eat it anyways."

Lastly, in accordance with their high mean scores on active learning rubric assessments, several participants across the majority of the focus groups stated outright how they enjoyed the active learning lessons from the *Everyone Jump Program* more than the traditional classroom-based activities. As one student explained, "I lose interest after long discussions, so the activities kept me moving and focused. I get excited when we get to be active and I listen more instead of like sitting down, looking at a paper...so boring." In addition, participants enjoyed the creative freedom with active learning and the chance to invent their own exercise circuit or dance routine. For example, one participant noted, "Usually your teacher says you have to do all these different exercises...but with the kids making it up, it’s all about our imagination to come up with it [an exercise] ...and we get to be the teachers."

Discussion

The goal of this research study was to determine whether the *Everyone Jump Program* was able to attain its program objectives, designed to raise awareness among elementary students about the role that physical activity and healthy eating play in type 2 diabetes prevention. The first program objective, to emphasize the importance of keeping physically active, was met. At the end of the intervention period, participants who received the *Everyone Jump Program* were engaging in greater amounts of physical activity compared with participants who did not receive the program. Notably, self-reported physical activity levels also significantly increased from Time 1 (pre-intervention period) to Time 2 (post-intervention period). Positive outcome expectations (i.e., perceived benefits), with respect to physical activity, are a significant correlate to physical activity participation in children (Heitzler, Martin, Duke, & Huhman, 2006). Since the *Everyone Jump Program* strongly emphasizes the benefits to regular physical activity, participants may have become more aware of these physical activity benefits and their relevance to overall health. Thus, having positive attitudes toward physical activity participation may have resulted in greater intention to engage in physical activity. In contrast, participants in our control group, who were not exposed to the *Everyone Jump Program* during regularly scheduled physical education and health class time, did not significantly improve physical activity levels.

The second program objective, to educate elementary students to make healthy eating choices, was not met. The *Everyone Jump Program* was not able to improve dietary intake (i.e., consuming greater amounts of fruit/vegetables, less desserts/snacks) or healthy food choices (i.e., selecting a healthy alternative when presented with options). The only significant improvement was with regards to knowledge about Canada's Food Guide. Although some participants in the Program Recipient group described a change to eating behaviours in focus group discussions, the *Everyone Jump Program* was not able to improve overall eating habits. In the focus groups, participants often discussed eating behaviour and nutrition choices in relation to family members (i.e., parents, siblings, grandparents). This highlights how influential others, especially parental figures, are to children's eating behaviour. Parents retain control over what foods are made available and act as models for eating behaviour to their children (Savage, Fisher, & Birch, 2007). Therefore, regardless of the *Everyone Jump Program* information, the home environment may have acted as a barrier to behaviour change in our elementary student participants. Encouragement from family and friends has been shown to be positively associated with eating behaviour change. Adolescents in a health education intervention program, who reported strong social support, experienced improvements to their dietary intake (Casazza & Ciccazzo, 2007). Thus, the variability in social support participants may have received might be one reason for the insignificant change to eating behaviour within our sample. However, it is promising that participants who received the *Everyone Jump Program* did show improvement in their knowledge about Canada's Food Guide. It is vital for students to be well-informed about healthy nutrition choices at a young age as behaviours learned in childhood often continue into adulthood (Kelder et al., 1993; Malina, 1996; Raitakari et al., 1994).

Notably, the *Everyone Jump Program* was able to cultivate diabetes-related health literacy over a relatively short time period. This was reflected in the knowledge assessments, as participants demonstrated a high level of understanding regarding type 2 diabetes prevention. Our rubric assessments and participant discussion indicated the active learning program activities produced optimal and engaging learning conditions. Participant enjoyment is crucial to the success of a health promotion intervention program, especially for children and adolescents (Hagger, Chatzisarantis, & Biddle, 2001). As several participants indicated in focus group discussion, the active learning environments kept their attention through engaging activities and allowed them to learn more through doing rather than just passively listening in traditional classroom settings.

The results of the present study are encouraging; however, there are some limitations to address. First, although all teachers who implemented the *Everyone Jump Program* were provided with the same teaching resource training manual, including the same four lessons and instructions on how to implement them, variation in delivery method and investment in program material likely occurred. Therefore, the participants may not have received an identical experience with the *Everyone Jump Program*. Second, even though the pedometer device provided very useful information regarding physical activity levels that was not self-report, there were still limitations. Participants were provided with verbal and written instructions on pedometer-use techniques. However, we recognize there may have been cases of incorrect use given the age of our sample participants. In addition, approximately 3% of the pedometers malfunctioned due to mechanical errors (i.e., defective batteries). Lastly, the complex nature of school-based field research, especially working with elementary students, also presented limitations. Our unequal group sizes resulted from the difficulty encountered in our recruitment of control group schools. In addition, due to logistical reasons (e.g., pedometer cost, school timetables) pedometer physical activity data was only collected for two consecutive days within

the school week. Also, due to the nature of school-based field research where class scheduling may slightly differ among schools, we were unable to control for many extraneous variables (e.g., frequency of lessons, duration of lessons).

In conclusion, this unique research study has several important implications for school-based physical activity and health promotion intervention programs. Although changes to eating behaviour were not found in this study, the *Everyone Jump Program* was able to develop diabetes-related health literacy about type 2 diabetes and improve physical activity participation in a short period of time (i.e., 8 weeks). Future studies, should explore the long-term effects of the program and how to sustain improvements to physical activity levels. The importance of parental support was evident in participant discussion surrounding eating behaviour. Therefore, it is recommended that future school-based physical activity and health promotion intervention programs incorporate a multi-faceted approach to include parents in program objectives. Lastly, school-based physical activity and health promotion interventions, like the *Everyone Jump Program*, should consider incorporating active learning strategies to ensure student participants remain engaged in the material for an optimal learning environment. Overall, the *Everyone Jump Program* appears to be an effective supplement to the existing physical education and health curriculum to educate elementary students about type 2 diabetes prevention.

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