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A Comparative Study of the Determinants of Physical Activity, Sedentary Behaviours, and Dietary Intake among Korean children in Korea and Canada

by

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Abstract

Background: The rising trends in youth physical inactivity are universal, especially among ethnic minority youth populations. Even though reduced physical activity levels and increased sedentary behaviours have influenced the current epidemic of overweight and obesity in children, little attention has focused on youth physical activity among Asian populations such as Koreans. Research is needed to examine how socio-cultural factors influence health-related behaviours of Korean children in Canada, and whether they are more at risk of being physically inactive than children living in their own country.

Purpose: In a series of three studies, this dissertation aimed to compare the environment and health-related behaviours of two cultural groups and then investigate which factors may be related to the differential rates of physical activity, sedentary behavior and dietary intake among Korean children in Korea and Canada.

Methods: In Study 1, the reliability of a Korean translation of the Physical Activity Questionnaire for Older Children (PAQ-C) was tested with 48 bilingual children. For Study 2, 1,094 children were recruited from Canada and Korea. Measurement included anthropometric measures, physical activity levels, sedentary behaviours, dietary intake, correlates of physical activity and prevalence of obesity. Pedometers were used to measure physical activity among 198 Korean and Korean Canadian children in Study 3.

Results: In Study 1, a significant test-retest correlation was found between the Korean and English versions of the PAQ-C. In Study 2, the interaction effect

between group and gender was statistically significant for levels of physical activity. Statistically significant differences also emerged for sedentary behaviours between Korean and Korean Canadian children. In addition, significant differences were found in involvement in organized sports and active transportation to school between the two groups. Significant associations were also identified among the correlates of physical activity in both groups.

Conclusion: This dissertation provided important and contextual information regarding the role the environment plays on health-related behaviours in Korean children in Korea and Canada. By exploring environmental influences on physical activity, dietary habits, and sedentary behaviours in relation to childhood obesity, this study may offer new understanding about the important role of socio-cultural factors on children's health.

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CHAPTER 1: INTRODUCTION

Background

Overweight and Obesity in Childhood

Until recently, childhood obesity has been considered a chronic health problem primarily in Western countries (WHO, 2000). For instance, 27% of boys and 25% of girls aged 2 to 17 years were overweight, and 9% of boys and 8% of girls were obese based on direct measurement of body fat within Canadian children (Statistics Canada, 2004). However, studies reveal that Asian countries also have increasing numbers of obese children, and the incidence of obesity-related disease has risen rapidly. The prevalence of childhood obesity (BMI >30.0 kg/m^2) in Japan increased from 6.1% for boys and 7.1% for girls to 11.1% and 10.2% respectively over a period of 25 years from 1976 to 2000 (Matushita, Yoshiike, Kaneda, Yoshita & Takimoto, 2004). In China, prevalence of overweight and obesity in children increased from 14% for girls and 7.4% for boys in 1985 to 24.6% and 20.9% in 1995, and to 34.2% and 30.3% in 2005 (Ji & Cheng, 2009). In Taiwan, the prevalence of obesity among children has grown from 12.4% for boys and 10.1% for girls in 1980, to 15.6% and 12.9% in 1996 (Chu, 2005). According to the 2005 National Health and Nutrition Survey, the prevalence of overweight among Korean children increased from 9.4% for boys and 8.9% for girls in 1998, to 17.9% for boys and 11.4% for girls in 2005 (Korean Ministry of Health and Welfare, 2005). Though lower than levels observed within Canadian children, the level of overweight among Korean boys has almost doubled over the 7-year period.

Obesity presents numerous problems for children. For instance, obesity during childhood increases the risk of adult obesity (Freedman, Khan, Serdula, Dietz, Srinivasan, & Berenson, 2005). Children with BMI values at the 95th percentile had a 62-98% probability of being overweight in adulthood (Guo, Wu, Chumlea, & Roche, 2002), and approximately 30% of adult obesity begins in childhood (Styne, 2001). In addition to the risk of obesity in adulthood, childhood obesity is one of the leading causes of pediatric hypertension (Scott, Siatkowski, Eneyni, Brodsky, & Lam, 1997), sleep disorders (Chaput, Brunet, Tremblay, 2006), and Type II diabetes (Cruz, Shaibi, Weigensberg, Spruijt-Metz, Ball, & Goran, 2005). It also increases the risk of cardiovascular disease and all-cause mortality (Must & Strauss, 1999). Finally, overweight and obese children suffer from low self-esteem, lack of self-confidence and social isolation (Wabitsch, 2000). Thus, it is important to identify factors that may explain the rapid rise in overweight and obesity observed among children in Asian countries such as Korea.

Several factors that may explain increases in rates of obesity include changing behaviours (e.g., dietary habits) and environments (e.g., fast food restaurants) related to a Western lifestyle. Recent economic and social changes in Asia have resulted in a transition that includes the introduction of Western style food and mechanized transportation. However, older Koreans are less influenced by these factors and have maintained a more traditional diet consisting of low-fat intake and high carbohydrate (e.g., rice) intake (Kim, Moon, & Popkin, 2000). National movements (e.g., mass media campaigns) to retain elements of the

traditional diet have helped Koreans adhere to these unique dietary patterns (Kim, Moon, & Popkin, 2000). In spite of these efforts, under rapid economic growth, children and adolescents in Korea have become accustomed to Western style food rather than Korean traditional food (Kim, Ahn, & Nam, 2005). Interestingly, environmental factors in relation to dietary intake (junk food) and sedentary behaviour (extracurricular activities) were found to have a great influence on prevalence of obesity among children (Park et al, 2003). Yet, Prentice and Jebb (1995) argue that a decline in physical activity, as opposed to changes in energy intake, is the main reason for increasing overweight and obesity among the population.

Understanding Physical Activity in Children

Understanding and promoting physical activity in children is critical because physical activity habits developed in childhood are more likely to be maintained in adulthood (Harro & Riddoch, 2000). Evidence from physical activity tracking studies highlights the importance of sport participation during adolescence as a significant predictor of adult physical activity (Telama, Yang, Hirvensalo, & Raitakari, 2006). Children who are physically active experience lower cardiovascular risk factors than less active children, including coronary heart disease, blood pressure, and body fat (Boreham & Riddoch, 2001; Strong et al, 2005). Regular physical activity in childhood contributes to the development of healthy bones and muscles and helps reduce depression and anxiety (Biddle, Gorely, & Stensel, 2004). Physical activity is also associated with positive self-esteem, greater self-efficacy, and academic performance (Strauss, Rodzilsky,

Burack, & Colin, 2001; Tremblay, Inman, & Willms, 2000). Finally, physical activity helps children maintain a healthy body weight and prevent overweight (Lemura & Maziekas, 2002; Roberts, 2000).

Despite the numerous health benefits of regular physical activity, many Canadian children and youth do not meet public health physical activity recommendations. According to Canada's Physical Activity Guide for Healthy Active Living (Health Canada and the Canadian Society for Exercise Physiology, 2002), children need 60 minutes of moderate and 30 minutes of vigorous physical activity daily. The recent CANPLAY study (Canadian Fitness Lifestyle Research Institute [CFLRI], 2009) showed Canadian children and youth took an average of 11,356 steps per day in 2005-2006 and 11,700 steps per day in 2007-2009. Ninety minutes of moderate-to vigorous activity for children and youth is roughly equivalent to 16,500 steps daily (Beighle & Pangrazi, 2006). When applying this definition, 88 % of children and youth do not accumulate enough daily steps related to the guidelines (CFLRI, 2009). Tudor-Locke and colleagues (2004) suggested that recommended daily steps in association with BMI-referenced standards are 12,000 steps/day for girls and 15,000 steps/day for boys aged 6 to 12 years. However, 69% of Canadian children and youth do not accumulate enough steps per day to meet the recommendations associated with a healthy weight (CFLRI, 2009).

Time spent in moderate and vigorous physical activity decreases as children progress through adolescence (Riddoch et al., 2004). For instance, a study by the CFLRI (2007) showed that physical activity decreased from 49% among children

aged 5 to 12 years to 36% among teenagers aged 13-17 years. Additionally, girls spend significantly less time in moderate and vigorous activities than do boys from an early age and this gap continues to grow as children get older (Trost, Pate, Freedson, Sallis, & Taylor, 2000). Factors associated with decreasing levels of physical activity among girls may include negative experiences of physical activity, feelings of embarrassment, fear of letting down team mates, and teachers' negative attitudes towards girls' skill levels (Dwyer, Allison, Goldenberg, Fein, Yoshida, & Boutilier, 2006). Moreover, injury is a negative aspect of physical activity. For instance, adolescent girls participating in jumping and pivoting sports are 4 to 6 times more likely to have knee injuries than boys participating in the same type of sports (Hewett, Myer, & Ford, 2004).

In spite of the increasing attention paid to the health benefits related to an active lifestyle, few studies have investigated physical activity levels of Korean children. The Korean Ministry of Health and Welfare (2006) revealed that 66.3% of Korean children and youth aged 10 to 19 years were physically inactive. Only 3% engaged in more than 30 minutes of moderate physical activity 5 times a week, and 30.7% accumulated more than 20 minutes of vigorous physical activity 3 times a week. Korean youth aged 14 - 17 years engaged in only 3.7 hours of physical activity a week for boys and 2.2 hours a week for girls (Yoon, 2001). Using pedometers, An (2007) found that elementary school boys aged 10-13 years accumulated 15,748 ± 3817 steps. Lee and Kim (2007) reported that the mean number of steps taken per day for children (grades 3 and 5) in rural Korea was 17,585 ± 5,051. Based on the recommendation of Tudor-Locke and colleagues

(2004), it appears that most young Korean children participate in moderate physical activity when considering the number of daily steps taken. Yet, the majority of Korean youth are insufficiently active according to Korean Ministry of Health and Welfare (2006). However, few comprehensive studies have been conducted on the topic and there is lack of standardized self-report measures to sufficiently examine physical activity among Korean children. Therefore, there is a need for more research in this area as well as the development of validated questionnaires from which the levels of physical activity among Korean children can be assessed more accurately at a population level.

Environmental Influences on Health-related Behaviours

Emigrating from one country to another may influence health-related behaviours such as physical activity, dietary habits, or sedentary behaviours among immigrants. A growing number of individuals and families are immigrating to Canada from a variety of countries. Data from the 2006 Census shows that one in five (20%) of the total population in Canada was born outside the country (Statistics Canada, 2007). While the Canadian-born population grew by 3.3% between 2001 and 2006, Canada's foreign-born population increased 13.6% during the same period. Among the recent immigrants who arrived between 2001 and 2006, 58.3% were born in Asian countries. South Koreans account for 3.2% of all immigrants to Canada. About 20% of newcomers were children aged 14 years and under, and 15.1% were youth and young adults aged 15 to 24 years. This proportion is similar to the one for Canadian-born children (21%) and Canadian-born youth and young adults (14.4%) of the same age group.

In spite of this large and growing population, little information is available on the health-related behaviours of immigrant and ethnic minority groups in Canada.

Few studies have examined how immigration and acculturation are related to current trends in health-related behaviours such as physical activity and sedentary lifestyles among children. Acculturation, a multidimensional and multidirectional process, is conceptualized as a change that immigrants and their children experience in behaviours, attitudes, language usage, and values as a result of continuous contact with another culture (Landrine & Klonoff, 2004). Unger and colleagues (2004) found that acculturation to the United States was significantly associated with a lower frequency of physical activity and a higher frequency of fast-food consumption among Asian American children. New environments can be critical for behavioural changes of individuals based upon the acculturative process. Children in particular grow up and interact with various environmental factors that influence their development and behaviour. Therefore, understanding how children perceive and adopt new environments is important.

Recently, more attention has focused on the influence of environmental factors on individual behaviour. Theories such as social cognitive theory (SCT; Bandura, 1986), the Youth Physical Activity Promotion Model (Welk, 1999), and ecological systems theory (EST; Bronfenbrenner, 1979) hypothesize that multiple levels of influence (not only individual but also social, and cultural environments) determine individual behaviour. The living environments may be defined as the social environments (e.g., family, school, community) and physical environments (e.g., weather, parks, facilities). Living environment influences behaviour either

indirectly through cognitions and beliefs or directly, through family and social supports. Therefore, emigrating and living in new environments may influence individual behaviours.

Studies conducted with the Pima Indians in the Gila River Indian Community in Arizona provide good examples of how environmental factors have influenced behaviours related to obesity. As a considerable lifestyle change occurred for the Pima Indians during the 20th century, their dietary habits have become increasingly Westernized (Smith, Schakel, & Nelson, 1991). When the Pima Indians are exposed to a Westernized environment, they have a high prevalence of obesity, low level of physical activity, and high amount of TV viewing (Fitzgerald, Kriska, Pereira, & Courten, 1997). Moreover, research with the Arizona Pima and the Mexican Pima Indians reveals that those in Arizona have lower levels of physical activity, are more likely to be obese, and have higher rates of type 2 diabetes than the Pimas in Mexico (Schulz et al., 2006). Since the two groups share a common genetic background, any differences in behaviour and health are determined mostly by environmental circumstances.

Similarly, under the influence of a Western lifestyle, the dietary habits of Japanese women in Hawaii resembled the Caucasian diet more than the Japanese diet (Takata, Maskarinec, Franke, Nagata, & Shimizu, 2003). Japanese men living in Japan had a significantly lower mean BMI and mean subscapular skin fold thickness than Japanese men living in Hawaii or California (Curb & Marcus, 1991). And Japanese women born in the United States have considerably higher body fat than native Japanese women (Kim et al, 1993). Finally, Japanese

American men who were born in Japan have a lower prevalence of diabetes, higher levels of physical activity, and lower percentage of caloric intake from fat than those who were born in Hawaii (Huang, Rodriguez, Burchfiel, Chyou, Curb, & Yano, 1996).

In addition to the examples of the Pimas and Japanese, recent immigrants from other countries may experience changes in their behaviours and weight status. Chinese children living in the United States consume more fat, sugar, and total food calories than Chinese children living in Taiwan (Chen & Kennedy, 2004), and Chinese adolescents in the United States eat more meat, fat, sweets and snacks, and fast food than those in China (Sun & Chen, 1994). Japanese immigrant women living in the United States had higher body fat than native Japanese women (Kim et al., 1993), and a national sample of acculturated Korean American men had a high mean BMI and were likely to be overweight (Lee, Sobal, & Frongillo, 2000).

Interestingly, the prevalence of overweight and obesity in adults is associated with time since immigration. For instance, Lauderdale and Rathouz identified (2000) that the number of years living in the United States is directly related to the risk of being overweight or obese among Asian immigrants who were born in their home country. They also found that Asian Americans who were born in the United States are significantly more likely to be overweight or obese than foreign-born Asian Americans. Similarly, in Canada the prevalence of overweight and obesity of people who have emigrated over 11 years or more is higher than those who emigrated within 10 years (Tremblay et al., 2005). These

authors concluded that transitions away from typical diet and lifestyle of one's country to a Western diet and sedentary lifestyle may help explain the increase of overweight and obesity.

The rising trends in youth physical inactivity are universal, especially among ethnic minority youth populations (Gordon-Larsen, Harris, Ward, & Popkin, 2003). Even though reduced physical activity levels and increased sedentary behaviours have influenced the current epidemic of overweight and obesity in children, little attention has focused on youth physical activity among Asian populations such as Koreans. Therefore, gaining an understanding of the factors that influence health-related behaviours of Korean children is a fundamental step towards developing future health intervention studies in Canada. Moreover, research is needed to examine how socio-cultural factors influence the physical activity and sedentary behaviours of Korean children in Canada, and whether they are more at risk of being physically inactive than children living in their own country.

Purpose

The purpose of this dissertation is to explore the relationship between socio-cultural environments and health-related behaviours in childhood. As a cross-sectional research project, this study will investigate the physical activity levels, the number of step taken, sedentary behaviours, dietary intake, and levels of obesity of two cultural groups (Korean children and Korean Canadian children). It will also identify how personal, socio-cultural, and environmental factors are related to the levels of physical activity and sedentary behaviours. In order to

develop a better understanding of this issue, this study will compare the environment and behaviours of two cultural groups and then investigate which factors may be related to the differential rates of physical activity and sedentary behaviour among Korean children in Korea and Canada. The main hypothesis is that there are differences in physical activity levels, sedentary behaviours, and dietary intake, and weight status between Korean and Korean Canadian children based on the nature of their environments.

Research Questions

The research questions for this dissertation are as follows:

1. Are there differences in self-reported levels of physical activity between Korean and Korean Canadian children?
2. Are there differences in the number of step taken, as measured by a pedometer, between Korean and Korean Canadian children?
3. Are there differences in sedentary behaviours (e.g., watching movies or TV, playing video games, surfing the Internet) between Korean and Korean Canadian children?
4. Are there differences in the types of food consumed between Korean and Korean Canadian children?
5. Are there differences in physical environment factors (e.g., the accessibility of parks, the availability of recreation facilities) between Korea and Canada?
6. What are the most important correlates of physical activity in Korean children?

7. What are the most important correlates of physical activity in Korean Canadian children?
8. Is there a difference in the prevalence of being overweight between Korean and Korean Canadian children?
9. Are there differences in involvement of organized sports between Korean and Korean Canadian children?
10. Are there differences in transportation to school between Korean and Korean Canadian children?

Significance

By exploring the influences of social and physical environments on physical activity, dietary habits, and sedentary behaviours in relation to childhood obesity, this study will offer a new perspective on childhood physical activity and open up new understanding about the important role of socio-cultural factors on children's health. Findings from this study may shed light on future physical activity initiatives. Finally, this dissertation could be significant in both understanding patterns of physical activity and sedentary behaviour and planning appropriate intervention strategies to increase levels of physical activity and decrease sedentary behaviours among Korean children in Korea and Canada.

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CHAPTER 2: STUDY 1

Developing a Korean Version of the Physical Activity Questionnaire for Older Children

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Abstract

Few standardized questionnaires are currently available for measuring physical activity among Korean children. The Physical Activity Questionnaire for Older Children (PAQ-C) has been supported as a valid and reliable measure of general physical activity levels among children. The purpose of this study was to test the reliability of a Korean translation of the PAQ-C. A convenience sample of 21 boys and 27 girls (ages 8-14, grades 3-9) was recruited from a Korean school and two Korean churches in Edmonton Alberta, Canada. To be included in the study, children needed to be able to read both Korean and English. Children were asked to complete both a Korean and English version of the questionnaire, one week apart. A significant test-retest correlation between the Korean and English versions of the PAQ-C was found ($r_{total} = 0.79$, $r_{boys} = 0.80$ and $r_{girls} = 0.78$). Statistically significant relationships existed between the two time points for all items on the questionnaires (ranging from $r = 0.51$ to 0.83, $p < 0.01$). In summary, the Korean version of the PAQ-C appears to be a reliable measure of physical activity. The results of this study will allow physical activity levels to be more accurately assessed among children in Korea.

Introduction

Understanding and promoting physical activity in children are critical issues because physical activity habits developed in childhood are more likely to be maintained in adulthood (Harro & Riddoch, 2000). Physical activity is generally defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen, Powell, & Christenson, 1985, p. 129). Children who are physically active have lower cardiovascular risk factors (e.g., coronary heart disease, blood pressure, and body fat) than less active children (Boreham & Riddoch, 2001; Strong et al, 2005). Regular physical activity in childhood develops healthy bones and muscles and helps reduce depression and anxiety (Biddle, Gorely, & Stensel, 2004). Physical activity is also associated with positive self-esteem, greater self-efficacy, and academic performance (Strauss, Rodzilsky, Burack, & Colin, 2001; Tremblay, Inman, & Willms, 2000). Finally, physical activity helps children maintain a healthy body weight and prevent over weight (Lemura & Maziekas, 2002; Roberts, 2000).

Although there are numerous benefits of regular physical activity, few studies have described physical activity levels of Korean children. The National Health Nutrition Survey (2005) revealed that 66.3% of Korean youth and children aged between 10 and 19 years were physically inactive (Korean Ministry of Health and Welfare, 2006). Only 3% engaged in more than 30 minutes of moderate physical activity 5 times a week, and 30.7% accumulated more than 20 minutes of vigorous physical activity 3 times a week. Using pedometers, An (2007) found that elementary school boys aged 10-13 years attained 15,748 ±

3817 steps daily and accumulated significantly higher steps/day during weekdays (19,370 ± 4,386) than weekends (12,125 ± 3,248). Lee and Kim (2007) also assessed the daily steps of elementary school children (grade 3 and 5) in rural Korea. The mean number of steps per day for children was 17,585 ± 5,051, and daily steps of boys (18,924 ± 6,083) were higher than that of girls (16,615 ± 3,988).

Researchers have suggested that accumulating 12,000 steps/day for girls and 15,000 steps/day for boys were associated with healthy weight (Tudor-Locke et al, 2004), and boys who accumulated 13,000 steps per day engaged in 60 minutes or more of moderate physical activity (Rowlands & Eston, 2005). Based on these recommendations, most children in the previously described studies participate in moderate physical activity in terms of daily steps taken. Yet, the majority of Korean youth are insufficiently active according to The National Health Nutrition Survey (2005). A lack of standardized measures is one of the reasons that may cause the inconsistent results.

Few standardized questionnaires are currently available for measuring physical activity among Korean children. Even though accuracy in measurement is crucial, the most accurate instruments of physical activity are often invasive (e.g., direct calorimetry, direct observation) or expensive (e.g., accelerometry, doubly-labeled water) to apply with large samples. Therefore, most studies that assess physical activity in children rely on self-reports, which are low cost, time efficient, and easy to administer to large population-based samples. One potentially useful measure for children is the Physical Activity Questionnaire for

Older Children (PAQ-C). It was developed to assess levels of moderate to vigorous physical activity in children (8 to 14 years of age) throughout the school year (Crocker, Bailey, Faulkner, Kowalski & McGrath, 1997). The PAQ-C is a self-report, 7-day recall questionnaire that can be completed in 10 to 15 minutes.

The PAQ-C has been supported as a valid and reliable measure of general physical activity levels in childhood (Crocker et al., 1997; Kowalski, Crocker, & Faulkner, 1997). It has been used to classify children's physical activity level (Ball, Marshall, & McCargar, 2003; Paxton, Estabrooks, & Dzewaltowski, 2004; Ni Mhurchu, Maddison, Jiang, Jull, Prapavessis, & Rodgers, 2008) and to examine the relationship between physical activity and health variables (Muratova, Islam, Demerath, Minor, & Neal, 2001; Chen, Lee, Chiu, & Jeng, 2008; Janz et al., 2008). Also, the scale was also used in longitudinal research to successfully assess the levels of physical activity in children (Bailey, McKay, Mirwald, Crocker, & Faulkner, 1999; Thompson, Baxter-Jones, Mirwald, & Bailey, 2003; Mundt, Baxter-Jones, Whiting, Bailey, Faulkner, & Mirwald, 2006). Therefore, the PAQ-C offers a reasonable measure to assess the levels of physical activity of children.

Because few standardized questionnaires are available for measuring physical activity among Korean children, the purpose of this study was to translate the PAQ-C into Korean and test the reliability of the new scale. A high level of agreement between the English-based questionnaire and Korean-based questionnaire would allow this questionnaire to be used in Korea, and for comparisons to be made with children in other countries such as Canada.

Method

Participants

A convenience sampling strategy was used to recruit 48 children aged between 8 and 14 years (21 boys and 27 girls). Specifically, the children were recruited from a Korean language school and two Korean churches in Edmonton Alberta, Canada. Participants needed to be able to read both Korean and English. Prior to collecting data, informed consent was obtained from the parent/guardian along with the assent of the child. An information letter was provided in Korean for parents who were not comfortable reading English. All procedures were approved by the Faculty of Physical Education and Recreation Research Ethics Board at the University of Alberta.

Measures

The PAQ-C is 7-day recall questionnaire designed to measure general levels of physical activity in children ages 8 to 14 years throughout the school year (Crocker et al., 1997). It consists of 10 items (Table 1). The first question is an activity checklist that includes common sports, leisure activities, games, and other activities. Items 2 to 8 assess activity in physical education classes, recess, lunch, right after school, in the evenings, and on the weekend. Question 9 asks the children to indicate how often they did physical activity for each day of the week. The last question, not used in calculation of the activity score, asks about a child's sickness or other events that prevented him/her from engaging in regular physical activity. Each of the nine items is converted to a 5-point scale. The mean of all

items is used to indicate level of physical activity and can range from 1 to 5. A high score indicates higher levels of physical activity. When first developed, a significant test-retest reliability of the PAQ-C was reported (boys, $r = 0.75$ and girls, $r = 0.82$), and the internal consistency was also statistically significant with a Cronbach's alpha of 0.79 – 0.89 (Crocker et al., 1997). According to Kowalski et al, significant moderate relationships were found between the PAQ-C and other methods such as a 7-day recall interview ($r = 0.46$), a Caltrac motion sensor ($r = 0.39$), and the Canadian Home Fitness Test ($r = 0.28$).

Procedures

In a crossover design, participants were asked to complete both a Korean and English version of the questionnaire one week apart. Specifically, participants from the Korean language school completed the Korean version of the PAQ-C and then completed the English version of the PAQ-C (Kor-Eng), and the participants from Korean churches completed the English version of the PAQ-C first and then the Korean version (Eng-Kor).

Process of translation

Translations were completed by two experienced translators who were bilingual in the two languages (English and Korean) and who possessed graduate degrees in English at Canadian universities. Specifically, the English version of the PAQ-C was translated into Korean by one translator and then translated back into English by a different translator who did not have access to the original English version. The two versions were then compared and discussed to reconcile any differences observed. No major differences were found between the two

English versions, but small wording and phrasing changes were made for the Korean version of the PAQ-C.

Data Analysis

Descriptive statistics for the samples were conducted. Means and standard deviations for each item were initially computed to determine any differences between the Korean version and the English version of the PAQ-C. Test re-test reliability of the both versions of the PAQ-C over one week was calculated with the Pearson correlation. The Statistical Package for the Social Science (SPSS) for Windows version 15.0 was used to carry out the correlations. According to Welk (2002), a high correlation (i.e., $r \geq 0.80$) between two administrations of the equivalent test indicates a reliable test. For the purpose of statistical analysis, this study included participants who completed questionnaires and indicated they had no disabilities or other medical condition that prevented them from engaging in regular physical activity.

Results

Means and standard deviations for all items of both the Korean and English version of the PAQ-C are listed in Table 2. No significant difference was observed between the English version ($M = 3.24$, $SD = 0.61$) and the Korean version ($M = 3.16$, $SD = 0.51$) for boys. Similarly, no significant difference existed between the English ($M = 2.73$, $SD = 0.65$) and Korean versions ($M = 2.79$, $SD = 0.56$) of the PAQ-C for girls. However, when averaged over the two versions, boys ($M = 3.22$, $SD = 0.50$) were more active than girls ($M = 2.76$, $SD = 0.61$), $t = 2.80$, $p < 0.01$. Overall, significant test-retest correlations existed

between the Korean and English versions of the PAQ-C for both boys ($r = 0.80$) and girls ($r = 0.78$, $p < 0.01$).

Means, standard deviations, and correlations for each item in both the Kor-Eng and Eng-Kor groups are shown in Table 3. When collapsed across the two groups, correlations between the two versions of the PAQ-C were statistically significant for all items ranging from $r = 0.51$ to 0.83, $p < 0.01$. Within the Kor-Eng group, the test-retest correlations on Items 2 ($r = 0.37$), 5 ($r = 0.40$), 6 ($r = 0.29$), 7 ($r = 0.38$), and 8 ($r = 0.46$) were not significant. All items in the Eng-Kor group were significantly correlated between the two versions (from $r = 0.66$ to 0.95, $p < 0.01$). Overall, a significant test-retest correlation was found between the Korean and English versions of the PAQ-C regardless of the order in which the PAQ-C was completed ($r_{total} = 0.79$, $r_{Kor\text{-}Eng} = 0.73$ and $r_{Eng\text{-}Kor} = 0.83$, $p < 0.01$).

Discussion

The purpose of this study was to provide preliminary reliability evidence for the PAQ-C that has been translated into Korean. A high level of agreement was found between the English and Korean versions of the PAQ-C. Interestingly, the Eng-Kor group ($r = 0.83$) had a higher correlation than the Kor-Eng group ($r = 0.73$). One possible explanation for this finding is due to differences in reading comprehension in Korean. Because they lived in Canada, it is likely that the children were more familiar with reading in English than in Korean. The Eng-Kor may have benefited by having the questionnaire in English first. This may have helped those participants understand the items when they were answering the Korean version of PAQ-C a week later.

The issue of reading comprehension in Korean may also explain why some items of the PAQ-C in Kor-Eng were not significant. Even though participants were able to read and speak both Korean and English, most of them felt more comfortable in English than in Korean. Some participants in the Kor-Eng group may not have fully understood the content of the Korean version of the PAQ-C. Therefore, some participants in the Kor-Eng group who had low reading comprehension skills may have contributed to the lower reliability observed for some of the items in that group. Thus, further studies should verify the reliability of the PAQ-C among children living in Korea.

The levels of physical activity observed in our study are similar to those reported by other studies using the PAQ-C with Canadian youth (Crocker et al., 1997; Kowalski et al., 1997; Thompson et al., 2003). For instance the mean PAQ-C score for our total sample was 2.94 in comparison to 3.23 reported by Kowalski and colleagues (1997). When considered by gender, our mean PAQ-C scores of 3.22 (boys) and 2.76 (girls) are similar to those reported by Thompson and colleagues (boys = 3.11; girls = 2.71) and Crocker and colleagues (boys = 3.44; girls = 2.96). Therefore, the levels of physical activity among Korean Canadian children appear to be similar to those observed among other samples of Canadian children. Future studies should measure physical activity among children in Korea to allow for more comparisons on an international level.

The PAQ-C has certain advantages and disadvantages that should be considered. The strength of the PAQ-C is to use memory cues such as recess, lunch, and after school to enhance the recall ability of children. It is also useful for

discriminating between physically active and inactive children by the calculation of an overall activity score (Kowalski et al., 1997). On the other hand, there are several limitations of the PAQ-C. The PAQ-C was developed to assess general levels of physical activity providing a summary activity score. Therefore, it does not provide specific frequency, duration, intensity, or overall estimation of energy expenditure. Finally, the PAQ-C is not appropriate for use during summer and winter vacations because it was designed to only assess physical activity throughout the school year (Kowalski et al., 1997).

Though there is currently great interest in the health benefits of physical activity in children (Malina, Bouchard, & Bar-Or, 2004), few studies have assessed the level of physical activity among children in Korea. One of the reasons is due to a greater emphasis on the importance of physical skills and fitness in the country (Ko & Yu, 1998). Even though physical activity and physical fitness are related in that physical activity should lead to enhanced fitness, they are different concepts. Physical fitness is defined as "a set of attributes that people have or achieve that relates to the ability to perform physical activity" (Caspersen et al., 1985, p. 129). It seems that the distinction between physical fitness and physical activity may not be apparent among people in Korea. For instance, children who are physically inactive but score well on fitness tests may believe that it is not necessary to be regularly active. On the other hand, children who are physically active but perform poorly on fitness tests may develop negative attitudes toward physical activity. Whitehead & Corbin (1991) reported that a child's level of intrinsic motivation to participate in physical activity could

be reduced by negative feedback from fitness tests. Physical fitness is important for children, but physical activity needs to be considered as having a crucial role on children's health.

The development of a Korean version of the PAQ-C should allow international comparisons of physical activity with children in other countries. Moreover, understanding current levels of physical activity among Korean children will contribute to the development of national physical activity guidelines that prescribe appropriate levels of physical activity for health benefits. Although physical activity guidelines for Korean children have not been established, other countries such as the UK (Department of Health, 2004), Australia (Department of Health and Ageing1999), and the United states (Byers et al., 2002; US Department of Health and Human Services and US Department of Agriculture, 2005) have developed guidelines recommending that children engage in at least 60 minutes of moderate-intensity physical activity every day. Canada has set a higher standard of 90 minutes of physical activity per day for child and youth (Health Canada and the Canadian Society for Exercise Physiology, 2002). The 90 minutes should include 60 minutes of moderate activity and 30 minutes of vigorous activity. Interestingly, the Canadian guide also recommends the reduction of non-active time, starting at 30 minutes a day or less and progressing over the course of 5 months to 90 minutes a day.

This study is not without limitations, including the use of a convenience sampling strategy and a small sample size. No random samples were drawn because of the limited number of Korean children who were bilingual in the two

languages. Another limitation is that participants were not randomly divided into Kor-Eng and Eng-Kor groups. Because the children were recruited through churches and a school, it was much simpler for data collection purposes that they remained as intact groups: one group of children recruited through churches and one group of children recruited through a Korean language school.

In conclusion, although there has been increasing attention regarding health benefits related to an active lifestyle, few studies have described physical activity levels of Korean children because of a lack of standardized questionnaires. The PAQ-C has been considered as a reliable measure to assess general physical activity levels in childhood. A significant test-retest correlation was found between the Korean and English versions of the PAQ-C ($r_{total} = 0.79$). Therefore, the Korean version of PAQ-C should more reliably assess physical activity among children in Korea. This translated questionnaire should also aid in making international comparisons of physical activity among children. Findings from such studies will contribute to the development of Korean – specific physical activity guidelines for children.

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Table 1. PAQ – C items

Items	Questions
Item 1	Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (e.g., tag, bicycling, jogging, soccer, swimming) 당신의 여유시간의 신체활동: 지난 7 일 (지난 주) 동안 당신은 아래의 활동 중 어떤 것을 했습니까? 만약 했으면 몇 번이나 하였나요? (예, 잡기놀이, 자전거 타기, 조깅, 축구, 수영)
Item 2	In the last 7 days, during your physical education classes, how often were you very active (playing hard, running, jumping, throwing)? 지난 7 일동안, 체육 시간에, 당신은 얼마나 자주 활동적이었습니까? (열심히 노는 것, 뛰는 것, 점핑, 던지기등)
Item 3	In the last 7 days, what did you do most of the time at recess? 지난 7 일 동안, 당신은 학교에서 쉬는 시간에 보통 무엇을 하였습니까?
Item 4	In the last 7 days, what did you normally do at lunch (besides eating lunch)? 지난 7 일 동안 당신은 점심시간에 보통 무엇을 하였습니까 (점심 먹는 것 이외에)?
Item 5	In the last 7 days, on how many days right after school, did you do sports, dance, or play games in which you were very active?

	지난 7 일동안, 학교가 끝난 직후 당신은 얼마나 많은 날 동안 매우 활동적인 스포츠나, 춤 또는 게임을 하였습니까?
Item 6	In the last 7 days, on how many evenings did you do sports, dance, or play games in which you were very active? 지난 7 일동안, 당신은 얼마나 많은 저녁시간 동안 매우 활동적인 스포츠나 춤 또는 게임을 하였습니까?
Item 7	On the last weekend, how many times did you do sports, dance, or play games in which you were very active? 지난 주말 동안, 당신은 얼마나 자주 매우 활동적인 스포츠나, 춤, 또는 게임을 하였습니까?
Item 8	Which one of the following describes you best for the last 7 days? 다음 중 어느 것이 지난 7 일 동안 당신을 가장 잘 묘사합니까?
Item 9	Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week 당신이 얼마나 자주 신체적인 활동을 했는지 지난 주 각각의 날마다 표시하세요. (스포츠, 게임, 춤, 또는 어떤 다른 신체적인 활동)
Item 10	Were you sick last week, or did anything prevent you from doing your normal physical activities? 지난 주 당신은 아팠습니까? 또는 당신의 보통 신체적인 활동을 못하도록 만든 어떤 이유가 있었습니까?

Table 2. Test re-test correlation by gender

Gender	PAQ – C	*M (SD)*	*r*
Boy	English version	3.24 (0.61)	0.80**
	Korean version	3.16 (0.51)	
Girl	English version	2.73 (0.65)	0.78**
	Korean version	2.79 (0.56)	

Note. ** $p < 0.01$

Table 3. Test re-test correlation by group

Items	Groups	Kor-Eng group		Eng-Kor group		Total	
		M (SD)	*r*	*M (SD)*	*r*	*M (SD)*	*r*
Item 1 (checklists)	ENG	1.81 (0.52)	0.78**	1.48 (0.23)	0.95**	1.65 (0.43)	0.83**
	KOR	1.79 (0.45)		1.49 (0.25)		1.66 (0.40)	
Item 2 (PE class)	ENG	4.30 (0.73)	0.37	4.26 (0.73)	0.88**	4.28 (0.72)	0.55**
	KOR	4.00 (0.85)		4.05 (0.80)		4.02 (0.82)	
Item 3 (recess)	ENG	3.70 (1.34)	0.54*	3.68 (1.25)	0.66**	3.69 (1.28)	0.59**
	KOR	3.09 (1.31)		3.22 (1.40)		3.15 (1.33)	
Item 4 (lunch time)	ENG	2.65 (1.42)	0.54*	2.89 (1.45)	0.82**	2.77 (1.42)	0.65**
	KOR	3.26 (1.29)		2.83 (1.42)		3.07 (1.35)	
Item 5 (after school)	ENG	3.20 (1.06)	0.40	2.31 (1.15)	0.81**	2.77 (1.18)	0.67**
	KOR	3.43 (1.04)		2.56 (0.98)		3.05 (1.09)	
Item 6 (evening)	ENG	2.85 (1.14)	0.29	1.84 (0.83)	0.77**	2.36 (1.11)	0.51**
	KOR	2.70 (1.02)		2.22 (0.81)		2.49 (0.95)	
Item 7 (weekend)	ENG	3.20 (1.20)	0.38	2.84 (1.21)	0.84**	3.02 (1.02)	0.60**
	KOR	2.91 (0.95)		2.89 (1.02)		2.90 (0.97)	
Item 8 (7 days)	ENG	3.35 (1.09)	0.46	2.37 (1.07)	0.78**	2.87 (1.17)	0.61**
	KOR	3.34 (1.37)		2.78 (0.94)		3.10 (1.22)	
Item 9 (each day)	ENG	3.31 (1.06)	0.69**	2.83 (0.91)	0.82**	3.07 (1.00)	0.77**
	KOR	3.16 (0.89)		2.83 (0.81)		3.01 (0.86)	
Overall	ENG	3.15 (0.71)	0.73**	2.72 (0.56)	0.83**	2.94 (0.67)	0.79**
	KOR	3.07 (0.55)		2.76 (0.53)		2.94 (0.56)	

Note. * $p < 0.05$ ** $p < 0.01$

CHAPTER 3: STUDY 2

A Comparative Study of the Determinants of Physical Activity, Sedentary Behaviours, and dietary intake among Korean children in Korea and Canada

Introduction

Immigrating from one country to another may influence health-related behaviours such as physical activity, dietary habits, or sedentary behaviours among immigrants. A growing number of individuals and families are immigrating to Canada from a variety of countries. Data from the 2006 Census shows that one in five (20%) of the total population in Canada was born outside the country (Statistics Canada, 2007). While the Canadian-born population grew by 3.3% between 2001 and 2006, Canada's foreign-born population increased 13.6% during the same period. Among the recent immigrants who arrived between 2001 and 2006, 58.3% were born in Asian countries. South Koreans account for 3.2% of all immigrants to Canada. About 20% of newcomers were children aged 14 years and under, and 15.1% were youth and young adults aged 15 to 24 years. This proportion is similar to the one for Canadian-born children (21%) and Canadian-born youth and young adults (14.4%) of the same age group. In spite of this large and growing population, little information is available on the health-related behaviours of immigrant and ethnic minority groups in Canada. Because of the large influx of Koreans into Canada, we can no longer ignore the health related behaviours of this understudied population (Statistics Canada, 2007). Understanding physical activity, sedentary behaviours, dietary intake, and weight status of Korean Canadian children is critical for more effective interventions to prevent obesity in childhood.

In spite of the increasing attention paid to the health benefits related to an active lifestyle, few studies have investigated physical activity levels of Korean

children. Korean Ministry of Health and Welfare (2006) revealed that 66.3% of Korean children and youth aged 10 to 19 years were physically inactive. Only 3% engaged in more than 30 minutes of moderate physical activity 5 times a week, and 30.7% accumulated more than 20 minutes of vigorous physical activity 3 times a week. Korean youth aged 14 - 17 years engaged in only 3.7 hours of physical activity a week for boys and 2.2 hours a week for girls (Yoon, 2001). Using pedometers, An (2007) found that elementary school boys aged 10-13 years accumulated 15,748 ± 3817 steps. Lee and Kim (2007) reported that the mean number of steps taken per day for children (grades 3 and 5) in rural Korea was 17,585 ± 5,051. Based on the recommendation of Tudor-Locke and colleagues (2004), it appears that most young Korean children participate in moderate physical activity when considering the number of daily steps taken. Yet, the majority of Korean youth are insufficiently active according to Korean Ministry of Health and Welfare (2006).

Few studies have examined how immigration and acculturation are related to current trends in health-related behaviours such as physical activity and sedentary lifestyles among children. Acculturation, a multidimensional and multidirectional process, is conceptualized as a change that immigrants and their children experience in behaviours, attitudes, language usage, and values as a result of continuous contact with another culture (Landrine & Klonoff, 2004). Unger and colleagues (2004) found that acculturation to the United States was significantly associated with a lower frequency of physical activity and a higher frequency of fast-food consumption among Asian American children. New environments can

be critical for behavioural changes of individuals based upon the acculturative process. Children in particular grow up and interact with various environmental factors that influence their development and behaviour. Therefore, understanding how children perceive and adopt new environments is important.

The Youth Physical Activity Promotion Model (Welk, 1999) hypothesizes that multiple levels of influence (not only individual but also social, and cultural environments) determine individual behaviour. According to the YPAP model, predisposing, enabling, and reinforcing factors help a child to be physically active and maintain an active lifestyle into adulthood. Predisposing factors are based on two components: *Am I able?* and *Is it worth it?* While the predisposing factors describe the individual constructs, the enabling and reinforcing factors reflect the physical and social environmental constructs. Enabling factors consist of determinants from both the environmental and biological categories that help children to be physically active. The environmental factors, such as access to facilities, equipment, and programs, can influence physical activity behaviours, and biological attributes such as physical fitness and skills are considered important determinants of enabling factors. The YPAP posits that physical activity in children can be influenced through reinforcing factors. Parent, peer, and coach influence have been stressed as important for reinforcing physical activity among children. The living environments may be defined as the social environments (e.g., family, school, community) and physical environments (e.g., weather, parks, facilities).

Living environments influence behaviour either indirectly through cognitions and beliefs or directly, through family and social supports. Studies conducted with the Pima Indians in the Gila River Indian Community in Arizona provide good examples of how environmental factors have influenced behaviours related to obesity. When the Pima Indians are exposed to a Westernized environment, they have a high prevalence of obesity, low level of physical activity, and high amount of TV viewing (Fitzgerald, Kriska, Pereira, & Courten, 1997). Moreover, research with the Arizona Pima and the Mexican Pima Indians reveals that those in Arizona have lower levels of physical activity, are more likely to be obese, and have higher rates of type 2 diabetes than the Pimas in Mexico (Schulz et al., 2006). Since the two groups share a common genetic background, any differences in behaviour and health are determined mostly by environmental circumstances.

Similarly, under the influence of a Western lifestyle, the dietary habits of Japanese women in Hawaii resembled the Caucasian diet more than the Japanese diet (Takata, Maskarinec, Franke, Nagata, & Shimizu, 2003). Japanese men living in Japan had a significantly lower mean BMI and mean subscapular skin fold thickness than Japanese men living in Hawaii or California (Curb & Marcus, 1991). Finally, Japanese American men who were born in Japan have a lower prevalence of diabetes, higher levels of physical activity, and lower percentage of caloric intake from fat than those who were born in Hawaii (Huang, Rodriguez, Burchfiel, Chyou, Curb, & Yano, 1996).

Interestingly, the prevalence of overweight and obesity in adults is associated with time since immigration. For instance, Lauderdale and Rathouz identified (2000) that the number of years living in the United States is directly related to the risk of being overweight or obese among Asian immigrants who were born in their home country. They also found that Asian Americans who were born in the United States are significantly more likely to be overweight or obese than foreign-born Asian Americans. Similarly, in Canada the prevalence of overweight and obesity of people who have emigrated over 11 years or more is higher than those who emigrated within 10 years (Tremblay, Perez, Ardern, Bryan, & Katzmarzyk, 2005). These authors concluded that transitions away from typical diet and lifestyle of one's country to a Western diet and sedentary lifestyle may help explain the increase of overweight and obesity.

Imigrating and living in new environments may influence individual behaviours. Recent immigrants from other countries may experience changes in their behaviours and weight status. For example, Chinese children living in the United States consume more fat, sugar, and total food calories than Chinese children living in Taiwan (Chen & Kennedy, 2004), and Chinese adolescents in the United States eat more meat, fat, sweets and snacks, and fast food than those in China (Sun & Chen, 1994). Japanese immigrant women living in the United States had higher body fat than native Japanese women (Kim et al., 1993), and a national sample of acculturated Korean American men had a high mean BMI and were likely to be overweight (Lee, Sobal, & Frongillo, 2000).

The rising trends in youth physical inactivity are universal, especially among ethnic minority youth populations (Gordon-Larsen, Harris, Ward, & Popkin, 2003). Even though reduced physical activity levels and increased sedentary behaviours have influenced the current epidemic of overweight and obesity in children, little attention has focused on youth physical activity among Asian populations such as Koreans. Multiple factors related to correlates of physical activity should be identified to increase physical activity levels and decrease sedentary behaviours in children. However, little research has examined the relationship between socio-cultural factors and health-related behaviours in Korean childhood. Therefore, a study is needed to investigate how personal, socio-cultural, and environmental factors are associated with the levels of physical activity, sedentary behaviours, dietary intake and weight status among Korean children in Korea and Canada, whether they are more at risk of being physically inactive than children living in their own country.

Purpose

The purpose of this study is to identify how personal, socio-cultural, and environmental factors are related to levels of physical activity and sedentary behaviours among children in Korea and Canada. This study also investigated which factors contributed to the potentially different levels of physical activity in Korean children and Korean Canadian children. By exploring the current levels of physical activity in two different cultural environments, this study steps toward developing a better understanding how social and contextual factors influence the

physical activity, sedentary behaviours, and dietary intake of Korean children immigrating to Canada.

Hypotheses

1. Korean children spend more time participating in physical activity than Korean Canadian children;
2. Boys are more physically active than girls in both Korean and Korean Canadian children;
3. Differences will exist in sedentary activities between Korean children and Korean Canadian children;
4. Korean children eat less fast food than Korean Canadian children;
5. Differences will exist in correlates of physical activity between Korean children and Korean Canadian children;
6. The prevalence of overweight and obesity will be lower among Korean than Korean Canadian children.

Method

Participants

A total of 1,094 participants were recruited from Canada and Korea. Using a convenience sampling strategy, 468 Korean Canadian (Kor-Can) children were recruited from Korean language schools and churches in Edmonton, Calgary, and Vancouver and 626 Korean (Kor) children were recruited from elementary and junior high schools in Seoul and Kyounggi-Do in Korea. A total of 1,506 children were initially approached to participate in the study. Of these, 412 children either refused to take part in the research or failed to complete the questionnaires,

resulting in a response rate of 72.6%. Among participants who responded to the survey, 20% of Kor-Can children's (N = 468) and 39% of Kor children's (N = 626) parents completed the parent questionnaires, for a total of 13.4% response rate for Kor-Can group and 34.7% for Kor group. Ethical approval for study in each country was granted by the Faculty of Physical Education and Recreation, Agricultural, Life and Environmental Sciences and Native Studies Research Ethics Board at the University of Alberta.

Measures

Data were collected through direct measurement of height, weight, and waist circumference, parental reports of education level, income, and dietary habits, children's reports of physical activity, sedentary behaviours, correlates of physical activity, involvement in organized sports, and transportation to school.

Demographic information. Information about the child's age, gender, country of birth, and number of years living in Canada (Kor-Can) was collected. Parent's gender, occupation, education level, income, and number of years living in Canada (Kor-Can) were also recorded.

Height and Weight. Height and weight data of the children were measured using a GL-150 auto height and weight scale (G-Tech International Ltd, Seoul, Korea). Body Mass Index (BMI) is a simple index of weight-for-height that is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). Asians usually have higher level of abdominal fat at lower BMIs than whites and have a higher percentage of body fat than whites of the same age, sex, and BMI. In addition, BMI adjusted for age has been more widely used to assess

the prevalence of childhood obesity (Dietz & Robinson, 1998). A study defined international cut-offs of overweight and obesity for children between ages 2 to 18 years corresponding to a BMI of 25.0 and 30.0 kg/m^2 in adults (Cole, Bellizzi, Flegal, & William, 2000). Therefore, international cut-offs developed by Cole et al. (2000) were used to estimate weight status in Kor and Kor-Can children.

Waist Circumference. Waist circumference was measured midway between the 10^{th} rib and the top of the iliac crest and recorded to the nearest millimeter following the World Health Organization protocol (WHO, 1995). Because McCarthy, Ellis, and Cole (2003) found no significant clothing effect after testing duplicate measurements at the same site over a school shirt, T-shirt, or vest, and again over skin, the children were asked to wear a shirt for this test. Test-retest reliabilities were high ($r > 0.99$).

Self-reported physical activity. The Korean version (Lee, Spence & Jeon, 2009) of the Physical Activity Questionnaire for Older children (PAQ-C; Crocker et al., 1997) was used to investigate levels of physical activity. The PAQ-C was developed to assess levels of moderate to vigorous physical activity in children (Crocker et al., 1997). It is a self-report, 7-day recall questionnaire that can be completed in 10 to 15 minutes. It was designed to measure general levels of physical activity throughout the elementary school year for students in grades 4 to 8 (8 to 14 years of age). It consists of 10 items. The first question is an activity checklist that includes common sports, leisure activities, games, and other activities. Items 2 to 8 assess activity in physical education classes, recess, lunch, right after school, in the evenings, and on the weekend. Question 9 asks the

children to indicate how often they engaged in physical activity for each day of the week. The last question, not used in the calculation of the activity score, asks about a child's sickness or other events that may have prevented the children from engaging in their regular physical activity. Each of the 9 items is converted to a 5-point scale. The mean of all items is used to indicate overall level of physical activity and can range from 1 to 5. A high score indicates higher levels of physical activity. For the KPAQ-C (Lee et al., 2009), Taekwondo and Judo were added on the activity checklist under the first item because they are popular activities among Korean children. Those children who did not have recess in school (e.g., those in junior high school) were asked to leave item 3 (physical activity at recess) blank.

The PAQ-C has been supported as a valid and reliable measure of general physical activity levels in childhood (Crocker, et al., 1997; Kowalski, Crocker & Faulkner, 1997). A significant test-retest reliability of the PAQ-C has been reported (boys, $r = 0.75$ and girls, $r = 0.82$), and the internal consistency was also found to be statistically significant with a Cronbach's alpha of 0.79 – 0.89 (Crocker, et al., 1997). Furthermore, according to Kowalski et al, the PAQ-C was statistically correlated to other physical activity questionnaires such as a peer-comparison activity rating ($r = 0.63$), teacher's rating of physical activity ($r = 0.45$), a daily checklist of moderate to vigorous physical activity ($r = 0.53$), perceptions of athletic competence ($r = 0.48$), and the Leisure Time Exercise Questionnaire ($r = 0.41$). Significant moderate relationships were also found between the PAQ-C and other activity measurements such as a 7-day recall

interview (r = 0.46), a Caltrac motion sensor (r = 0.39), and the Canadian Home Fitness Test (r = 0.28).

Lee et al. (2009) reported a significant test-retest correlation between the Korean and English versions of the PAQ-C (r_{total} = 0.79, r_{boys} = 0.80 and r_{girls} = 0.78). Statistically significant relationships existed between two time points, one week apart, for all items on the questionnaires (ranging from r = 0.51 to 0.83, $p <$ 0.01).

Sedentary behaviours. The Adolescent Sedentary Activity Questionnaire (ASAQ) was used to measure sedentary behaviours (Hardy, Booth, & Okely, 2007). The ASAQ includes five categories: small screen recreation (SSR), education, travel, cultural activities and social activities (Hardy et al., 2007). The items within each sedentary category have both content and face validity and comprise activities that expend less than 1.5 metabolic equivalents (Ainsworth et al., 2000). Hardy and his colleagues (2007) suggest the ASAQ has good to excellent reliability and can be considered a potentially useful measure of a comprehensive range of sedentary behaviours among children and adolescent. Participants were asked to think about a normal week and to report how long they usually spent engaged in a range of sedentary behaviours on each day of the week and for each weekend day and to report the amount of time spent in each activity. Time spent in each category was calculated and also added across categories to yield the total time per week spent in sedentary behaviours.

Involvement in organized sports. Participants were asked one question about their involvement in organized sports. The question is as follows, *"Some kids*

participate in organized sport clubs such as soccer, taekwondo, or ballet" or *"Other kids don't participate in any organized sport clubs"*. Participants selected one of two statements that best described them and were asked to choose whether the statement is *"sort of true"* or *"really true."*

Transportation to school. One question was asked about the child's transportation to school. The format of the question was the same as the question pertaining to involvement in organized sports. The question is *"Some kids walk or ride their bike to school"* or *"Other kids travel to school by car, bus, or subway".*

Dietary intake. The food frequency questionnaire for Koreans (KFFQ) was used to assess dietary intake. It consists of 63 food items in 10 categories. The KFFQ was adapted from the Health Habits and History Questionnaire (Block & Subar, 1987), and has been supported as a reliable tool in assessing the dietary habits of Koreans (Kim & Yang, 1998). The KFFQ was statistically correlated with a 3-day diet record ranging from $r = 0.26$ to $r = 0.59$ (Kim & Yang, 1998) and was used to assess dietary behaviours and preference patterns of Koreans in the 2005 National Health and Nutrition Survey (Korean Ministry of Health and Welfare, 2006).

Correlates of physical activity. The questionnaires developed by Rowe, Raedeke, Wiersma, and Mahar (2007), in relation to the Youth Physical Activity Promotion (YPAP) model, was used to measure correlates of physical activity. There are three main components to the YPAP model: *Predisposing*, *Enabling*, and *Reinforcing* factors. *Predisposing* factors consist of the *Am I able?* and *Is it worth it?* subcomponents. Physical Self-Worth (PSW) and Perceived Physical

Competence (PPC) measure the *Am I able?* subcomponent of the YPAP model, and Liking of Games and Sports (LGS), Fun of Physical Exertion (FPE), and Liking of Vigorous Exercise (LVE) test the *Is it worth it?* subcomponent of *Predisposing* factors. Peer Acceptance (PA) and Parent Encouragement (PE) were used to measure the *Reinforcing* factors component of the YPAP model. Rowe and colleagues (2007) adapted 39 items from existing instruments to test components of the YPAP model. Based on confirmatory factor analyses, 7 items from the scale were deleted to balance parsimony and improve fit with a strong theoretical or logical rationale. Item keys and Cronabch's alpha coefficients for each variable are shown in Table 1. Alpha coefficients ranged from .65 to 81.

Rowe and colleagues (2007) did not develop items to measure the enabling factors of the model. Therefore, Accessibility of Playgrounds or Parks (APP), Accessibility of Sports Facilities (ASF), Safety from Strangers (SS), and Safety from Traffic (ST) were added to investigate the enabling factors of the YPAP model.

The response format was the same for all items. Participants were asked to choose between two alternative sentences (e.g., "Some kids are proud of themselves physically" or "Other kids don't have much to be proud about physically") based on which one describes them best, and then select whether the statement is "really true for me" or "sort of true for me." Each item ranges between 1 and 4, with 1 indicating the most negative response (e.g., really true for me) and 4 indicating the most positive response.

Acculturation. The Acculturation, Habits, and Interests Multicultural Scale for Adolescents (AHIMSA) scale was used to assess acculturation of Kor-Can children (Unger, Gallaher, Shakib, Ritt-Olson, Palmer, & Johnson, 2002). It has been developed for use with children as it contains child- appropriate concepts and presents at a child-friendly reading level. The eight items on the AHIMSA are "*I am most comfortable being with people from,"* "*My best friends are from"*. "*The people I fit in with best are from*," "*My favourite music is from*," "*My favourite TV shows are from*," "*The holidays I celebrate are from*," "*The food I eat at home is from*," and "*The way I do things and the way I think about things are from*." Each of the 8 items consists of four response choices: *"The US*," *"The country my family is from," "Both,"* or *"Neither."* Because the original scale was designed for people who immigrated to the United States, wording of the first two responses was changed from *"The US"* to *"Canada"* and from "*The country my family is from*" to "*Korea*".

The AHIMSA scale generates four scores based upon four orientations: Assimilation (the total number of "Canada" responses), Separation (the total number of "Korea" responses), Integration (the total number of "Both" responses), and Marginalization (the total number of "Neither" responses). For instance, the total number of *"Canada"* responses indicates the children's Canada Orientation score. Scores on the AHIMSA scale can range from 0 to 8, with 0 indicating the respondent did not answer *"Canada"* to any items, and 8 indicating the respondent answered *"Canada"* to all eight items. All subscales of the AHIMSA scale except Marginalization were significantly associated with the subscales of a

modified Acculturation Rating Scale for Mexican-American-II (ARSMA-II) and English language usage (Unger et al., 2002).

Procedures

Recruitment. Kor-Can participants were recruited from Korean language schools and churches in Edmonton, Calgary, and Vancouver, and Kor children were recruited from elementary and junior high schools in Seoul and Kyounggi-Do in Korea. To obtain permission to recruit participants in the schools or churches, a contact letter was sent to the principals/pastors of each institution. Specific schools or churches were selected based on their accessibility to researchers and their willingness to participate.

Instruments translation. Among the instruments, only the dietary intake and the PAQ-C were available in the Korean Language. Thus, the rest of the measures were translated into Korean. The English version of the questionnaires were translated into Korean and then translated back into English by a different translator who did not have access to the original English version. Translations were completed by two experienced translators who were bilingual in both languages (English and Korean) and who possessed graduate degrees in English at Canadian universities. Two English versions were then compared, discussed, and modified to identify possible differences; no major differences were found between the two. Finally, several Korean students at a Canadian university pilot tested both the English and Korean versions of the questionnaires. Based on their feedback, small wording and phrasing changes were made in the Korean version of the questionnaires.

Data collection. The parental survey questions and informed consent were distributed one week before collecting data and obtained from the parent/guardian on the date of data collection. Before the data collection, participants were informed they could withdraw anytime during the data collection by telling the investigator. Along with the verbal assent, participants were asked to complete the questionnaires after a brief explanation from the investigator. Kor children completed a Korean version of the questionnaires, and Kor-Can children completed either a Korean or English version of the questionnaires in terms of their preference.The total survey required approximately 30 minutes to complete. Data were checked at the time of administration for any implausible responses. The investigator and one other assistant then took device measures of height, weight, and waist circumference of each participant. The measurement protocols were based on the Canadian Physical Activity, Fitness and Lifestyle Approach (Canadian Society for Exercise Physiology, 2003). Before the study, both investigators were trained in standard protocols by a Certified Personal Trainer.

Data Analysis

Statistical analyses were performed using the Statistical Package for the Social Science (SPSS) for Windows version 18.0 (Chicago, IL). The data obtained from the survey were analyzed and compared to test the hypotheses of this study. Descriptive statistics were calculated for all variables. To address hypotheses 1-4, a series of 2 (sex: boys, girls) X 2 (group: Kor, Kor-Can) ANCOVAs were conducted to examine potential differences in the levels of physical activity, dietary intake, and sedentary behaviours. To determine if the predictive ability of a

set of independent variables (e.g., correlates of physical activity) on dependent variables (e.g., physical activity) was different between Kor and Kor-Can (hypothesis 5), a path analysis with a series of multiple regression analyses was conducted. Path analysis is a straightforward extension of multiple regression in which the researcher is able to study the direct and indirect relationship between constructs and behaviour (Pedhazur, 1997). This is best explained by considering a path diagram which consists of exogenous and endogenous variables. According to Pedhazur, exogenous variables are those explained by variables outside of the model (e.g., Enabling, Reinforcing) where as endogenous variables are those determined by other exogenous or endogenous variables in the model (e.g., Am I able?, Is it worth it?, physical activity). Based upon the YPAP model (Welk, 1999), a series of multiple regressions were conducted (see Figure 1). They can be specified as follows: 1. With *Am I able?* as the criterion, *Enabling* and *Reinforcing* as the predictors; 2. *Is it worth it?* as the criterion, *Reinforcing* as the predictors; and 3. With the PAQ-C as the criterion, all four variables as the predictors. To examine hypothesis 6, a Pearson chi-square analysis was used to determine if the proportions of overweight are different between the two groups. Statistical significance was determined at an alpha of $p < .05$.

Statistical power. According to Cohen (1991), with a total sample size larger than 800 and sub samples larger than 400 in each group, this study had sufficient statistical power to detect small effects or associations between 2 groups with 8 independent variables at an alpha of 0.05 and power of 0.8 (see Table 2).

Results

Demographic characteristics

Table 3 shows demographic characteristics of Korean children in Canada and Korea. The sample consisted of 468 Kor-Can children (46.2 % boys), ranging in age from 9.1 to 15.8 years (M = 12.6, SD = 1.5) and 626 Kor children (54.3 % boys), ranging from 10.1 to 15.8 years (M = 13.3, SD = 1.2). On average, Kor children were taller and heavier than Kor-Can children, but the mean BMI of the Kor group (M = 20.0, SD = 3.5) was not significantly different to the Kor-Can group (M = 19.7, SD = 3.4). The mean waist circumference of Kor children (M = 68.7 cm, SD = 8.8) was slightly higher than that of Kor-Can children (M = 67.1 cm, SD = 9.1). Parents in Canada were highly educated: 92.7 % had a college education or more as compared with 35.3 % of parents in Korea. Canadian parents also reported a higher household income than those in Korea.

Self-reported physical activity

A 2 (gender: boys, girls) X 2 (group: Kor children, Kor-Can children) ANCOVA was performed to examine differences in levels of physical activity, as collected by the PAQ-C. The interaction between group and gender was significant, F (1, 1032) = 5.19, p = 0.02; however, the effect size was small (partial eta squared = 0.005). Therefore, an independent-samples t-test was conducted to compare the PAQ-C scores for Kor boys and Kor-Can boys and Kor girls and Kor-Can girls. Based on the mean scores (see Table 4), Kor boys (M = 3.01, SD = 0.85) appeared to be more physically active than Kor-Can boys (M = 2.93, SD = 0.75), but no significant differences existed, t (525) = -1.06, p = 0.29. Similarly, no

significant differences were observed in the PAQ-C scores of Kor girls (M = 2.48, SD = 0.72) and Kor-Can girls (M = 2.58, SD = 0.65), t (516) = 1. 63, p = 0.11. There was a statistically significant main effect for gender, F (1, 1032) = 91.01, p < 0.001. An inspection of the means (see Table 4) indicated the mean PAQ-C score reported by boys (M = 2.98, SD = 0.82) was higher than that of their counterparts (M = 2.52, SD = 0.69). The two-way ANOVA failed to reveal a significant main effect for group, F (1, 1032) = 3.07, p = 0.08.

Sedentary behaviours

A two-way ANCOVA was conducted to investigate differences in the levels of sedentary behaviours by cultural group and gender, as measured by the Adolescent Sedentary Activity Questionnaire (ASAQ). The interaction effect between cultural group and gender was not statistically significant, F (1, 1077) = 1.12, p = 0. 28. There was a statistically significant main effect for cultural group, F (1, 1077) = 48.12, p < 0.001. Specifically Kor children reported spending more time in SSR and education than did Kor-Can children (see Table 5). However, Kor children were less engaged in motorized travel than Kor-Can children. No significant differences in cultural and social activities were observed between the two groups. No main effect was found for gender, F (1, 1077) = 1.13, p = 0.29.

Involvement in organized sports and transportation to school

Statistically significant differences existed in involvement in organized sports between Kor and Kor-Can children, F (1, 899) = 32.48, p = 0.001. Specifically, 57.6 % of Kor-Can children reported participating in organized sport clubs such as soccer, taekwondo, or ballet as compared with 34.2 % of Kor

children. The two-way ANCOVA also revealed a significant main effect for gender, F (1, 899) = 46.03, $p < 0.001$. Boys in both groups engaged more time in organized sports than did girls. The interaction between group and gender was not significant, F (1, 899) = 0.60, $p = 0.44$.

A statistically significant main effect for cultural group, F (1, 899) = 137.93, $p = 0.001$, was observed for transportation to school. The majority of Kor children (82.4 %) walked or rode their bike to school whereas about half of Kor-Can children (53.4 %) traveled to school by car, bus, or subway. No significant difference in transportation to school was found between genders, F (1, 899) = 0.66, $p = 0.42$. Also, no interaction between group and gender was observed, F (1, 899) = 0.00, $p = 0.99$.

Table 6 shows a significant relationship was found between involvement in organized sports and the level of physical activity for both Kor ($r = 0.42$, $p < 0.001$) and Kor-Can children ($r = 0.30$, $p < 0.001$). Active transportation to school was negatively associated with total travel time by a car for both groups (Kor, $r = -0.13$, $p < 0.001$ and Kor-Can, $r = -0.22$, $p < 0.001$).

Dietary habits

Mean and SD for each food consumption per week are shown in Table 7. Consumption of fruit, milk, pop, pizza, and fried food was not significantly different between the two groups. Children in Korea reported higher intakes of ice cream than did children in Canada, F (1, 436) = 16.68, $p < 0.001$. On the other hand, Kor-Can children ate more hamburgers than their counterparts, F (1, 455) = 54.13, $p < 0.001$.

Correlates of physical activity

All YPAP variables had significant bivariate associations with PAQ-C (see Table 8), ranging from 0.16 to 0.48 (Kor-Can children) and from 0.25 to 0.50 (Kor children). Significant associations were also found among the correlates of physical activity in both groups.

In the path analysis (see Figure 1), *Am I able?* (β = .14, $p < 0.05$) and *Is it worth it?* (β = .30, $p < 0.01$) had significant effects on physical activity in Kor-Can children. *Reinforcing* factors had no direct effect upon physical activity, but had an indirect effect through *Is it worth it?* (β = .45, $p < 0.01$) and *Am I able?* (β = .46, $p < 0.01$). *Enabling* factors did not influence physical activity directly, but influenced indirectly through *Am I able?* (β = .17, $p < 0.01$).

For the Kor children, physical activity was influenced directly by *Am I able?* (β = .15, $p < 0.01$), *Is it worth it?* (β = .22, $p < 0.01$), and *Reinforcing* (β = .20, $p < 0.01$). *Enabling* factors had no direct effect on physical activity, but had an indirect effect through *Am I able?* (β = .08, $p < 0.05$). Unlike Kor-Can children, *Reinforcing* factors had a direct effect on physical activity (β = .20, $p < 0.01$) and an indirect effect through *Am I able?* (β = .55, $p < 0.01$) and *Is it worth it?* (β = .50, $p < 0.01$).

An independent-samples t-test was conducted to compare the scores for correlates of physical activity between Kor and Kor-Can children. An inspection of the means (see Table 9) indicated no significant differences in scores of *Is it worth it?* and *Reinforcing* factors between the two groups. However, significant differences were revealed in the *Am I able?* factor for Kor-Can (M = 2.74, SD =

0.52) and Kor (M = 2.55, SD = 0.48), t (923) = 5.37, $p < 0.001$ and in Enabling factor for Kor-Can (M = 3.06, SD = 0.55) and Kor (M = 2.76, SD = 0.55), t (908) = 7.84, $p < 0.001$.

Prevalence of obesity and overweight

Based upon the international age- and gender-specific child BMI cut-off points (Cole et al., 2000), the overall prevalence of obesity and overweight was significantly higher in Kor children (21.6 %) than Kor-Can children (16 %) after adjusting for age and gender, χ^2 (3, 1094) = 24.37, $p < .0001$ (see Table 10).

Acculturation

Table 11 shows the most common response was *"Both"* (Integration) for most AHIMSA items. For two items, *"My favourite music"* and *"My favourite TV shows*", approximately 40 % of the respondents responded *"Korea"* (Separation).

Both acculturation to Canada (Assimilation) and Acculturation to bicultural (Integration) were statistically associated with immigration year. Acculturation to Canada was more strongly associated with PAQ-C, SSR, and the consumption of fruit, pop, pizza, hamburgers, and ice cream.

Discussion

The objectives of this study were to investigate the physical activity levels, sedentary behaviours, dietary intake and levels of obesity among Korean children in Korea and Canada. This study also indentified which factors (e.g., personal, socio-cultural, environmental factors) contributed to the different levels of behaviours in the two groups. We partially confirmed our hypotheses as the interaction effect between cultural group and gender was statistically significant in

the levels of physical activity. Moreover, statistically significant differences emerged for sedentary behaviours such as SSR, education, and travel between Kor-Can children and Kor children. Further, significant differences were found in involvement in organized sports and active transportation to school between the two groups. Significant association were also identified among the correlates of physical activity in both groups. Interestingly, significant differences between the two groups were revealed in correlates of physical activity such as *Am I able?* and Enabling factors.

The levels of physical activity observed in our study are similar to those reported by other studies using the PAQ-C with Canadian youth (Crocker et al., 1997; Kowalski et al., 1997; Thompson, Baxter-Jones, Mirwald, & Bailey, 2003). For instance the mean PAQ-C score for our total sample was 2.98 in comparison to 2.94 reported by Lee and colleagues (2009). In regard to hypothesis 1 (i.e., Korean children spend more time participating in physical activity than Korean Canadian children), we found a significant interaction between group and gender. Based on the mean scores, Kor boys appeared to be more physically active than Kor-Can boys whereas Kor girls were less physically active than Kor-Can girls, but no significant differences existed after conducting an independent-samples t-test. Although an interaction effect reached statistical significance, the actual difference in the mean value is very small due to the small effect size. We failed to find a significant main effect for group. One possible explanation for this finding may be due to time since immigration. Because about 40 % the Kor-Can children immigrated to Canada within the previous 3 years, their lifestyles may not be

much different compared to their counterparts in Korea. Therefore, the levels of physical activity among Kor-Can children appear to be similar to those observed among Kor children. But larger differences between genders are observed in Korea suggesting that more support is required in that country for girl's physical activity and sport.

In regard to hypothesis 2 (i.e., boys are more physically active than girls in both Korean and Korean Canadian children), we identified a significant difference in physical activity levels between boys and girls. The mean PAQ-C score reported by boys (2.98) was higher than that of girls (2.52). This finding is similar to those reported by Thompson and colleagues (boys = 3.11; girls = 2.71) and Crocker and colleagues (boys = 3.44; girls = 2.96). According to the HBSC 2005-2006 survey (Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2008), boys are more likely to report being active for at least 60 minutes a day as compared girls. The SHAPES study (Leatherdale, Manske, Wong, & Cameron, 2009) investigating the levels of physical activity in Alberta, British Columbia, and Ontario also found a gender difference in all three provinces (e.g., Alberta: boys = 40% active, girls = 31% active; British Columbia: boys = 53% active, girls = 38% active; Ontario; boys = 73% active, girls = 68% active). A gender difference was also found in the studies of Korean children. For example, Yoon (2001) reported that Korean boys (3.7 hours) engaged in more time of physical activity a week than Korean girls (2.2 hours). In terms of mean steps taken daily, Korean boys were also significantly more active than Korean girls (Chun & Oh, 2007; Lee & Kim, 2007).

In addition to the levels of physical activity, we supported hypothesis 3 (i.e., differences will exist in sedentary activities between Korean children and Korean Canadian children). Sepecifically, we found differences in sedentary behaviours between Kor-Can children and Kor children. Kor children (boys = 27.92 h / week; girls = 23.74 h / week) reported spending twice more time in SSR than did Kor-Can children (boys = 12.72 h / week; girls = 12.86 h / week). One possible explanation is Kor children may have easier access to TV, computers, and smart phones compared to Kor-Can children.

Over the past few decades, the definition of screen time (SSR in our study) has expanded to include watching TV, viewing movies, playing on computers, playing video games, and text messaging (Anderson & Bucher, 2006). SSR was the most popular sedentary behaviour in both groups in this study. This finding is consistent with a research of Australian adolescents that used the same questionnaire and revealed SSR accounted for approximately 60% of total time spent engaged in sedentary behaviours (Hardy, Dobbins, Booth, Denney-Wilson & Okely, 2006). They revealed the proportion of other sedentary behaviours was respectively small; educational (11%), travel (5%), cultural (18%), and social activities (6%). We found that 34% of Kor-Can children reported more than 2 hours of SSR time each day. This is consistent with previous work showing 36 % of children aged 6 to 11 accumulated more than 2 hours of screen time every day (Statistics Canada, 2004). Approximately 55% of Kor-Can children exceeded the maximum recommendation of no more than 90 minutes of screen time per day. However, our findings suggest that Kor-Can children are less likely to report

accumulating screen time as compared to Canadian children. For example, the average accumulated screen time of Canadians aged 10 to 16 years was about 6 hours per day (Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2008) and 50 % of Canadian youth reported watching TV more than 4 hours per day and 30 % of them reported spending more than 3 hour per day on the computer (Currie, 2004).

In addition to spending more time in SSR, Kor children also reported accumulating more time in education than did Kor-Can children. One explanation for this finding lies in the difference in terms of social desirability. There is strong competition for places in tertiary education institutions in Korea (Han, 1994). As a consequence, many Kor children devote substantial amounts of their time to studying to improve their academic performance. For instance, most Kor children were reported to engage in at least one sedentary extracurricular activity such as English, Science or computer classes.

However, Kor children were less engaged in motorized travel than Kor-Can children. This finding is associated with active transportation to school. Approximately 80 % of Kor children walked or rode bike to school, but only 46% of Kor-Can children were likely to walk or bike to school. This result is slightly higher as compared to a study identifying that only 30 % of 1495 Canadian children attending 67 elementary schools in Montreal traveled to school on foot or by bike (Torres, & Lewis, 2010). Most schools in Korea are close to home because of population density. This is one possible reason why most Kor children walk to school. Total travel time by a car was negatively associated with active

transportation for both Kor-Can and Kor children. Active transport to school has declined among children over the past decade with a corresponding increase in the proportion of students travelling by car (Heelan, Donnelly, Jacobsen, Mayo, Washburn, & Greene, 2005). Active transport to school requires greater emphasis in future discussions of children's physical activity patterns.

Unlike the rate of active transport to school, participating in organized sports tends to be higher in Kor-Can children (58 %) when compared to Kor children (34 %). One possible explanation is due to availability of programs within the community. Most communities in Canada provide opportunities for children to be involved in various sports (Active Healthy Kids Canada, 2011). For example, community soccer and basketball are the most popular sports (Ifedi, 2008). Interestingly, soccer has ranked as the number one sport activity for children aged 5 to 14 years old since 1998 (Ifedi, 2008). According to Guevremont, Findlay and Kohen (2008), 86% of Canadian children and youth are engaged in at least one community activity. Another reason to find a difference in levels of participation in organized sports may be socioeconomic influences. Our data indicated that household income of parents in Canada is higher than that of parents in Korea. Children and youth from lower income families are less likely to participate in organized sports which require some expenditure for registration, uniforms, equipment, travel or accommodations (Spence, Holt, Dutove, & Carson, 2010; Offord, Lipman, & Duku, 2005). Approximately 92 % of Canadian children from the highest income families are involved in organized sports, whereas 72 % of

children from the lowest income families participated in organized sports (Ifedi, 2008).

In regard to hypothesis 4 (i.e., Korean children eat less fast food than Korean Canadian children), assessment of dietary intake in the current study revealed children in Korea reported higher intakes of ice cream than did children in Canada while Kor-Can children ate more hamburgers than their counterparts. No significant group differences existed in consumption of vegetables, fruit, milk, pop, pizza, and fried food. Kor-Can children consumed an average of 19.7 servings of fruits per week, which is similar to the mean servings (18.4) found in Kor children. According to Canada's Food Guide to Healthy Eating (Health Canada, 2007), children aged 9 to 13 years need 6 servings of fruits per day. Overall, 94 % of Kor-Can children and 90 % of Kor children did not meet the fruit intake recommendation. In comparison to other research studies that examined Canada's Food Guide to Healthy Eating (CFGHE) recommendations of children and youth, our findings suggest lower consumption of fruits. The National 2004 CCHS: Nutrition (Garriguet, 2007) showed that children and youth aged 2 to 17 years consumed an average of 4.5 servings of vegetables and fruit per day, which is high when compared with the mean servings found in our samples. The same study revealed that 61 % of boys and 83% of girls 10 to 16 years of age did not meet the CFGHE recommendation of milk products per day. Our study had similar findings that showed only 20 % of Kor-Can children and 25 % of Kor children met the milk and alternatives recommendations.

Other studies have also found similar findings identifying poor eating dietary habits of Canadian children (Ball, Marshall, & McCargar, 2005; Veugelers, Fitzgerald, Johnston, 2005) and demonstrating that Canadian adolescents were not meeting minimum CFGHE recommendations (Jacobs-Starkey, Johnson-Down, & Gray-Donald, 2001). Moreover, this is a concern because inadequate consumption of vegetables, fruits, and milk products were related to a risk of childhood overweight and obesity (Shield, 2005; Weaver & Boushey, 2003).

To address hypothesis 5 (i.e., differences will exist in correlates of physical activity between Korean children and Korean Canadian children), a path analysis with a series of multiple regression analyses was conducted. We found significant relationships between all constructs from the Youth Physical Activity Promotion model (YPAP) and physical activity in both Kor and Kor-Can children directly or indirectly. A review of YPAP variables and sport participation among South Australian youth found *Enabling, Is it worth it?* and *Reinforcing* factors were significant predictors of sport participation (Dollman & Lewis, 2010), which is similar to our findings. Our data suggest *Am I able?* and *Is it worth it?* were important determinants of physical activity because these factors influenced physical activity directly in both groups. This result suggests that Korean children are motivated to be involved in physical activity by their competence and perceptions of the benefits of participation (Hagger, Chatzisarantis, & Biddle, 2001; McAuley & Blissmer, 2000). *Reinforcing* factors influenced physical activity either directly (Kor Children only), or via *Am I able?* and *Is it worth it?*, which may then influence physical activity. Our results also support that the

Enabling construct appears to influence physical activity through *Am I able?* in both groups. Interestingly, significant differences in scores of the *Am I able?* and *Enabling* factors existed between the two groups. Thus, Kor-Can children tended to participate more in physical activity because of their perceived abilities when compared with Kor children. Kor-Can children also had more access to sports facilities and play grounds or parks than Kor children.

Study results did not support hypothesis 6 (i.e., the prevalence of overweight and obesity will be lower among Korean than Korean Canadian children). The objective measurement of the height and weight is a strength of the current study. Participants in our study were directly measured for height and weight to calculate BMI. The prevalence of obesity was similar to both groups (Kor-Can children = 3.4 %, Kor children = 4.0 %) while the overall prevalence of overweight including obese was slightly higher in Kor children (21.6 %) than in Kor-Can children (16 %) based upon the international age- and gender-specific child BMI cut-off points (Cole et al, 2000). One possible reason is due to differential willingness of children to allow height and weight measures. Though most participants in Korea were measured for height and weight, we were unable to measure height and weight for some participants who appeared overweight in Canada because they did not want to participate in the study.

Few studies have investigated how immigration and acculturation are related to current trends in health-related behaviours such as physical activity, sedentary behaviours, and dietary intake among children (Demory-Luce, Morales, & Nicklas, 2005). The number of years living in the United States is directly related

to the risk of being overweight among Asian immigrants who were born in their home country (Lauderdale & Rathouz, 2000). Similarly, the prevalence of overweight and obesity of people who have emigrated over 11 years or more is higher than those who emigrated within 10 years in Canada (Tremblay et al., 2005). North American Chinese were less physically active and had greater BMI than Chinese in China (Lee et al., 1994). The observed decrease in physical activity with increasing years in North America is consistent with a progressively less active lifestyle. However, the current study did not find a relation between BMI and time since immigration but did find a significant relationship between acculturation to Canada and physical activity. One possible explanation for this finding may be due to the acculturation process. While Chinese immigrants to North America often go through a gradual and continuous process of assimilating a Western lifestyle (assimilation), the Koreans in our study appear to be intergrated (bicultural) but not assimilated.

Understanding acculturation, health behaviours, and weight status of Kor-Can children is critical for more effective targeting, delivery, monitoring of health programs. Because of the growing population of Korean immigrants in Canada, we can no longer ignore the health needs including physical inactivity and obesity of this population. Continued research is needed to assess the health status and lifestyle of Kor-Can families in a much larger epidemiological study so that the needs of this select population can be understood and addressed.

This study has several limitations including the use of self-reported questionnaire. Children completed self-report data for physical activity, sedentary

behaviours and correlates of physical activity, and parents provided data for children's dietary habits. Therefore, it is possible that some children or parents may have over or under reported their behaviours (Welk, Corbin, Dale, 2000). Another limitation is the use of a convenience sampling strategy. No random samples were drawn because of the limited access to and number of Kor children living in Canada. There was also an age difference in the samples. Another limitation of the study is the relatively low response rate for the parent survey, which raises the possibility of a response bias. In addition, since the study applied a cross-sectional design, causal inferences cannot be made and future studies should verify the findings.

Although there is a substantial body of literature on influences on health behaviours among children of various ethnic and racial backgrounds (McCanahy, Smiciklas-Wright, Birch, Mitchell, & Picciano, 2002; Allen, Elliott, Morales, Diamant, Hambarsoomian, & Schuster, 2007), little is known about Kor-Can children. Therefore, additional studies are needed to better understand the health status and lifestyle of this understudied population. These preliminary data will provide the basis for a much larger epidemiological study assessing the health status and lifestyle of Kor-Can families living in Canada.

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Table 1. Item key for the YPAP model variables

Abbreviations	Key to subscale abbreviations	Number of items	Cronbach's Alpha
PSW	Physical Self-Worth	6 items	0.81
PPC	Perceived Physical Competence	7 items	0.74
LGS	Liking of Games and Sports	4 items	0.79
FPE	Fun of Physical Exertion	4 items	0.70
LVE	Liking of Vigorous Exercise	4 items	0.70
PA	Peer Acceptance	4 items	0.75
PE	Parent Encouragement	3 items	0.65

Table 2. Description of statistical power for main stated hypotheses

	Hypothesis	Analysis	Power
1	Physical activity: Kor-Can < Kor	2 X 2 ANCOVA	N = 786 (n = 393 per group,
2	Physical activity: boys > girls	2 X 2 ANCOVA	small effect at $p < .05$
3	Sedentary activities: Kor-Can ≠ Kor	2 X 2 ANCOVA	N = 786 (n = 393 per group, small effect at $p < .05$
4	Fast food: Kor-Can > Kor	2 X 2 ANCOVA	N = 786 (n = 393 per group, small effect at $p < .05$
5	Correlates of PA: Kor-Can ≠ Kor	Path analysis	N = 645, small association at $p < .05$
6	Obesity status: Kor-Can > Kor	Pearson chi-square	N = 785, small association at $p < .05$

Note. Kor = Korean children; Kor-Can = Korean Canadian children

Table 3. Demographic characteristics

	Kor-Can children (N = 468)	Kor children (N = 626)	*P* value
Mean age (*SD*), years	12.6 (1.5)	13.3 (1.2)	.00
Gender, boys (girls), (%)	46.2 (53.8)	54.3 (45.7)	.59
Height (*SD*), cm	153.2 (11.3)	155.8 (9.5)	.00
Weight (*SD*), kg	46.8 (11.8)	49.0 (11.8)	.05
BMI (*SD*), kg/m^2	19.7 (3.4)	20.0 (3.5)	.40
Waist circumference (*SD*), cm	67.1 (9.1)	68.7 (8.8)	.95
Parent's education (% complete university/college)	92.7	35.3	.00
Household income annually (% more than $40,000)	61.3	35.7	.00

Table 4. The mean (SD) PAQ-C score by group and gender

Cultural group	Gender	PAQ-C
Kor-Can children	Boy	2.93 (0.75)
	Girl	2.58 (0.65)
	Total	2.73 (0.71)
Kor children	Boy	3.01 (0.85)
	Girl	2.48 (0.72)
	Total	2.77 (0.83)
Total	Boy	2.98 (0.82)
	Girl	2.52 (0.69)
	Total	2.75 (0.79)

Table 5. Mean minutes per week (SD) for sedentary behaviours by group and category

	Kor-Can M (SD)		Kor M (SD)	
Categories	Boys	Girls	Boys	Girls
SSR	763.08 (819.20)	771.37 (1139.69)	1675.29 (1053.19)	1424.08 (1019.00)
Education	545.44 (650.65)	688.14 (693.33)	954.26 (775.88)	964.75 (791.00)
Travel	162.73 (226.12)	173.35 (246.86)	71.32 (195.53)	70.12 (108.06)
Cultural	548.99 (687.68)	625.74 (890.68)	476.99 (541.88)	520.74 (537.53)
Social	354.17 (366.21)	394.61 (454.80)	315.06 (364.96)	490.07 (538.49)

Note. SSR = Small Screen Recreation

Table 6. Pearson correlations among variables

Groups	Variables	Pearson correlation (*r*)
Kor-Can children	Organized sports PAQ-C	.30**
	Active transportation Total travel time by a car	-.22**
Kor children	Organized sports PAQ-C	.42**
	Active transportation Total travel time by a car	-.13**

Note. ** $p < .01$

Table 7. Mean and SD for food consumption per week

Groups	Food	Mean	SD
Kor-Can children	fruit	19.74	13.12
	milk	9.58	6.83
	ice cream	1.03	1.63
	pop	1.14	1.70
	hamburger	0.66	0.59
	pizza	0.62	0.40
	Fried food	0.75	0.76
Kor children	fruit	18.40	20.15
	milk	8.85	6.66
	ice cream	3.28	3.58
	pop	1.29	2.08
	hamburger	0.25	0.41
	pizza	0.45	0.96
	Fried food	0.68	1.15

Table 8. Pearson correlations between correlates of physical activity and PAQ-C

Groups	Variables	1	2	3	4	5	6	7
Kor-Can	1. PAQ-C	1	.43**	.48**	.33**	.16**	-.32**	-.24**
children	2. Am I Able		1	.67**	.53**	.30**	-.10	-.28**
	3. Is It Worth It			1	.47**	.20**	-.09	-.31**
	4. Reinforcing				1	.26**	-.16**	-.11
	5. Enabling					1	-.01	-.05
	6. Age						1	.40
	7. Gender							1
Kor	1. PAQ-C	1	.47**	.50**	.48**	.25**	-.24**	-.31**
children	2. Am I Able		1	.63**	.58**	.26**	-.05	-.19**
	3. Is It Worth It			1	.53**	.28**	-.13**	-.23**
	4. Reinforcing				1	.32**	-.23**	-.11**
	5. Enabling					1	-.17**	-.12**
	6. Age						1	-.05
	7. Gender							1

Note. ** $p < .01$

Table 9. Mean (SD) for the YPAP variables

Variables	Kor-Can children	Kor children	*P* value
Am I Able	2.74 (0.52)	2.55 (0.48)	0.00
Is It Worth It	2.87 (0.62)	2.87 (0.57)	0.93
Reinforcing	2.65 (0.50)	2.59 (0.51)	0.08
Enabling	3.06 (0.55)	2.76 (0.55)	0.00

Note. YPAP = Youth Physical Activity Promotion model

Table 10. The prevalence of obesity and overweight by group according to age specific cut-off points (Cole et al., 2000)

Cultural group	Normal weight	Overweight	Obese
Kor-Can Children	393 (84.0 %)	59 (12.6 %)	16 (3.4 %)
Kor Children	491 (78.4 %)	110 (17.6 %)	25 (4.0 %)

Table 11. Distribution of responses of the AHIMSA items

Item	Canada (%)	Korea (%)	Both (%)	Neither (%)
I am most comfortable being with people from	18.4	24.5	54.8	2.3
My best friends are from	24.8	28.4	38.0	8.9
The people I fit in with best are from	25.7	29.5	40.5	4.3
My favourite music is from	19.7	41.9	27.5	10.9
My favourite TV shows are from	25.3	40.0	27.3	7.3
The holidays I celebrate are from	19.7	18.2	60.4	1.8
The food I eat at home is from	3.8	48.6	47.1	0.5
The way I think about things are from	17.4	25.3	55.3	2.0

Note. AHIMSA = Acculturation, Habits, and Interests Multicultural Scale for Adolescents (Unger et al., 2002).

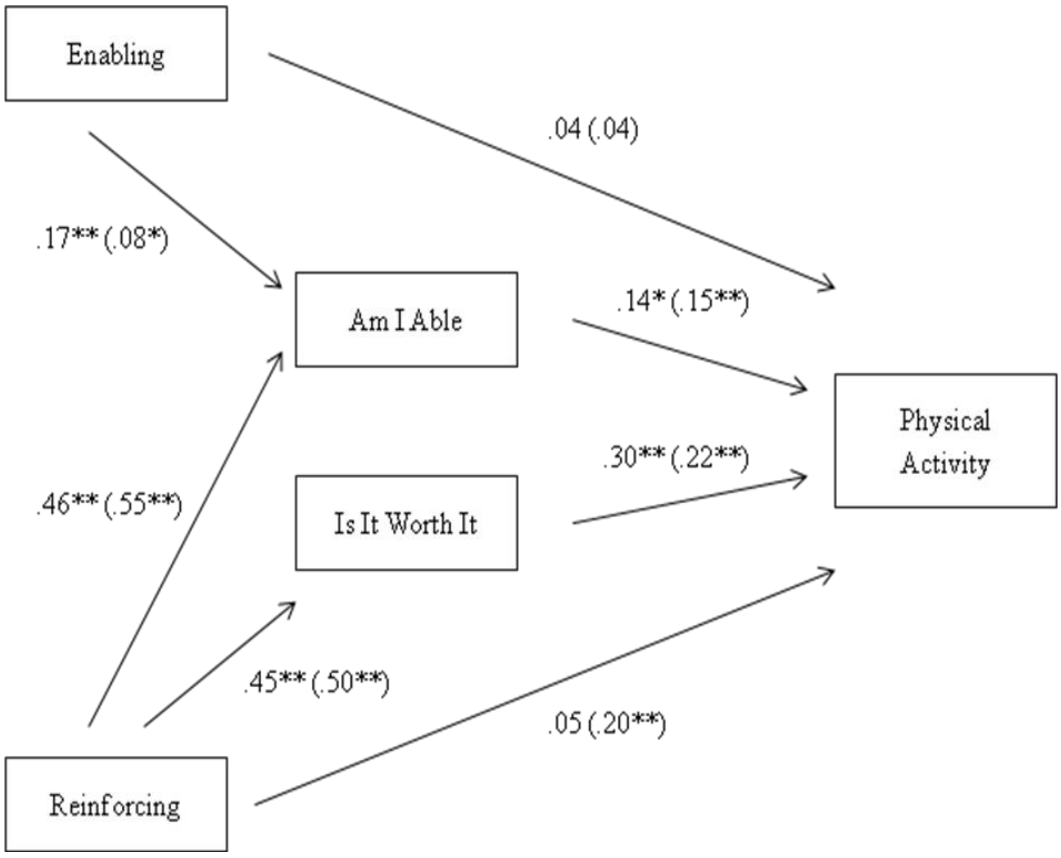
Table 12. Pearson correlations between acculturation and variables

	Acculturation to Canada (Assimilation)	Acculturation to both countries (Integration)
Immigration year	.29**	.61**
BMI	.04	-.03
PAQ-C	.14**	.09
Sedentary behaviours (SSR)	.17**	-.14**
Fruit	-.25*	.23
Pop	.46**	-.05
Pizza	.23*	-.13
Hamburger	.39**	-.08
Ice cream	.24*	-.12

Note. * $p < .05$, ** $p < .01$

SSR = Small Screen Recreation.

Figure 1. Path diagram depicting the relationships between YPAP model constructs and physical activity for Kor-Can and (Kor children)



Note. * $p < .05$, ** $p < .01$.

Data presented as Kor-Can children (Kor children)

Controlled for age and gender

CHAPTER 4: STUDY 3

A Comparative Study of Current Levels of Physical Activity among Korean children in Korea and Canada Using Both Self-report and Pedometers

Introduction

Physical activity provides substantial health benefits for children's psychological well-being (Parfitt & Eston, 2005), healthy bones and muscles (Biddle, Gorely, & Stensel, 2004), and reduces chronic disease risk factors (Cavill, Biddle, & Sallis, 2001). Regular physical activity also helps children maintain a healthy body weight and prevent overweight (Lemura & Maziekas, 2002; Roberts, 2000). In spite of the evidence linking physical activity with health, there is growing concern about the insufficient levels of physical activity among children (WHO, 2004). Therefore, monitoring physical activity in children is essential for public health purposes (Cavill et al., 2001).

A number of different methods have been used to assess physical activity in children (Welk, Corbin, & Dale, 2000). Researchers need valid and reliable measures of youth physical activity, but the difficulty of developing such instruments has been well documented (Baranowski, 1988; Bauman, Bellew, Vita, Brown, & Owen, 2002; Warnecke et al., 1997). Selecting proper measurements to assess physical activity is critical and is dependent on the explicit research purposes such as explaining descriptive studies of populations, investigating correlates and predictors of physical activity, or evaluating the effectiveness of interventions. No single instrument appears to measure physical activity adequately. Therefore, multiple assessments (e.g. pedometers along with physical activity questionnaires) can be useful to obtain more accurate data (Wood, 2000). Sallis and Saelens (2000) have suggested that the key role of self-reports may be to

assess the context and type of physical activity when used in combination with objective measures.

Pedometers are well acknowledged as a simple, accurate means to measure daily step activity, and have been demonstrated as an appropriate tool for assessing physical activity in children (Tudor-Locke, McClain, Abraham, Sisson, & Washington, 2009; Sirard & Pate, 2001). The Canadian Physical Activity Levels Among Youth (CANPLAY) study randomly selected over 23,000 children and youth aged 5 to 19 years and collected pedometer data on the number of daily steps taken by them across Canada between 2005 and 2007 (CFLRI, 2007). According to the study, Canadian children and youth took an average of 11,356 steps (11,946 steps for boys and 10,735 steps for girls) per day in 2005-2006 and 11,685 steps (12,420 steps for boys and 10,969 steps for girls) per day in 2006-2007. In terms of age, children aged 5 to 10 years (12,441 steps) took more steps than children aged 11 to 14 years (11,762 steps), who in turn took more steps than those aged 15 to 19 years (10,301 steps) between 2006 and 2007. Interestingly, the activity levels of children are associated with the education level of parent, the activity level of parent, and the child's participation in organized sport and physical activity.

According to Tudor-Locke and colleagues (2004), the number of recommended daily steps in association with BMI-referenced standards is 12,000 steps/day for girls and 15,000 steps/day for boys in children aged 6 to 12 years. However, 71% of Canadian children and youth do not accumulate enough steps per day to meet the recommendations related to a healthy weight, and 84% do not

meet the criteria of accumulating at least 12,000 steps for girls and 15,000 steps daily for boys (CFLRI, 2007). Moreover, 91% of children do not take enough daily steps to meet Canada's guidelines for children and youth which recommends 90 minutes of moderate to vigorous physical activity per day; roughly equivalent to 16,500 steps daily.

Few studies have assessed pedometer determined physical activity levels among Korean children. An (2007) found that elementary school boys aged 10-13 years attained 15,748 ± 3,817 steps daily and accumulated significantly higher steps/day during weekdays (19,370 ± 4,386) than weekends (12,125 ± 3,248). Similarly, one study has reported both boys and girls were significantly more active on weekdays than on weekend days (Chun & Oh, 2007). In this study, the mean of weekday pedometer-determined physical activity was 14,358 steps per day in boys and 8,367 steps per day in girls. The corresponding values for weekend days were 12,188 in boys and 7,674 in girls. Lee and Kim (2007) also assessed the daily steps of elementary school children (grade 3 and 5) in rural Korea. The mean number of steps per day for children was 17,585 ± 5,051, and daily steps of boys (18,924 ± 6,083) were higher than that of girls (16,615 ± 3,988).

A growing number of studies have used the pedometer for measuring the current levels of children from different populations (Duncan, Al-Nakeeb, Woodfield, & Lyons; Cox, Schofield, Greasley, & Kolt, 2006; Tudor-Locke, Lee, Morgan, Beighle, & Pangrazi, 2006). However, the existing data on Korean children's physical activity are insufficient because of a lack of standardized

measures. Therefore, the use of multiple measurements should help enable the accurate assessment of current levels of physical activity among Korean children in Canada and Korea.

In order to promote behaviour change, researchers advocate that written health information should be theoretically based (Fishebein, von Haeften, & Appleyard, 2001). There have been many interventions for the solution of the problem of obesity. Traditional research has employed individually–based approaches, focusing on individual attributes and attitudes. However, these individual approaches will be ineffective by themselves if nothing is done to alter the environmental factors believed to contribute to physical inactivity and unhealthy eating behaviour (Marcus & Forsyth, 1999). Recently research studies have become more interested in environmental factors which influence individual behaviour. Children in particular grow up and interact with various environmental factors that influence their development and behaviour. Therefore, understanding how children perceive and adopt new environments is important.

Studies suggest that attributes of the built environment can influence behaviour and facilitae or hinder physical activity (Giles-Corti, Timperio, Bull, & Pikora, 2005; Kirby, Levesque, Wabano, & Robertson-Wilson, 2007; Popkin, Duffey, & Gordon-Larsen, 2005). Little attention has focused on youth physical activity among Asian populations such as Koreans. Therefore, research is needed to examine how environmental factors influence the levels of physical activity among children in Korea and Canada, and whether these factors are related to the

risk of being physically inactive than to children who were born in their home country.

Purpose

The purpose of this study was to assess current levels of physical activity among Korean children in Korea and Canada, and to identify possible differences between the levels of physical activity in terms of the two different environments. Self-report questionnaires that assess physical activity are useful in large-scale studies because they are inexpensive and impose little burden on respondents, but these scales may be compromised by accuracy of recall, biases, including social desirability, as well as the complexity of the questionnaire (Kohl, Fulton, & Caspersen, 2000). Therefore, it is recommended to include objective measures such as pedometers when investigating physical activity in children (Sirard & Pate, 2001). To assess the levels of physical activity more reliably, both self-report and pedometers were employed as measurements in this study.

Another purpose was to test the reliability of the KPAQ-C. A significant test-retest correlation of 0.79 ($p < 0.01$) was observed between the Korean and English versions of the PAQ-C in a previous study (Lee, Spence, & Jeon, 2009), but no validity information was prescribed at that times. This study provides both reliability and validity evidence for the PAQ-C using both a self-report and pedometer.

Hypotheses

1. Korean children take more steps per day than Korean Canadian children.
2. Boys take more steps per day than girls in both Canada and Korea.

3. The Korean version of the PAQ-C is a reliable and valid measure of physical activity among Korean children.

Method

Participants

The participants of this study were 198 Korean Canadian (Kor-Can) and Korean (Kor) children aged between 9 to 15 years living in Canada and Korea. A total of 389 children were invited to participate in the sutdy. Of these, 191 children either did not submit a record sheet or failed to provide a minimum of 4 valid days of data, giving an overall study response rate of 51%. Canadian-based children were recruited from Korean language schools and churches in Edmonton, Calgary, and Vancouver, and the Korean-based children were recruited from elementary and junior high schools in Seoul and Kyounggi-Do in Korea. Specific schools were selected based on their accessibility to researchers and their willingness to participate. Informed consent was obtained from the parent/guardian along with the verbal assent of the participants. Ethical approval was granted by the Faculty of Physical Education and Recreation, Agricultural, Life and Environmental Sciences and Native Studies Ethics Board at the University of Alberta.

Measures

Demographic information. Parent's occupation, education level, and income were obtained from the parent by questionnaire. The age, gender, and country of birth for children were also recorded. Height and weight data of the children were obtained by direct measurement and converted to BMI.

Self-reported physical activity. The Physical Activity Questionnaire for Older children (PAQ-C), a self-report, 7-day recall questionnaire, was used to investigate levels of physical activity. It was developed to assess levels of moderate to vigorous physical activity in children (8 to 14 years of age) throughout the school year (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997). The English and Korean (Lee, Spence, & Jeon, 2009) versions of the PAQ-C were used to investigate the levels of physical activity among children in Canada and Korea respectively. The scale consists of 10 items. The first question is an activity checklist that includes common sports, leisure activities, games, and other activities. Item 2 to 8 assess activity in physical education classes, recess, lunch, right after school, in the evenings, and on the weekend. Question 9 asks the children to indicate how often they did physical activity for each day of the week. Each of the nine items is converted to a 5-point scale. The mean of all items is used to indicate level of physical activity and can rage from 1 to 5. A high score indicates higher levels of physical activity.

The PAQ-C has been supported as a valid and reliable measure of general physical activity levels in childhood (Crocker, et al., 1997; Kowalski, Crocker & Faulkner, 1997). A significant test-retest reliability of the PAQ-C has been reported (boys, $r = 0.75$ and girls, $r = 0.82$), and the internal consistency of the PAQ-C was also statistically significant with a Cronbach's alpha of 0.79 – 0.89 (Crocker, et al., 1997). The Korean version of the PAQ-C (KPAQ-C) appears to be a reliable measure of physical activity (Lee et al., 2009). A significant test-retest correlation between the Korean and English versions of the PAQ-C was found

(r_{total} = 0.79, r_{boys} = 0.80 and r_{girls} = 0.78) with significant relationships existing between the two time points for all items on the questionnaire (ranging from r = 0.51 to 0.83, $p < 0.01$).

Pedometer. The pedometer measures vertical accelerations at the hip, providing summary output of ambulatory activity of steps taken throughout the day (Vincent, & Pangrazi, 2002). Participants wore an MLS 2505 (Walk4Life, Inc., Plainfield, Illinois) pedometer. The device offers a delayed reset button to reduce the likelihood of accidental resets and an orange colour to makes it easily identifiable if dropped on playgrounds and other outdoor areas. Schneider et al. (2003) demonstrated that the MLS 2505 pedometer has good reliability (Cronbach's α = 0.89) and moderate to good accuracy (+/- 20% of actual steps taken during 400-m walk). Intraclass correlation coefficient (ICC) scores of 0.985 have been observed between registered pedometer steps and actual steps in 5-11-year-old children (Beets, Patton, & Edwards, 2005). In sum, this pedometer has been validated and considered a reliable estimate of children's physical activity participation.

Prior to data collection, a pedometer training session was conducted for teachers, parents, and children. This training session provided information on the pedometers and protocols to be followed. Specifically, participants were taught how to wear pedometers. Even though no differences have been found between pedometer attachment sites in elementary school children (Ramirez-Marrero, Smith, Kirby, Leenders, & Sherman, 2002), participants were asked to wear the pedometer over the their belt or waistband near the front of the hip bone, in line

with the kneecap. Students were instructed they should wear the pedometer at all times except during water activities and sleeping, record data with the help of their parents, and reset the pedometer at the end of each day.

Data Collection

Data collection took place over five school days and two weekend days. Four days of monitoring is a sufficient length of time to determine habitual activity levels in children (Trost, Pate, Freedson, Sallis, & Taylor, 2000; Duncan, Schofield, & Duncan, 2006). However, Tudor-Locke and colleagues (2009) have reported that a range of 2 to 8 days is acceptable when assessing children's free-living physical activity with pedometers. Therefore, participants were asked to wear the pedometer for 7 consecutive days (five weekdays and two weekend days) to investigate the difference in the number of steps taken between weekdays and weekends.

The research team provided children with instructions on how to record data and comply with the protocol. Each day at bedtime, children were asked to complete a log recording each day's steps onto a chart with the help of their parents. Children were also prompted to reset the pedometer for the following day. Data sheets were reviewed, and missing or unusual data were also checked. Any unusual or extreme responses were confirmed with the children for clarification to ensure the quality and completeness of the data.

Data Analysis

Statistical analyses were performed using the Statistical Package for the Social Science (SPSS) for Window version 18.0 (Chicago, IL). Descriptive

statistics for the samples were conducted. Means and standard deviations for each outcome were initially computed to determine any differences between Kor children and Kor-Can children. To address the hypothesis 1 and 2, a two-way analysis of covariance (ANCOVA) was conducted to examine potential differences in the levels of physical activity as mean steps per day by cultural group and gender. Participants with more than 4 days of pedometer data were included in the analyses. The majority of children (85%) achieved the full 7 days of recording. To test the reliability of the KPAQ-C (hypothesis 3), Person correlation coefficients were conducted. Finally, Pearson correlation was used to explore the strength of the relationship between pedometers and the KPAQ-C at time 2.

Results

The descriptive characteristics including anthropometric measures for the participants are shown in Table 1. The sample consisted of 84 Kor-Can children (37 boys, 47 girls) and 114 Kor children (56 boys, 58 girls). The age of Kor-Can children ranged from 9.1 to 15.8 years (M = 12.5, SD = 1.7), and the age of Kor children ranged from 10.9 to 15.0 years (M = 13.5, SD = 1.3). On average, height and weight are similar between the two groups. Finally, the mean BMI of the Korean group (M = 20.6, SD = 3.5) was not significantly different from the Kor-Can group (M = 20.3, SD = 3.6).

A two-way analysis of covariance (ANCOVA) was performed to assess the impact of cultural group and gender on physical activity levels as mean steps per day. No interaction between cultural group and gender on daily mean steps was

found ($F_{(1, 191)} = 0.78$, $p = 0.38$). However, a statistically significant main effect existed for cultural group, F (1, 191) = 15.00, $p < 0.001$, partial eta squared = 0.07. Specifically, Kor children (8,772 ± 3,149) obtained more mean daily step counts than Kor-Can children (7,164 ± 2,996). Significant differences were also found between boys and girls for mean steps taken daily, F (1, 191) = 10.13, $p = 0.002$. The mean number of steps per day for boys (8,821 ± 3,684) was higher than that of girls (7,462 ± 2,477) in both Korea and Canada. In addition, both Kor-Can and Kor children accumulated higher steps/day during weekdays (8,470 ± 3,050) than weekends (7,073 ± 4,463).

A 2 (group: Kor-Can children, Kor children) X 2 (gender: boys, girls) ANCOVA was also conducted to examine differences in levels of physical activity, as collected by the PAQ-C. The interaction between group and gender was not significant, F (1, 189) = 0.28, $p = 0.60$. However, the two-way ANCOVA revealed a significant main effect for group, F (1, 189) = 5.39, $p = 0.02$, partial eta squared = 0.03. There was also a statistically significant main effect for gender, F (1, 189) = 18.69, $p < 0.001$. An inspection of the means (see Table 2) indicated boys (M = 2.92, SD = 0.67) in both groups engaged more time in physical activity than did girls (M = 2.58, SD = 0.67).

Test re-test reliability of the Korean version of the PAQ-C (KPAQ-C) over one week was investigated with the Pearson correlation coefficient. Means, standard deviations, and correlations for both the Test 1 and the Test 2 of the KPAQ-C are shown in Table 3. No significant difference was observed between the Test 1 (M = 2.86, SD = 0.68) and the Test 2 (M = 2.68, SD = 0.71) for boys.

Similarly, no significant difference existed between the first (M = 2.53, SD = 0.71) and the second administration (M = 2.57, SD = 0.80) for girls. Overall, the KPAQ-C was relatively stable over the two assessments for both boys (r = 0.72, $p < 0.01$) and girls (r = 0.85, $p < 0.01$). In short, a significant test-retest correlation was found between the Test 1 (M = 2.68, SD = 0.71) and the Test 2 (M = 2.62, SD = 0.76) of the KPAQ-C (r_{total} = 0.79, $p < 0.01$). Finally, a significant, though small, correlation was found between the KPAQ-C and steps (r = 0.26, $p < 0.05$).

Discussion

The purpose of this study was to assess and compare possible difference the current levels of physical activity among Korean children in Korea and Canada children using both self-report and pedometers as measurements. We confirmed our hypotheses as significant differences existed in the levels of physical activity between groups and genders. We also demonstrated the Korean version of the PAQ-C is a reliable measure of physical activity among Kor children.

This study identified a significant difference in physical activity levels between the two groups by both the mean PAQ-C score and the mean number of steps per day. According to the mean PAQ-C, Kor children (M = 2.76, SD = 0.74) were more engaged in physical activity than Kor-Can children (M = 2.72, SD = 0.60), but the actual difference in the mean values appears very small due to the small effect size. We also confirmed Kor children were significantly more active than Kor-Can children in terms of their mean steps taken daily. The mean number of steps per day for Kor children (8,772 ± 3,149) was higher than that of Kor-Can children (7,164 ± 2,996). One possible explanation for this finding is due to

differences in active transportation to school and motorized travel time between the two groups. Specifically, we found Kor children (boys = 71 min, girls = 70 min per week) were less engaged in motorized travel than Kor-Can children (boys = 162 min, girls = 173 min per week) in study 2. In addition, approximately 80 % of Kor children walked or biked to school while only 46% of Kor-Can children were likely to walk or bike to school. Our finding is consistent with other studies reporting active commuting to school is an important means for youth to accumulate step counts. Studies found that children and youth who walked at least to or from school averaged 1,700 to 2,700 more steps per day than children and youth who rode in a car or bus (Hohepa, Schofield, Kolt, Scragg, & Garrett, 2008; Johnson, Brusseau, Darest, Kulinna, & White-Taylor, 2010). Similarly, children who walk or ride to school engaged more time in moderate to vigorous physical activity when compared to children who travel to school by car or bus (Cooper, Andersen, Wedderkopp, Page, & Froberg, 2005; Sirard, Riner, McIver, & Pate, 2005).

The physical environment of each country may contribute to the differences in the levels of physical activity in children. In Korea, the public transit systems are well developed due to population density. For example, the Seoul Subway is the third largest in the world, with over 2 billion passengers every year (Ministry of Land Transport and Maritime Affairs [MLTM], 2009) About 40 % of people including children use a subway because of traffic density (MLTM, 2009). People still need to walk for taking and transferring when they travel with a subway. This developed public transit system may contribute to differences in steps taken daily.

In addition, most schools are close to home in Korea. This is one possible explanation why most Kor children walk to school. According to Braza, Shoemaker, and Seeley (2004), active commuting to school was significantly associated with a route to school shorter than 800 m, which supports our findings.

The average steps taken per day in the current study were lower than reports of similarly aged children from the United Kingdom (boys = 16,035, girls = 12,729; Rowlands, Eston, & Ingledew, 1999); New Zealand (boys = 16,132, girls = 14,124; Duncan, Schofield, & Duncan, 2006); and Australia (boys = 13,824 – 15,023, girls = 11,221 – 12.322; Vincent, Pangrazi, Raustorp, Tomson, & Cuddihy, 2003). These differences may be due to the type of pedometer used. Tudor-Locke, Bassett, Shipe, and McClain (2011) found that individuals who accumulate many short bouts of activity may be underestimated in their daily step counts because the Walk4Life MLS 2505 records steps taken in bouts of 3 seconds or longer. This feature may account for why our data is low compared to other studies.

Both Kor and Kor-Can children accumulated higher steps per day during weekdays (9,079 steps for Kor children and 7,624 steps for Kor-Can children) than weekends (7,887 steps for Kor children and 6,001 steps for Kor-Can children), which is consistent with findings found in Korea. Few studies have assessed pedometer determined physical activity levels among Kor children. An (2007) found that elementary school boys aged 10-13 years accumulated significantly higher steps per day during weekdays (19370 ± 4386) than weekends (12125 ± 3248). Chun and Oh (2007) also reported both boys and girls were significantly more active on weekdays (14,358 steps / day in boys and 8,367 steps / day in girls)

than on weekend days (12,188 in boys and 7,674 in girls). Similarly, New Zealand children aged 5 to 13 years accumulated 16,132 (boys) and 14,124 (girls) steps on weekdays, respectively as opposed to 12,702 (boys) and 11,518 (girls) steps on weekend days (Duncan, et al., 2006).

The mean number of steps per day for boys was higher than that of girls in both Korea (boys = 9231 ± 3780, girls = 8272 ± 2315) and Canada (boys = 8089 ± 3453, girls = 6440 ± 2310). This pattern is similar to previous findings that elementary school boys (18,924 ± 6,083) accumulated higher mean daily steps than did girls (16,615 ± 3,988) in rural Korea (Lee & Kim, 2007). According to the CANPLAY study, significant gender differences appeared within all age group for Canadian children (boys = 11,946, girls = 10,735 in 2005-2006; boys = 12,420, girls = 10,969 in 2006-2007). We also found a significant difference in the levels of physical activity between genders in both groups based upon the PAQ-C score. In a Korean study of 1,097 youth, Cho (2004) found that boys (38.5 %) were more engaged in a sufficient amount of physical activity during leisure time than girls (6.8 %). Further, Kim and Cho (2002) identified a greater proportion of girls (63.3 %) were engaged in sedentary behaviours than boys (36.7%). One possible explanation may be because exercise and sports have not been favoured for females through the history of Korean society (Cho, 2000). As Korean culture changes, gender roles are still remaining traditionally unfavored for females to participate in dynamic and vigorous physical activities (Cho, Kim, & Kim, 2000). This cultural attitude may discourage girls from being involved in regular physical activity. Therefore, research is needed to help girls have a

positive attitude toward physical activity and promote physical activity through gender specific inventions in school and in the community.

In general, the gender difference may be explained as a result of biological factors (e.g., hormonal, growth) and social or lifestyle factors (Trost, Pate, Dowda, Saunders, Ward, & Felton, 1996). From the biological perspective, boys are more active than girls because daily energy expenditure and fat-free mass are usually higher in boys than in girls at all ages (Malina, Bouchard, & Bar-Or, 2004). Another explanation of gender differences is that boys may be more intrinsically motivated toward physical activity while girls may rely on extrinsic motivation such as direct reinforcement (Biddle & Armstrong, 1992). Factors associated with decreasing levels of physical activity among girls may include negative experiences of physical activity, feelings of embarrassment, fear of letting down team mates, and teachers' negative attitudes towards girls' skill levels (Dwyer, Allison, Goldenberg, Fein, Yoshida, & Boutilier, 2006).

Moreover, girls spend significantly less time in moderate and vigorous activities than do boys from an early age and this gap continues to grow as children get older (Trost, Pate, Freedson, Sallis, & Taylor, 2000). One reason for the decline in physical activity among girls may be associated with the experience of pubertal development. Studies show there is a decrease in physical activity levels with increasing biological age (Sherar, Esliger, Baxter-Jones, & Tremblay, 2007; Thompson, Baxter-Jones, Mirwald, & Bailey, 2003). Interestingly, gender differences in self-reported physical activity among adolescents disappeared when differences in physical maturity were controlled (Thompson et al., 2003). Because

girls tend to mature earlier in age than boys (Malina et al., 2004), this finding suggests that maturity differences between genders may be one reason why adolescents girls are less physically active than boys of the same chronological age. Therefore, the consideration of biological maturity may be helpful to design interventions targeting girls (Sherar et al., 2007). In addition, research is needed to support gender-targeted physical activity interventions because boys and girls prefer different activities and may face different barriers to physical activity (Vu, Murrie, Gonzalez, & Jobe, 2006).

Another purpose of this study was to test the reliability of Korean version of the PAQ-C (KPAQ-C). Lee, Spence, and Jeon (2009) reported that a significant test-retest correlation exists between the Korean and English versions of the PAQ-C (r = 0.79). However, some items of the PAQ-C were not significant due to low reading comprehension skills in Korean. Therefore, this present study was necessary to verify the reliability of the Korean version of the PAQ-C among children living in Korea. Overall, the KPAQ-C was relatively stable over the two assessments one week apart for both boys (r = 0.72) and girls (r = 0.85). In short, a significant test-retest correlation was found between the Test 1 (M = 2.68, SD = 0.71) and the Test 2 (M = 2.62, SD = 0.76) of the KPAQ-C (r = 0.79). This finding would be helpful in examining the levels of the physical activity among Kor children. The KPAQ-C should also aid in making international comparisons of physical activity among children.

Finally, a significant correlation was found between the KPAQ-C and pedometers. One possible reason for smaller correlation (r = 0.26) between them

in this study is that pedometer cannot assess water-based activities and may underestimate non-locomotor type activities such as skating and cycling (Loucaides, Chedzoy, & Bennett, 2003). Our finding is consistent with a study reporting the validity of the PAQ-C. According to Kowalski and colleagues (1997), significant moderate-sized relationships were found between the PAQ-C and other methods such as a 7-day recall interview, the Leisure Time Exercise Questionnaire, a Caltrac motion sensor, and the Canadian Home Fitness Test. Overall, our findings supported the KPAQ-C as a reliable and valid measure of general physical activity levels in children.

The objective measurement of physical activity is a strength of the present study. Objective measurements are recommended to investigate levels of physical activity in children (Strycker, Duncan, Chaumeton, Duncan, & Toobert, 2007). Although a pedometer is unable to detect certain activities (e.g. swimming) and physical activity intensity, duration, or frequency, it has been demonstrated as a simple, accurate means to measure physical activity in children (Sirard & Pate, 2001).

In spite of the strengths of this study, there are limitations that should be taken into account when interpreting our data. First, no random samples were drawn. Specifically, it was a cross-sectional study that included only participants in specific cities with researcher's convenience because of the limited access to children. Future studies should employ prospective research designs and include children from the remaining K-12 grade levels so further specific population-related step count comparisons can be made. Second, the sample size was different

between Kor and Kor-Can children. Future studies should use equal number of representation of participants in between the two groups. A logical next step might include repeating this study, using accelerometers. It is necessary to repeat this study with a more objective measure of physical activity to see if the findings are confirmed. Pedometers only provide a measure of ambulatory activity, and therefore give no indication of the intensity of the activity (e.g., mild walking, brisk walking, jogging). Given this limitation, more advanced objective measures such as accelerometers may provide more complete information (e.g., energy expenditure).

In conclusion, Kor-Can children were significantly less active than Kor children in terms of their mean steps taken daily. In addition, the mean number of steps per day for boys was higher than that of girls in both Korea and Canada. Finally, both Kor and Kor-Can children accumulated higher steps per day during weekdays than weekends. Ecological models view physical activity as being influenced by the interaction between the environmental setting in addition to biological and psychological factors at the level of the individual (Sallis et al., 2006; Spence & Lee, 2003). Incorporating a theoretical approach based on behavioural theory into an intervention program may increase the proportion of participants who successfully change their behaviour (Ammerman, Lindquist, Lohr, & Hersey, 2002; Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003). Thus, findings from such studies will contribute to the development of physical activity interventions that are specifically tailored to meet the needs of Korean children in Canada and Korea. Gaining an understanding of the factors that

influence health-related behaviours of Korean children is a fundamental step towards developing future health intervention studies in Canada.

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Table 1. Demographic characteristics

	Kor-Can children	Kor children	*P* value
Sample size	84	114	.03
Mean age (*SD*), years	12.5 (1.7)	13.5 (1.3)	.00
Gender, boy (girls), (%)	46.2 (53.8)	54.3 (45.7)	.39
Height (*SD*), cm	153.3 (11.4)	155.9 (10.3)	.18
Weight (*SD*), kg	48.8 (12.0)	49.8 (12.4)	.16
BMI (*SD*), kg/m^2	20.6 (3.5)	20.3 (3.6)	.23

Note. Kor-Can = Korean Canadian children; Kor = Korean children

Table 2. The mean (*SD*) values for PAQ-C and step counts of Korean and Korean Canadian children

Cultural group	Gender	PAQ-C Mean (*SD*)	Daily steps Mean (*SD*)	Weekday steps Mean (SD)	Weekend steps Mean (SD)
Kor-Can children	Boy	2.90 (0.63)	8089 (3453)	8505 (3231)	7037 (4486)
	Girl	2.57 (0.53)	6440 (2310)	6934 (2452)	5191 (3022)
	Total	2.72 (0.60)	7164 (2966)	7624 (2909)	6001 (3823)
Kor children	Boy	2.93 (0.69)	9291 (3780)	9631 (3489)	8216 (5780)
	Girl	2.59 (0.76)	8272 (2315)	8545 (2385)	7592 (3620)
	Total	2.76 (0.74)	8772 (3149)	9079 (3015)	7887 (4750)
Total	Boy	2.92 (0.67)	8821(3684)	9190 (3417)	7728 (5287)
	Girl	2.58 (0.67)	7462 (2477)	7833 (2534)	6520 (3558)
	Total	2.74 (0.69)	8100 (3168)	8470 (3050)	7073 (4463)

Table 3. The mean (SD) and test re-test correlation of KPAQ-C

Gender	KPAQ-C	*M (SD)*	*R*
Boy	Test 1	2.86 (0.68)	
			0.72**
	Test 2	2.68 (0.71)	
Girl	Test 1	2.53 (0.71)	
			0.85**
	Test 2	2.57 (0.80)	
Total	Test 1	2.68 (0.71)	
			0.79**
	Test 2	2.62 (0.76)	

Note. ** $p < 0.01$

Table 4. Pearson correlations among between the KPAQ-C and pedometers

	KPAQ-C (Time 1)	KPAQ-C (Time 2)	Average daily steps
KPAQ-C (Time 1)	1	0.79**	0.26**
KPAQ-C (Time 2)		1	0.26*
Average daily steps			1

Note. * $p < 0.05$ ** $p < 0.01$

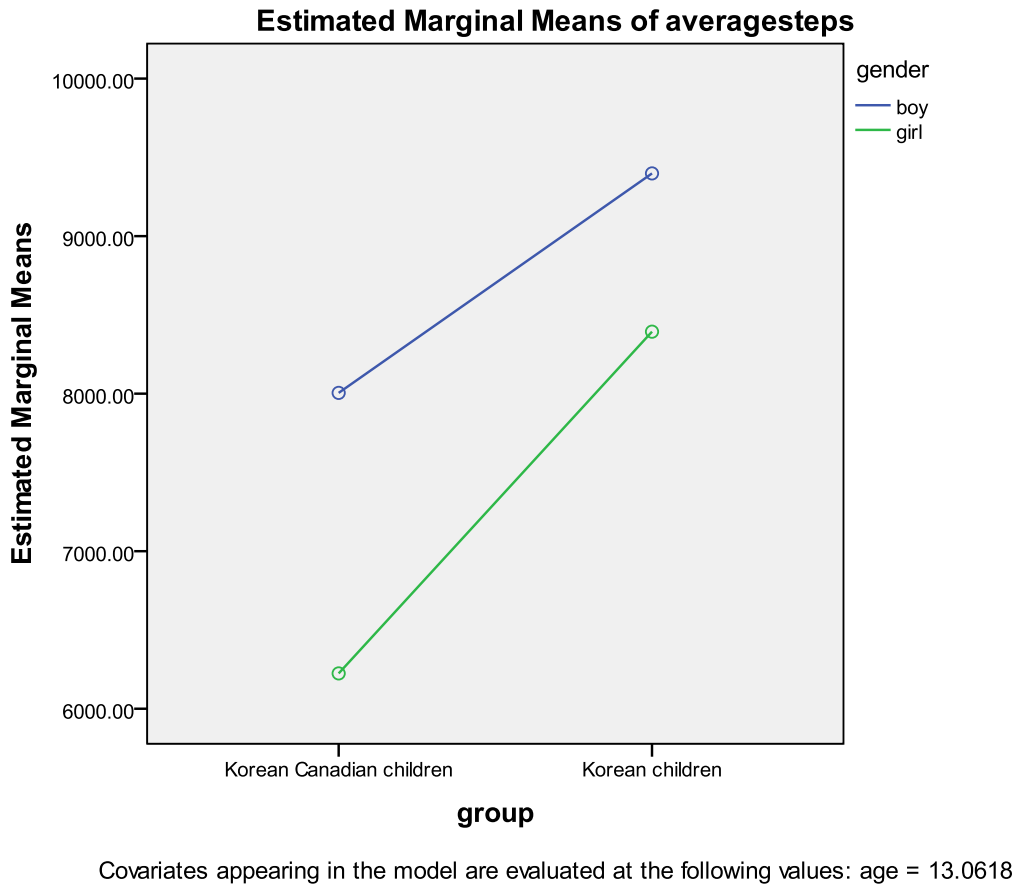

Figure 1. Mean number of steps for Kor-Can and Kor children

CHAPTER 5: Conclusions and Implications

Conclusions

The rising trends in youth physical inactivity are universal, especially among ethnic minority youth populations (Gordon-Larsen, Harris, Ward, & Popkin, 2003). Even though reduced physical activity levels and increased sedentary behaviours have influenced the current epidemic of overweight and obesity in children, little attention has focused on youth physical activity among Asian populations such as Koreans. Therefore, gaining an understanding of the factors that influence health-related behaviours of Korean children is a fundamental step towards developing future health intervention studies in Canada. Moreover, research is needed to examine how socio-cultural factors influence the physical activity and sedentary behaviours of Korean children in Canada, and whether they are more at risk of being physically inactive than children living in their own country.

The purpose of this dissertation was to explore the relationship between socio-cultural environments and health-related behaviours among Korean (Kor) children and Korean Canadian (Kor-Can) children. Specifically, this study investigated the physical activity levels, the number of step taken, sedentary behaviours, dietary intake, and levels of obesity of two cultural groups. The main hypothesis was that Kor children have higher physical activity levels, more steps taken, lower sedentary behaviours, and less consumption of high fat food than Kor-Can children based on the nature of their environments.

Study 1 developed the Korean version of the PAQ-C because few standardized questionnaires are available for measuring physical activity among

Korean children. The PAQ-C has been developed and considered as a reliable measure to assess general physical activity levels in childhood (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997; Kowalski, Crocker, & Faulkner, 1997). The strength of the PAQ-C is its use of memory cues such as specific and easily identifiable time references including, recess, lunch, and after school to enhance children's recall ability. The scale is also useful for discriminating between physically active and inactive children as it provides a calculation of an overall activity score (Kowalski, et al., 1997). Thus, we translated the PAQ-C into Korean and tested the reliability of the new scale. A significant test-retest correlation was found between the Korean and English versions of the PAQ-C.

The developers of the PAQ-C have encouraged researchers to add relevant activities to the scale as needed in order to make it more appropriate for the target population (Crocker, et al., 1997). Therefore, the PAQ-C offers a useful measure to assess the levels of physical activity of Kor and Kor-Can children. In summary, the findings from this study could be used to guide future studies that assess physical activity among children in Korea. This translated questionnaire will also contribute to research projects in making international comparisons of physical activity among children.

In study 2, we investigated the physical activity levels, sedentary behaviours, dietary intake, correlates of physical activity and levels of obesity among Korean children in Korea and Canada. The interaction effect between cultural group and gender was statistically significant for levels of physical activity. Based on the mean scores, Kor boys appeared to be more physically active than Kor-Can boys

whereas Kor girls were less physically active than Kor-Can girls, but no significant differences existed after conducting an independent-samples t-test. Not surprisingly, we identified a significant difference in physical activity levels between boys and girls for both groups. Our findings were consistent with other studies examining differences between the genders (Crocker, et al., 1997; Thompson, Baxter-Jones, Mirwald, & Bailey, 2003; Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2008).

In addition to the levels of physical activity, we found group differences in sedentary behaviours as measured with the ASAQ (Hardy, Booth, & Okely, 2007). We found small screen recreation (SSR) was most popular sedentary activity in both groups. Our finding is consistent with a previous work investigating sedentary behaviours among Australian adolescents (Hardy, Dobbins, Booth, Denney-Wilson, & Okely, 2006). Interestingly, Kor children were more engaged in SSR and education activities than Kor-Can children. On the other hand, Kor-Can children reported accumulating more time in travel than did Kor children. This finding was associated with non-active transportation to school. Total travel time by a car is negatively associated with active transportation for both Kor-Can and Kor children.

Approximately 80% of Kor children walked or rode their bike to school, but only 46% of Kor-Can children were likely to walk or bike to school. This fact may contribute to the differences in the levels of physical activity between the two groups. Active commuting to school is a potentially critical component of a child's overall physical activity (Spink, Shields, Chad, Odnokon, Muhajarine, & Humbert,

2006). Children walking or cycling to school tend to report a higher physical activity level than those being driven over the school day (Cooper, Page, Foster, Qahwaji, 2003; Metcalf, Voss, Jeffery, Perkins, & Wilkin, 2004). Other research has shown the same results. In a review by Faulkner, Buliung, Flora & Fusco (2009), nine of thirteen studies showed that children who use active transportation to school report significantly higher levels of physical activity, as investigated by an objective measure, than those who travel by motorized transport. Therefore, active transport to school should be stressed in future discussions of children's physical activity patterns.

In addition to active commuting to school, involvement in organized sports during childhood is associated with the levels of physical activity in children (Pate, Trost, Levin, & Dowda, 2000). We found participating in organized sports appears to be higher in Kor-Can children (58%) when compared to Kor children (34%). Possible explanations are due to availability of community programs and socioeconomic influences. Most communities in Canada provide children with an opportunity for involvement in various sports, such as soccer, basket ball, or swimming (Active Healthy Kids Canada, 2011). Our data also revealed household income of parents in Canada is higher than that of parents in Korea. Socioeconomic influences are important indicators of participation in organized sport (Ifedi, 2008). For example, lower income parents were less likely to have time to participate and support their child's sport involvement (Duke, Huhman, & Heitzler, 2003). Similarly, Ifedi (2008) has shown that 88% of children aged 6 to 9 years from the highest income families had participated in organized sports,

compared with 49% of those from the lowest income families. In short, according to the CANPLAY study (CFLRI, 2009), children and youth who participate in sport accumulate more steps per day and are more likely to meet the physical activity guidelines than those who do not participate in sport. This finding suggests that involvement in organized sports is one way to encourage children's participation in physical activity.

No significant differences existed in consumption of vegetables, fruits, milk, pop, pizza, and fried food between the two groups. However, significant differences in some food consumption were observed. Children in Korea reported higher intakes of ice cream than did children in Canada, while Kor-Can children ate more hamburgers than their counterparts. We identified poor dietary habits in both groups according to Canada's Food Guide to Healthy Eating (Health Canada, 2007). Specifically, 94% of Kor-Can children and 90% of Kor children did not meet the fruit and vegetable intake recommendation. We also found 80% of Kor-Can children and 25% of Kor children did not meet the milk and alternatives recommendations. This is consistent with other findings that show 39% of boys and 17% of girls aged 10 to 16 years met the CFGHE recommendation of milk products per day. In short, the majority of Kor and Kor-Can children did not meet the Canada's Food Guide to Healthy Eating recommendation of vegetables, fruits, and milk products per day. Acculturation to Canada was significantly associated with the consumption of fruit, pop, pizza, hamburgers, and ice cream in Kor-Can children. This finding suggests that the dietary habits of Korean children in Canada may become westernized under the influence of a Western lifestyle.

Similarly, Chinese children living in the United States consume more fat, sugar, and total food calories than Chinese children living in Taiwan (Chen & Kennedy, 2004). Therefore, helping children to develop a taste for healthy food is critical for eating the recommended amount and type of food each day (Health Canada, 2007).

Study 2 also investigated relationships between constructs from the Youth Physical Activity Promotion model (YPAP) and physical activity in both Kor and Kor-Can children, and identified possible differences in correlates of physical activity between two different environments. Kor-Can children obtained higher scores on the *Am I able?*and *Enabling* factors than did Kor children. This finding suggests that Kor-Can children feel more competent when they are participating in physical activity. They also had more accessibility to sport facilities, play grounds or parks than did their count parts. Thus, understanding the role of the environment in youth physical activity is highlighted as the key element that influences active lifestyle in children.

Moreover, our data suggest all constructs of the YPAP model were important determinants of physical activity in our study participants. Among them, *Am I able?* and *Is it worth it?* were most important determinants of physical activity because they directly influenced physical activity in both Kor and Kor-Can children. This result suggests that, regardless of country of residence, Korean children are motivated to be involved in physical activity by their perceived physical competence and perceptions of the benefits of participation (Hagger, Chatzisarantis, & Biddle, 2001; McAuley & Blissmer, 2000). In the Kor-Can group, the *Reinforcing* and *Enabling* factors influenced physical activity indirectly

through either *Am I able?* or *Is it worth it?*. However, the *Reinforcing* factors had both direct effect and indirect effect via *Am I able?* and *Is it worth it?,* which may then influence physical activity. This is the first study to examine YPAP constructs in Korean children. We can, however, compare our results to data from YPAP research in other populations. A review of YPAP variables and sport participation among South Australian youth found *Enabling, Is it worth it?* and *Reinforcing* factors were significant predictors of sport participation (Dollman & Lewis, 2010), which is similar to our findings.

Based on international age- and gender-specific child BMI cut-off points (Cole, Bellizzi, Flegal, & Dietz, 2000), the overall prevalence of overweight including obese was higher in Kor children (21.6 %) than in Kor-Can children (16 %) after controlling for age and gender. Though it is possible that Korean-based children are more likely to be overweight than Canadian-based children, national data from both countries suggest this is not the case (Statistics Canada, 2004; Korean Ministry of Health and Welfare, 2005). Instead, this discrepancy may be due to differential willingness of children in this study to allow their height and weight to be measured. Almost all Kor children (99.7 %) were measured for height and weight whereas 81.2 % of Kor-Can children participated in these measures. Because most Korean children participate in annual fitness tests at their schools, including height and weight assessments, the Kor children had little issue with height and weight measurement. On the other hand, some Kor-Can children were sensitive about having their height and weight measured. Therefore, we were

unable to obtain these measures for some Kor-Can participants who appeared to be overweight.

Studies have investigated how immigration and acculturation to North America are related to a risk factor for negative health-related behaviours such as physical inactivity (Lee et al., 1994), poor dietary intake (Demory-Luce, Morales, & Nicklas, 2005) and being overweight (Lauderdale & Rathouz, 2000; Tremblay, Perez, Ardern, Bryan, & Katzmarzyk, 2005). However, the current study did not find a relation between BMI and time since immigration but did find acculturation to Canada was more strongly associated with physical activity, sedentary behaviour, and the consumption of fruit, pop, pizza, hamburgers, and ice cream. One possible explanation for this finding may be due to the acculturation process. While other immigrants to North America often go through a gradual and continuous process of assimilating a Western lifestyle (assimilation), the Koreans in our study appear to be intergrated (bicultural) but not assimilated.

The purpose of study 3 was to assess and compare possible differences in the current levels of physical activity more reliably among Kor and Kor-Can children. Both self-report and pedometers were used as measurements in this study. We confirmed our hypotheses as significant differences existed in the levels of physical activity between groups and genders in both groups. Specifically, this study identified a significant difference in physical activity levels between the two groups based upon the PAQ-C score. Our mean PAQ-C score reported by Kor children was higher than that of Kor-Can children. Moreover, Kor children obtained more mean daily step counts than Kor-Can children. Thus, Kor children

were significantly more active than Kor-Can children in terms of their mean steps taken daily. Active commuting to school and the use of public transit systems may have contributed to differences in physical activity between the two groups.

We also found girls were significantly less active than boys in terms of their daily mean steps and PAQ-C score in both Korea and Canada. This gender difference may be a result of Korean cultural attitudes and traditional beliefs about acceptable activities for females that appear to remain even after Korean families move to Canada. In addition, factors associated with decreasing levels of physical activity among girls may include feelings of embarrassment, teachers' negative attitudes towards girls' skill levels (Dwyer, Allison, Goldenberg, Fein, Yoshida, & Boutilier, 2006), negative experiences of physical activity (Hewett, Myer, & Ford, 2004), and girl's parents concern about neighbourhood and transportation safety issues (Duke et al., 2003). Moreover, one main reason for lower physical activity among girls may be due to maturity differences between genders such as pubertal development (Sherar, Esliger, Baxter-Jones, & Tremblay, 2007). Thus, further exploration is required of how biological and cultural factors may interact to influence physical activity of children and adolescents.

Implications

In spite of the limitations in this dissertation, a number of implications should be recognized. First, it is clear that the physical environment plays an important role in health related behaviours among children. For example, our findings indicated approximately 80% of Kor children walked or rode their bike to school while only 46% of Kor-Can children were likely to walk or bike to school.

Kor children were also less engaged in motorized travel than Kor-Can children. In other words, the environment of each country may contribute to the differences in the levels of physical activity in children. In Korea, most schools are close to home due to population density. This is one possible explanation why most Kor children walk to school. For instance, active commuting to school is significantly associated with a route to school shorter than 800 m (Braza, Shoemaker, & Seeley, 2004). Therefore, we can conclude that Kor children were significantly more active than Kor-Can children in terms of their mean steps taken daily.

The YPAP model has been recommended as an appropriate conceptual framework in understanding the role of the environment in youth physical activity and sedentary behaviour due to its consideration of a direct influence of environment on behaviour (Salmon, Spence, Timperio, & Cutumisu, 2008). However, the model has not been used in an Asian context. Therefore, we examined relationships between constructs from the YPAP model and physical activity in both Kor and Kor-Can children. Our finding showed all constructs of the YPAP model were important determinants of physical activity in Korean children.

In addition, we found a significant difference in the levels of physical activity between genders in both groups based upon both pedomers and the PAQ-C score. The gender difference may be explained as a result of biological factors (e.g., hormonal, growth) and social or lifestyle factors (cultural attitude). Therefore, research is needed to help girls have a positive attitude toward physical activity and promote physical activity through gender specific interventions in

school and in the community. Furthermore, advocacy efforts should be targeted at parents, schools, community organizations, and government agencies in Korea to educate about the importance of physical activity for girls.

Finally, we used both self-report and pedometers as measures of physical activity. No single instrument appears to measure physical activity adequately. Therefore, multiple assessments (e.g., pedometers along with physical activity questionnaires) can be useful to obtain more reliable data (Wood, 2000). Sallis and Saelens (2000) have suggested the key role of self-reports may be to assess the context and type of physical activity when used in combination with objective measures.

In summary, implications of this dissertation are follows: active commuting to school should be emphasized in future discussions of children's physical activity patterns; participating in organized sports is an important factor to increase physical activity in children; the YPAP model was useful in the Korean context; Korean children are motivated to be involved in physical activity by their competence and perceptions of the benefits of participation; Gender-targeted physical activity interventions are needed to increase physical activity levels for girls; The use of multiple measurements should help enable the reliable assessment of current levels of physical activity among children; and, interventions to increase physical activity should target ethnic minority youth populations.

Although valid and reliable measures need to be taken to enhance and promote children's physical activity, strategic interventions may be necessary to increase physical activity in children. Specifically, interventions for Korean

children in Canada and Korea should be aimed primarily at the school and community environments (i.e., active transportation to school, involvement in organized sports). But, current evidence is inadequate to intervene with confidence among ethnic minority communities to generate sustained behavioural change in Canada. Therefore, there is an urgent need to better understand the social and environmental factors that should be targeted. Continuing to collect demographic, anthropometric and health-related behaviour data of children will help researchers evaluate the effectiveness of interventions.

Health care providers can promote physical activity in Kor-Can Children by encouraging active commuting to school, particularly among those who recently immigrated, and by developing community programs to promote levels of physical activity. Government-funded subsidies are necessary for registration fees and sport uniforms, and improved access to facilities through more comprehensive public transport options. Knowledge of neighbourhood sporting clubs and facilities could be raised through the development of public websites that are regularly updated by local governing councils. Finally, it is important to target parental attitudes to physical activity in children because parents can influence the physical activity of their children via a variety of mechanisms including encouragement, facilitation, and role modeling (Welk, Wood, & Morss, 2003). Specifically, parents influence children's physical activity through direct support such as parental encouragement (Adkins, Sherwood, Story, & Davis, 2004), transportation (Hoefer, McKenzie, Sallis, Marshall, & Conway, 2001), and economic support (Heitzler, Martin, Duke, & Huhman, 2006). Welk and colleagues (2003) proposed that direct facilitation

and overt encouragement were identified as the most powerful mediators of a child's interest and participation in physical activity.

Immigrating and living in new environments may influence individual behaviours. A growing number of individuals and families are immigrating to Canada from Asian countries. Because of the large influx of Koreans into Canada, we can no longer ignore the health related behaviours of this understudied population (Statistics Canada, 2007). Understanding physical activity, sedentary behaviours, dietary intake, and weight status of Kor-Can children is critical for more effective interventions to prevent obesity in childhood.

It seems reasonable to conclude that the findings from this dissertation provide important and contextual information regarding the role the environment plays on physical activity behaviours in children. By exploring the influences of social and physical environments on physical activity, dietary habits, and sedentary behaviours in relation to childhood obesity, this study will offer a new perspective on childhood physical activity and open up new understanding about the important role of socio-cultural factors on children's health. Findings from this study may shed light on future obesity prevention initiatives. Finally, this dissertation could be significant in both understanding patterns of physical activity and planning appropriate intervention strategies to increase levels of physical activity among Korean children in Korea and Canada.

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APPENDIX 1. LITERATURE REVIEW

Determinants of Overweight and Obesity Among Children

Sedentary Behaviours

The current epidemic of obesity is mainly caused by high levels of sedentary behaviour and low levels of physical activity among children (Rennie, Johnson, & Jebb, 2005). The development of technology and transportation has reduced the need of physical activity in daily life. The appeal of television, electronic games, and computers has increased so that children are spending more time engaged in sedentary activities (Hill & Peters, 1998). Television viewing in particular has been identified as a crucial factor. Studies have reported a significant positive association between the number of hours spent watching television and the risk of overweight and obesity (Dennison, Erb, & Jenkins, 2002; Salmon, Campbell, & Crawford, 2006; Vandewater & Huang, 2006).

Canadian children watch an average of 15.5 hours of television a week while youths aged between 12 and 17 years watch an average of 14.1 hours weekly (Statistics Canada, 2002). Christakis, Ebel, Rivara, and Zimmerman (2004) found children younger than 11 years of age are spending daily 1.45 hours watching television and 1.64 hours watching video and playing computer games combined daily. According to the 2004 Canadian Community Health Survey, 36% of children aged 6-11 years reported more than 2 hours of screen time each day, 19% of 12-17 year-old children spent 30 or more hours of screen time per week, and 57% of old children accumulated between 10 and 30 hours per week. Interestingly, the prevalence of overweight was higher in those children who spent more than 2 hours of screen time than those who viewed less than 1 hour.

Recently, the number of hours spent watching television in children has actually decreased because other media such as computers and video games have replaced the time (Christakis et al., 2004). Researchers have investigated positive cross-sectional associations between electronic game use and body weight (Stettler, Signer, & Suter, 2004). This association was independent of weekday television viewing and snack consumption while watching television. In short, it may be postulated that an increase in the sedentary behaviours such as TV viewing, video games, and computer use results in a decrease in physical activity and, in this way, causes excess weight gain.

Television viewing may also impact eating behaviour. A survey of adolescents revealed that sedentary pastimes were significantly associated with consumption of savoury snacks and negatively related to fruit consumption (Rennie & Jebb, 2003). The positive relationship between watching television and increasing energy intake indicates that children take the chance to consume snacks while being inactive and that exposure to food advertising may influence food choice and eating habits. Interestingly, Sustain (2001) reported that most food advertising during children's programming was related to high fat food while fruit and vegetables were rarely advertised. In addition, the proportion of overweight children is significantly associated with the number of advertisements per hour on children's television, especially those advertisements that cause the consumption of energy-dense, micronutrient-poor food (Lobstein & Dibb, 2005). Similarly, Thomson, Spence, Raine, and Laing (2008) showed that significant relationships were found among TV viewing, energy-dense snack consumption, and snacking

behaviour. TV viewing was also significantly associated with body weight status in this study.

Dietary Habits

In addition to sedentary behaviour, it is assumed that unhealthy dietary habits are one of primary reasons for childhood obesity. Research in Western cultures has shown that consuming high fat, high caloric, and high sugar foods are associated with increased body weight in adults and children (Kennedy, 1998). According to the 2004 CCHS, one-third of Canadian children reported they had fast food such as a pizza, hamburger or hot dog on that particular day, and 62% of girls and 68% of boys aged 9 to 13 years did not meet minimum consumption levels for fruit and vegetables (Garriguet, 2007).

In addition to fast food, beverage consumption is also associated with overweight in children. A recent study has reported a positive relationship between consumption of sugar-sweetened drinks and increases in the risk of obesity (Ludwig, Peterson, & Gortmaker, 2001). Consumption of fruit juice drinks that contain high levels of sugar is higher in younger children. Dennison and his colleague (2002) found that children who drank more than 12 oz of fruit juice per day had a higher BMI than those who consumed less fruit juice. Moreover, the increase in consumption of sugar-sweetened drinks and fruit juice has displaced consumption of milk although milk is an important source of other nutrients in children (Nielsen & Popkin, 2004). Therefore, increased availability of fast foods and sugar-sweetened drinks seems to contribute to child obesity.

Physical Activity

Prentice and Jebb (1995) argue that a decline in physical activity is the main reason for increasing overweight and obesity. Social and environmental changes such as parent job status, increased safety concerns, development of transportation, and decreased physical education classes have reduced opportunities for physical activity among children (Troiano et al., 1995). Even though physical activity helps children maintain a healthy body weight and prevent overweight (Lemura & Maziekas, 2002; Roberts, 2000), there is a rapid decrease in time spent in moderate and vigorous physical activity from childhood through adolescence (Riddoch et al., 2004). Specifically, children's physical activity decreased from 49% among children aged 5 to 12 years to 36% among teenagers aged 13-17 years (Craig, Cameron, Russell, & Beaulieu, 2001).

Childhood obesity may be largely the result of a decline in regular physical activity. Therefore, the levels of children's physical activity should be considered. Canada's Physical Activity Guides for Children and Youth recommend that child and youth should accumulate at least 90 minutes including 60 minutes of moderate activity and 30 minutes of vigorous activity per day (Health Canada and the Canadian Society for Exercise Physiology, 2002*b*). The Canadian guide also recommends that children reduce non-active time, starting at reducing 30 minutes a day or less and progressing over the course of 5 months to 90 minutes a day. According to the 2007 CCHS, only 51% of Canadian youth 12 –17 years were classified as "active" in their leisure time based on the total daily energy expenditure values (kcal/kg/day). Moreover, objectively measured data reveal that

87% of children are not meeting Canada's physical activity guidelines even though the proportion of children meeting the guidelines has increased from 9% in 2005/2006 to 13% in 2007/2008 (CFLRI, 2007).

Summary

Wong and Leatherdale (2009) proposed that interventions to reduce obesity by increasing physical activity levels might not be effective if levels of sedentary behaviour remain high. Therefore, levels of both physical activity and sedentary behaviour should be considered when trying to identify the factors associated with overweight and in the development of effective obesity prevention initiatives. In addition, unhealthy dietary habits such as high energy density diets, high consumption of sugar-sweetened beverages, and large portion sizes of foods should be considered as a risk factor for obesity in children. Thus, Rennie and colleagues (2005) suggested that more research is needed to understand the complex interaction among dietary habits, sedentary behaviour, and physical activity in order to decrease the probability of childhood obesity. Moreover, understanding correlates of physical activity is important in increasing physical activity and decreasing sedentary behaviours related to the prevalence of childhood obesity.

Correlates of Physical Activity among Children

The primary objective of this section of the literature review is to investigate the correlates of physical activity among children. Many factors have been identified as predicting physical activity in youth including self-efficacy, some degree of parental influence, and perceptions of environment (i.e., neighbourhood safety, access to parks). Correlates of physical activity among children can be grouped into factors such as biological, psychological, social, and environmental.

Biological Factors

Biological factors such as sex, age, ethnicity, and BMI have been associated with physical activity. For instance, most studies report that boys are usually more physically active than girls (Sallis, Prochaska, & Tayler, 2000; United States Department of Health and Human Services [USDHHS], 2001). This gender difference may be explained as a result of biological factors (e.g., hormonal, growth) and social or lifestyle factors (Trost, Pate, Dowda, Saunders, Ward, & Felton, 1996). From the biological perspective, boys are more active than girls because daily energy expenditure and fat-free mass are usually higher in boys than in girls at all ages (Malina, Bouchard, & Bar-Or, 2004). Another explanation of gender differences is that boys may be more intrinsically motivated toward physical activity while girls may rely on extrinsic motivation such as direct reinforcement (Biddle & Armstrong, 1992).

In addition to sex, age can affect participation in physical activity. Levels of physical activity begin to decline substantially between the ages of 6 years to 18 years (Kemper, 1994). The decline, steepest from childhood to young adulthood,

continues during adulthood. Thompson and colleagues (2003) found that physical activity levels decline linearly with age from 10 through 18 years in a longitudinal study of Canadian youth. These declines in physical activity may be a result of an interaction between age and sex (Garcia et al, 1995). In other words, variation in biological maturity status at young ages may influence physical activity level, and this effect may differ in boys and girls.

It is believed that overweight children are less physically active than normal weight children. Although evidence suggests that BMI is inversely associated with physical activity levels in children and adolescents (Ruiz, Rizzo, Hurtig-Wennlof, Ortega, Warnberg, & Sjostrom, 2006; Sulemana, Smolensky, & Lai, 2006), results are often weak or inconsistent. For instance, physical activity explained less than 4% of the variance in fat mass among 190 male youth (Ekelund, Neovius, Linne, Brage, Wareham, & Rossner, 2005), and no difference in activity levels was shown between children at high risk of obesity and children not at high risk of obesity using doubly labelled water and heart rate monitoring (Rennie et al, 2005). Overall, the majority of recent evidence suggests that increasing the levels of physical activity may be an important role for preventing overweight and obesity in children (Atlantis, Barnes, & Fiatarone Singh, 2006).

Ethnicity is also a factor that may influence physical activity among children. Ethnicity is a social construction that indicates identification with a particular group. It is often descended from common ancestors and refers to the sharing of common cultural traits such as language, religion, and dress (Comstock, Castillo, & Lindsay, 2004). Gorden-Larsen, McMurray, and Popkin (1999) have revealed

that Non-Hispanic Black, Hispanic, and Asian children may be less active than Caucasian children. American Black girls have lower participation in moderate and vigorous activities than American White and Hispanic girls (Grunbaum et al., 2004). Interestingly, even though first generation Asians were significantly less physically active than Whites, second and third generation Asians were not different from Whites (Allen, Elliott, Morales, Diamant, Hambarsoomian, & Schuster, 2007). Thus, levels of physical activity are influenced by ethnicity, but acculturation may play an important role in changing participation in physical activity in different cultures (Unger et al., 2004). For instance, acculturated Southern Europeans who immigrated to Australia were less likely to be active than those who were born in Australia (Bull, Bauman, Bellew, & Brown, 2004). Similarly, acculturation to the United States was significantly associated with a lower frequency of physical activity participation among Hispanic and Asian American children in Southern California (Unger et al., 2004).

Psychological Factors

Psychological factors may influence habitual physical activity in children. Researchers have investigated the relationship between cognitive variables and physical activity participation in children (Motl, Dishman, Suanders, Dowda, & Pate, 2002; Trost, Pate, Dowda, Ward, Felton, & Saunders, 2002). Patterns of physical activity among children are associated with the value of an activity, perceived competence, and satisfaction during the activity (Sallis, Prochaska, & Tayler, 2000).

Self-efficacy, the confidence in one's abilities, is a primary determinant of behaviour (Bandura, 1997) and an important correlate of physical activity among youth (Motl et al., 2002; Trost et al., 2002). For instance, Trost and colleagues (2002) found that children reporting strong self-efficacy for seeking support for their physical activity participation were more physically active than those who reported low self-efficacy. Similarly, children who had been exercising regularly had stronger barrier self-efficacy than children who were not exercising and had no intention to begin exercising (Hausenblas, Nigg, Symons Downs, Fleming, & Connaughton, 2002). Girls' self-efficacy to participate in physical activity was also significantly associated with self-reported physical activity levels (Allison, Dwyer, & Makin, 1999). Interestingly, Spence and colleagues (in press) reported that boys had significantly higher levels of self-efficacy compare to girls, but self-efficacy was found to be a significantly stronger correlate of physical activity for girls than boys.

Perceived competence and enjoyment in habitual activities are stressed as being essential influences on young people's physical activity participation (Weiss, 2000). Perceived competence refers to individuals' judgments about their ability in a particular area such as school, peer relationships, or physical activity. Weiss and Ebbeck (1996) found that youth who report stronger beliefs about their physical competencies were more likely to enjoy activity and sustain interest in continuing involvement than children who report lower levels of physical competence. Similarly, children of high perceived competence participated in significantly more physical activity outside school than those of low perceived competence

(Carroll & Loumidis, 2001). Enjoyment of physical activity is also strongly associated with levels of physical activity (Sallis et al., 2000). Children who enjoy being physically active tend to participate in more physical activity than children who do not enjoy physical activity. Moreover, enjoyment and interest in an activity are consequences of intrinsic motivation, which may increase or sustain future participation (Ferrer-Caja & Weiss, 2000).

Social Factors

Beets, Pitetti, and Forlaw (2007) have suggested that the social influence on physical activity among children should be examined from a multidimensional approach to account for support offered by parents, siblings, and peers. First of all, parents can influence the physical activity of their children through a variety of mechanisms including encouragement, facilitation, and role modeling (Welk, Wood, & Morss, 2003). Parents influence children's physical activity through direct support such as parental encouragement (Adkins, Sherwood, Story, & Davis, 2004), transportation (Hoefer, McKenzie, Sallis, Marshall, & Conway, 2001), and economic help (Heitzler, Martin, Duke, & Huhman, 2006). For example, youth who have parents transporting them to physical activity locations were more active than youth who have parents providing less support (Hoefer et al., 2001). Welk and colleagues (2003) proposed that direct facilitation and overt encouragement were identified as the most powerful mediators of a child's interest and participation in physical activity.

Parent role modeling is also a significant predictor of children's physical activity. For instance, more active parents have been shown to have more active

children (Moore, Lombardi, White, Campbell, Oliveria, & Ellison, 1991). A significant correlation has been also found between parents' activity level and children's activity level (Welk et al., 2003). However, the influence of role modeling explained only a small amount of the variance in the prediction of their child's physical activity level, although it was significant for several outcome variables such as children's perception of competence and attraction of physical activity (Welk et al., 2003). Similarly, after reviewing 29 physical activity correlate studies, Sallis and colleagues (2000) revealed that only 38% of the studies demonstrated a positively significant relationship between parent and child activity levels. Because children spend most of their time outside of home, role modeling from parents may be infrequent. Therefore, peers may play a greater role in modeling in physical activity for youth than parents.

Peers have been identified as important social agents in the youth physical activity context. Reviews of potential determinants of physical activity have demonstrated that peer variables such as peer support and peer modeling are key correlates of physical activity (Raudsepp & Viira, 2000; Sallis, Taylor, Dowda, Freedson, & Pate, 2002). Beets and colleagues (2007) found that peer support was a direct predictor of physical activity. After investigating a variety of forms of social support including parents, siblings, and peers, they revealed that peer support was associated with physical activity while parental support was not. Similarly, perceived direct peer support for physical activity from friends has been related to motivation for physical activity (Spink, Shields, Chad, Odnokon, Muhajarine, & Humbert, 2006). In short, recognition of peer support in physical

activity, including encouragement, talking about activity, and being active together, are important correlates of physical activity in youth (Duncan, Duncan, & Strycker, 2005; Voorhees et al., 2005).

In addition to peer support, peer modeling is also related to physical activity levels in youth. Specifically, Spink and colleagues (2005) have found that youth choose to participate in physical activity because their friends are also participating. Other studies have also demonstrated that youngsters are much more likely to participate in sport when their best friends also participate (Rausepp & Viira, 2000; Zeiji et al., 2000). However, Vilhjalmsson and Kristjansdottir (2003) reported different results that suggest best friend physical activity levels did not predict youth activity level if sport club participation was controlled for.

Peer support and peer modeling have been combined into a single variable referred to as peer influence in a number of studies. Peer influences have been identified as a significant predictor of physical activity (Sabiston & Crocker, 2008; Wu, Pender, & Noureddine, 2003). On the other hand, the interaction of peer support and modeling has been explored to predict physical activity (Vilhualmsson & Thorlindsson, 1998). In this study, the authors identified that friend participation level was a stronger indicator of one's activity level when support from this friend support was higher. In short, the positive interaction of peer support and peer modeling can be a critical predictor of physical activity in youth.

Physical Environment Factors

The physical environment is a broad term that may incorporate setting, weather, time factors, availability of organized sport teams or programs, and

access to facilities such as recreation centres, parks, and play grounds (Salmon et al., 2008). All of these factors may influence physical activity among children. For instance, outdoor play spaces (e.g., parks, playgrounds) may be critical for improving the levels of physical activity because physical activity is significantly related to outdoor time among children (Tudor-Locke, Ainsworth, & Popkin, 2001). Sallis and colleagues (2000) have also identified time spent outdoors as an important correlate of children's physical activity. A recent study has suggested that encouraging children to engage in more time outdoors may be an effective strategy for increasing physical activity (Cleland, Crawford, Baur, Hume, Timperio, & Salmon, 2008). Despite these benefits, parents may restrict their children from spending time outdoor due to safety issues pertaining to neighbourhood design. The lack of appropriate spaces such as playgrounds or parks is also one of the impediments to children's physical activity.

The accessibility of parks and recreation facilities has been identified as an important predictor of physical activity among children (Frank, Kerry, Chapman, & Sallis, 2007; Gordon-Larsen, Nelson, Page, & Popkin, 2006; Krahnstoever Davison & Lawson, 2006). Parks are viewed as spaces for children to interact, socialize, and engage in physical activity (Loukaitou-Sideris & Stieglitz, 2002). The proximity of parks and playgrounds to the home was significantly associated with children's physical activity (Gomez, Johnson, Selva, & Sallis, 2004; Sallis et al., 1993; Timperio, Crawford, Telford, & Salmon, 2004). Specifically, Sallis and colleagues found that parental reports of the number of play areas within walking distance of the home were positively related to observed levels of physical activity

among preschool children. A significant inverse relationship has also been identified between a lack of parks or sports grounds near the home and walking and cycling trips (Timperio et al., 2004).

The availability of recreation facilities such as swimming pools, gyms, and sporting arenas has also been significantly associated with children's physical activity. For example, a significant positive relationship was identified between parents' reports of the presence of sporting facilities nearby their home and higher self-reported walking or cycling among youth (Carver, Salmon, Campbell, Baur, & Garnett, 2005). Timperio and colleagues (2004) also found that parental reports of few sporting arenas near their home were related to lower rates of walking and cycling among girls. Girls who indicated they had more opportunities for physical activity, including access to recreational facilities (e.g., gyms, swimming pools), also engaged in higher levels of physical activity (Hume, Salmon, & Ball, 2005). The presence of recreation facilities has been identified as a facilitator of increased activity because youth walk to the facility, and then participate in physical activity while at the facility (Frank et al., 2007; Gordon-Larsen et al., 2006).

In addition to the accessibility of parks and recreation facilities, perceived safety of neighbourhoods may be a correlate of children's physical activity. A positive relationship between parents' perceptions of safety about crossing intersections and walking or cycling in children aged 5 to 8 and 10 to 12 years has previously been established (Timperio et al., 2004). Similarly, Gomez and colleagues (2004) found that girls' reports of perceived neighborhood safety were related to higher outdoor physical activity. Moreover, residents' perceptions of

safety with regards to local play areas were positively linked with parental reports of their children's involvement in recreational activity (Molnar, Gortmaker, Bull, & Buka, 2004). However, in a review by Krahnstover Davison and Lawson (2006), seven of nine studies showed that perceived safety was not significantly associated with children's physical activity. This reported lack of relationship between perceived safety and physical activity may reflect the fact that most studies assessed general levels of physical activity, which may or may not be related to neighborhood safety.

Involvement in Organized Sports

Involvement in organized sports during childhood is associated with health-related behaviours (Pate, Trost, Levin, & Dowda, 2000), psychological well-being (Tomson, Pangrazi, Friedman, & Hutchison, 2003), and has a significant influence on physical activity engagement throughout young adulthood in both genders (Telama, Yang, Hirvensalo, & Raitakari, 2006). Youth sport participation occurs within a social context that is heavily influenced by parents (Vilhjalmsson, & Kristjansdottir, 2003). For instance, parental overall physical activity was positively associated with the extracurricular sport involvement of youth aged 7 to 15 years (Cleland et al., 2005), and parental sport participation was directly related to youths' sport participation (Nelson et al., 2005). Youth sport involvement is also strongly influenced by peer social relationships (Smith, 2003). Zeiji and colleagues (2000) have showed that youth who reported that their best friend participated in sport were much more likely to participate in sport. On the other hand, children have expressed negative aspects of youth sports including excessive

parental involvement, abusive coaches, continuous intense competition, lack of fun, and injuries (Coakley, 1992).

Socioeconomic influences are important indicators of participation in organized sport. Adults of lower income status are less likely to participate in organized sports (Canadian Fitness and Lifestyle Research Institute, 2005). Also, individuals with low income are less likely to have access to sport or exercise facilities and are more likely to experience cost as a barrier to participation (Duke, Huhman, & Heitzler, 2003). Moreover, lower-income parents were less likely to have time to participate and support their child's sport involvement (Duke, et al., 2003). Similarly, Vilhjalmsson and Thorlindsson (1998) have shown that students of lower socioeconomic statues had parents who tended to participate less in physical activity, which may explain lower rates of sport involvement among these students.

In summary, involvement in organized sports is one way to encourage children's participation in physical activity. Parents and socioeconomic influences are important contributing factors to childhood sport involvement and subsequent physical activity participation. One of the best ways to keep children involved in sports is to enhance their motivation through maximizing enjoyment and the benefits of participation (Smoll, 2001).

Transportation to School

Active commuting to school is a potentially critical component of a child's overall physical activity (Spinks et al., 2006). Children walking or cycling to school tend to report a higher physical activity level than those being driven over

the school day (Cooper, Page, Foster, Qahwaji, 2003; Metcalf, Voss, Jeffery, Perkins, & Wilkin, 2004). Parents may influence whether a child's method of commuting to school is active or not. For instance, school children were more likely to walk or bike to school when their father walked or biked to school with them or if their parents walked or biked to work (Merom, Rissel, Mahmic, & Bauman, 2005). Similarly, a positive association was found between parent commuting history and parent recognition of the importance of physical activity and walking to school in Australian children (Ziviani, Scott, & Wadley, 2004).

In addition to parental influence, environmental factors (e.g., safety, traffic, distance) were associated with children's active commuting to school (Timperio et al., 2006). Active commuting to school has dramatically decreased over the past 30 years (Dollman, Norton, & Norton, 2005). This may be partly due to the fact that parental concern has increased about their child's safety and traffic and crime. For example, parental perceptions of a lack of traffic lights or crossings are negatively related to regularly walking or cycling to school in children (Timperio et al., 2004). Similarly, parental recognitions of heavy traffic are inversely associated with boys' walking and girls' walking and biking for transportation (Carver et al., 2005). In addition to safety, a negative relationship exists between distance to school and children's physical activity (Cohen et al., 2006). Specifically, Timperio and colleagues (2006) identified that active commuting to school is strongly related to a route to school being shorter than one-half mile.

Summary

A greater understanding of the correlates of physical activity may aid in the development of effective interventions to prevent weight gain and promote healthy weight among children. Biological, psychological, social, and physical environmental factors have been identified as critical correlates of physical activity in children (Sallis et al., 2002). However, no single factor may account for most of the variance among children's physical activity because factors are expected to interact. Therefore, it is important that interventions to increase physical activity levels be designed and implemented using a multi-factor approach. Involvement in organized physical activity or sport and active commuting to school can also be key components of a child's overall level of physical activity. Therefore, the application of broad ecological approaches is necessary to identify the correlates of physical activity in children.

Theoretical Framework

Gaining a comprehensive understanding of the factors that potentially influence health behaviours may be difficult without the continued development and application of theoretical frameworks (King, Stokols, Talen, Glenn, Brassington, & Killingsworth, 2002). The utilization of a theoretical framework in health promotion research can be useful in understanding how people may change their behaviours. Moreover, the choice of a theory or theories is critical because different theories are best suited to different situations. Selecting a theoretical framework should begin with identifying the problem, goal, and units of practice (Van Ryn & Heaney, 1992). Because no single theory or conceptual framework dominates in health promotion areas, applying the most appropriate theory for a given situation can lead to an effective result in health behaviour research. Therefore, proper theoretical frameworks should be carefully considered to facilitate research and interventions for physical activity.

In this literature review, ecological approaches and the Youth Physical Activity Promotion (YPAP) model will primarily be discussed to identify how personal, socio-cultural, and environmental factors are related to the levels of physical activity and sedentary behaviours among children in Korea and Canada.

Ecological Approaches

Traditional intervention research has predominantly employed individually-based approaches, focusing on individual attitudes, beliefs, and affect. The majority of theories have been applied to identify the cognitive, affective, and social influences surrounding the individual and his/her choice of behaviours

(Dishman, 1994). However, individual approaches have been viewed as being ineffective by themselves, (in the area of health as a whole or just PA and diet?) since they do nothing to alter the environmental factors believed to contribute to physical inactivity and unhealthy eating behaviour (Marcus & Forsyth, 1999). Recently, more attention has been paid to environmental factors that may influence individual behaviour. These models hypothesize that multiple levels of influence (not only individual but also social, and cultural environments) determine individual behaviour (Stokols, 1996).

Ecological models identify relationships between a person and his or her environments (Spence & Lee, 2003). For instance, an ecological model of health behaviour identified five levels of influence: intrapersonal factors, interpersonal processes and primary groups, institutional factors, community factors, and public policy (Mcleroy, Bibeau, Steckler, & Glanz, 1988). Bleckely and Woodward (2000) have depicted ecological models in terms of aggregate, contagion, and environmental and structural features. Others have classified them in terms of resource availability, physical structures and cultural and media messages (Cohen, Scribner, & Farely, 2000). While there are many typologies of ecological models, they all share one common feature: people and their environments are interdependent and can render direct impacts on each other.

Egger and Swinburn (1997) have conceptualized obesity from an ecological perspective. For both eating and physical activity, they identified socio-cultural factors and influences in the physical, economic, and political environments. Another study by Booth et al. (2001) focused on physical activity and eating

behaviour. In this study, health behaviours represented the interaction of individuals and their environments. Hill and Peters (1998) also proposed that numerous environmental factors contribute to the obesity epidemic and Nestle and Jacobson (2000) reported that specific policy solutions may reduce the obesity problem.

Finally, Ecological Systems Theory (EST) highlights the mechanism of human development from an interactive contextual framework (Bronfenbrenner, 1979). According to this model, change in individual characteristics can be identified with the "ecological niche" in which the person is surrounded. This "ecological niche" includes personal attitudes, family and school influences, and community and societal environments. Interestingly, all of these characteristics interact and influence development. For instance, behavioural characteristics (e.g., physical activity, dietary habits) of the child can be influenced by the family and school, which they interact with the community and societal characteristics.

EST is used as a framework to summarize research assessing predictors of childhood overweight (Davison & Birch, 2001) [see Figure 1]. In terms of this approach, becoming overweight in childhood is based on child behavioural patterns such as physical activity, dietary intake, and sedentary behaviour. These factors are shaped by a child's characteristics, parenting styles and family characteristics, and social characteristics. The EST model has been suggested as an appropriate conceptual framework for understanding the role of the environment in children's physical activity because it highlights the direct influence of the environment on behaviour (Salmon, Spence, Timperio, & Cutumisu, 2008).

Spence and Lee (2003) adapted EST to identify how the environment influences physical activity. In this paper, the authors proposed that physical activity is influenced by the interaction between the environment and biological and psychological factors at the individual level.

Specifically, the environments referred to may be divided into the social environments (e.g., family, school, community) and physical environments (e.g., weather, parks, facilities). Environment influences behaviour either through cognitions and beliefs indirectly or through family and social supports directly. Interestingly, the built environment, defined as urban design, land use, and the transportation system, has recently received increased attention for its influence on physical activity.

A number of research studies have examined the relationship between the built environment and physical activity (Frank, 2000; Frank & Engelke, 2001). One aspect of the built environment that influences physical activity is opportunity structures (e.g., accessibility to recreation facilities, parks, walking trails). Several studies have found that sidewalks, recreation facilities, and parks are related to physical activity among children (Boarnet, Anderson, Day, McMillan, & Alfonzo, 2005; Frank, Kerry, Chapman, & Sallis, 2007; Krahnstoever Davison & Lawson, 2006). The accessibility of parks and recreation facilities has also been identified as an important predictor of physical activity (Huston et al., 2003). Krahnstoever Davison and Lawson have reviewed studies showing that the proximity of parks and playgrounds are significantly associated with physical activity in children.

Therefore, built environments designed to promote physical activity are necessary and require further attention.

In short, multilevel interventions that target change at more than one setting have been recommended to influence physical activity (Naylor, Macdonald, Reed, & McKay, 2006). In particular, home, school, and neighbourhood environments are important settings for health behaviours among children. Therefore, research is necessary to investigate how these different environments potentially influence physical activity and are perceived by individuals.

Youth Physical Activity Promotion Model

Welk (1999) introduced the Youth Physical Activity Promotion (YPAP) model which integrates current existing conceptual frameworks to explain youth physical activity behaviour.

According to the YPAP model (see Figure 2), predisposing, enabling, and reinforcing factors help a child to be physically active and maintain an active lifestyle into adulthood. Predisposing factors are based on two components: *Am I able?* and *Is it worth it?* The first component labeled *Am I able?* includes variables related to self-perceptions such as self-efficacy, perceived competence, and physical self-worth that involve how children feel and think of their abilities in the physical aspects. The second component *Is it worth it?* encompasses cognitive and affective variables in which addresses expected outcomes on physical activity behaviour.

While the predisposing factors describe the individual constructs, the enabling and reinforcing factors reflect the physical and social environmental

constructs. Enabling factors consist of determinants from both the environmental and biological categories that help children to be physically active. The environmental factors, such as access to facilities, equipment, and programs, can influence physical activity behaviours, and biological attributes such as physical fitness and skills are considered important determinants of enabling factors. The YPAP posits that physical activity in children can be influenced through reinforcing factors. Parent, peer, and coach influences have been stressed as important for reinforcing physical activity among children. For example, it was reported that parental encouragement of physical activity was significantly associated with children's competence and interest in physical activity behaviours (Brustad, 1996).

The Precede-Proceed health promotion planning model (Green & Kreuter, 1991) was utilized as an organizational framework for the YPAP model. This model combines a series of steps for the planning, implementation, and evaluation of health promotion programs. Therefore, this approach is useful not only to identify a variety of impacts on a conceptual framework, but also to guide intervention and program development. In addition to the Precede-Proceed model, the YPAP model adopts Bandura's (1986) Social Cognitive theory in which behaviour is influenced by relationships between an individual and the social and physical environment. A social-ecological framework is also used which illustrates how multiple levels of environmental factors (such as social, cultural, physical and institutional) can directly and indirectly influence physical activity behaviour in children

When considering the usefulness of the YPAP, it can be argued that it provides a comprehensive integration of potential influences from family, school, and community interventions into a single model of physical activity among children. The YPAP model also offers a broad perspective and understanding of the factors that influence youth physical activity. Therefore, these conceptual links become easy to apply in the real world which gives the YPAP inherent value. The YPAP model has been recommended as an appropriate conceptual framework in understanding the role of the environment in youth physical activity and sedentary behaviour due to its consideration of a direct influence of environment on behaviour (Salmon et al., 2008)

Rowe, Raedeke, Wiersma, and Mahar (2007) investigated internal and external validity for the brief set of questionnaires used to validate the YPAP model constructs developed by Welk (1999). Specifically, the authors adapted 7 scales which contained 39 items from existing instruments. Specifically, Physical Self-Worth (PSW) and Perceived Physical Competence (PPC) scales measure the *Am I able?* subcomponent of *Predisposing* factors. Next, Liking of Games and Sports (LGS), Fun of Physical Exertion (FPE), and Liking of Vigorous Exercise (LVE) scales test the *Is it worth it?* subcomponent of *Predisposing* factors. Finally, Peer Acceptance (PA) and Parent Encouragement (PE) scales were used to measure the *Reinforcing* factors component of the YPAP model.

To balance parsimony and improved fit with a strong theoretical or logical rationale, item deletion from the scale was determined based on confirmatory factor analyses for the purpose of future model testing. After 7 items were

removed from the initial questionnaire, all items were identified to have evidence of good internal validity. Acceptable external validity was confirmed through investigating correlations between physical activity (pedometers and Leisure Time Exercise Questionnaire) and body composition. Thus, Rowe and colleagues (2007) have demonstrated a set of existing items can be used to investigate the components of the YPAP model.

Summary

Application of appropriate theoretical frameworks can lead to an increased understanding of children's physical activity. The various characteristics of children interact with multiple levels such as family, school, and community environments. Therefore, ecological approaches are useful to identify how these different environments are perceived by individuals and potentially influence physical activity among children. In addition, the YPAP model is considered an appropriate conceptual framework because it has been developed for children (Welk, 1999), and focuses on the direct influence of the environment on behaviour (Salmon et al., 2008). In short, the application of both ecological approaches and the YPAP model may help improve the understanding of physical activity behaviour by identifying how psychological, social, and environmental factors are associated with the levels of physical activity among children.

Measurements of physical activity

The search for valid and reliable instruments has become a major challenge in the study of physical activity in children. A number of different methods have been used to measure physical activity in various fields (Welk, Corbin, & Dale, 2000; Trost, 2001), but no single measure of physical activity has proven accurate and reliable over a variety of settings and populations. Based upon the intended population and purpose, the appropriate instruments of physical activity should be considered. Assessing physical activity in children is a complex task since children have unique activity patterns. Children tend to move naturally and accumulate physical activity throughout the day (Welk, et al., 2000). Due to the intermittent behaviour pattern of children, it is often difficult to measure their habitual physical activity accurately. Therefore, it is crucial to select valid and reliable instruments to measure physical activity behaviour among children.

Vanhees and colleagues (2005) have categorized three types of physical activity measurements: criterion methods, objective methods, and subjective methods (see Table 1). Each type of method has certain advantages and disadvantages that should be considered before use in the field. Criterion methods such as doubly labeled water, indirect calorimetry, and direct observation are the most reliable and valid, but are also invasive and expensive, and limited to specific situations. Objective methods such as pedometers and accelerometers are relatively inexpensive and easy to wear, and provide valid data for free-living physical activity. However, pedometers and accelerometers cannot be worn in the water, and may underestimate activities such as skating, cycling, and stair

climbing. Finally, although subjective methods like self-reports have reliability and validity problems related to recall, they are inexpensive, time efficient, and easy to administer to large samples. Methods of self-report questionnaires and pedometers that are used in this dissertation will be discussed in detail.

Self-report Instruments

Self-reports are defined as recall questionnaires, activity logs or diaries, and proxy reports administered by either the self or interviewer. Wide ranges of self-report methods are commonly used in health research because of their minimal expense, practicality, and ease of administration (Welk, 2002). Another benefit of self-reports is their ability to collect data from a large sample at low cost. Therefore, self-report instruments have become the most common method to assess physical activity in children (Sallis, 1991).

There is a need for a reliable and valid self-report measurement to assess physical activity in children (Sallis, 1991). To enhance the ability of the child to accurately recall activity levels, the use of memory cues has been recommended to improve the memory recall skills (Baranowski, 1988). Specifically, the use of time related cues such as recess, lunch, after school, or evening and weekend or weekday has been suggested to structure physical activity questionnaires. Another memory cue would be to provide lists of physical activities including a variety of sports and games. The Physical Activity Questionnaire for Older Children (PAQ-C) has been developed based upon the recommendations mentioned above.

Physical Activity Questionnaire for Older Children (PAQ-C)

Crocker and colleagues (1997) developed the PAQ-C to assess levels of moderate to vigorous physical activity in children. The PAQ-C is a self-reported, 7-day recall questionnaire that can be administered in 10 to 15 minutes. It was designed to measure general levels of physical activity throughout the school year for students in grades 4 to 8 (8 to 14 years of age).

The PAQ-C has been supported as a valid and reliable measure of general physical activity levels in childhood (Crocker, et al., 1997; Kowalski, Crocker & Faulkner, 1997). A significant test-retest reliability of the PAQ-C was reported (boys, $r = 0.75$ and girls, $r = 0.82$), and the internal consistency of the PAQ-C was also statistically significant with a Cronbach's alpha of 0.79 – 0.89 (Crocker, et al., 1997). Furthermore, according to Kowalski et al, the PAQ-C was statistically correlated to other physical activity questionnaires such as a peer-comparison activity rating ($r = 0.63$), teacher's rating of physical activity ($r = 0.45$), a daily checklist of moderate to vigorous physical activity ($r = 0.53$), perceptions of athletic competence ($r = 0.48$), and the Leisure Time Exercise Questionnaire ($r = 0.41$). Significant moderate relationships were also found between the PAQ-C and other methods such as a 7-day recall interview ($r = 0.46$), a Caltrac motion sensor ($r = 0.39$), and the Canadian Home Fitness Test ($r = 0.28$).

The PAQ-C consists of 10 items. The first question is an activity checklist that includes common sports, leisure activities, games, and other activities. Items 2 to 8 assess activity in physical education classes, recess, lunch, right after school, in the evenings, and on the weekend. Question 9 asks the children to indicate how

often they did physical activity for each day of the week. The last question, not used in calculation of the activity score, asks about a child's sickness or other events that prevented the children from engaging in their regular physical activity. Each of the nine items is converted to a 5-point scale. The mean of all items is used to indicate level of physical activity and can range from 1 to 5. A high score indicates higher levels of physical activity.

The PAQ-C has been used to classify children's physical activity levels (Ball, Marshall, & McCargar, 2003; Paxton, Estabrooks, & Dzewaltowski, 2004; Ni Mhurchu, Maddison, Jiang, Jull, Prapavessis, & Rodgers, 2008) and to examine the relationship between physical activity and health variables (Muratova, Islam, Demerath, Minor, & Neal, 2001; Chen, Lee, Chiu, & Jeng, 2008; Janz, et al., 2008). It has also been used in longitudinal research to successfully assess the levels of physical activity in children (Bailey, McKay, Mirwald, Crocker, & Faulkner, 1999; Thompson, Baxter-Jones, Mirwald, & Bailey, 2003; Mundt, Baxter-Jones, Whiting, Bailey, Faulkner, & Mirwald, 2006). The developers of the PAQ-C have encouraged researchers to add relevant activities to the scale as needed in order to make it more appropriate for the target population (Crocker, et al., 1997). Therefore, the PAQ-C offers a useful measure to assess the levels of physical activity of Korean and Korean Canadian children within the context of this study.

The strength of the PAQ-C is its use of memory cues such as specific and easily identifiable time references including, recess, lunch, and after school to enhance children's recall ability. The scale is also useful for discriminating

between physically active and inactive children as it provides a calculation of an overall activity score (Kowalski, et al., 1997). On the other hand, there are several limitations of the PAQ-C. The PAQ-C was developed to assess general levels of physical activity and results in a summary activity score. Therefore, it does not provide specific frequency, duration, intensity, and overall estimation of energy expenditure. The PAQ-C is also not appropriate for use during summer and winter vacations because it was designed to only assess physical activity throughout the school year (Kowalski, et al., 1997).

However, limitations of self-reports have been recognized because self-reports rely heavily on a respondent's ability to provide information about his or her own behaviours (Vanhees et al., 2005). Participants are supposed to correctly interpret the questions and are then expected to accurately remember their physical activity patterns. But children may be unable to answer the questions accurately. Understanding ambiguous terms such as physical activity, moderate/vigorous intensity, and leisure time activity is a difficult task for children. Recalling physical activity is also a highly complex task because children have less developed cognitive skills and more concrete thinking patterns than adults (Baranowski, 1988). In addition to interpretation and recall skill limitations, social desirability can lead to over-estimation of physical activity (Warnecke et al, 1997). Therefore, use of direct measures has been recommended for researchers to assess children's physical activity (Strycker, Duncan, Chaumeton, Duncan, & Toobert, 2007; Trost, 2001).

Pedometers

There have been significant advances in the measurement of youth physical activity with the emergence of instruments such as accelerometers, pedometers and heart rate monitors. Although accelerometers are easy to operate, able to collect data over several weeks, and are noninvasive for participants, they are difficult to apply in studies with large sample sizes because of the high cost (Dale, Welk, Matthews, 2002). The pedometer has shown promise as an objective tool for measuring children's physical activity because it is relatively simple and inexpensive compared to accelerometers and heart rate monitors. The pedometer is a device that is worn on the body (often around the thigh or torso) and measures vertical displacement as steps or counts. Its low-cost, ease of use and accuracy in measuring daily step activity make the pedometer an appropriate tool for assessing physical activity in children (Sirard & Pate, 2001).

The use of pedometers to measure youth physical activity levels has demonstrated good reliability and validity (Eston, Rowlands, & Ingledew, 1998; Jago et al., 2006). For example, significant correlations (r = 0.95 - 0.99) were found among a pedometer, a Tritrac accelerometer, and direct observation when activity levels during recreational activities and classroom activities were compared using all measurement techniques (Kilanowski, Consalvi, & Epstein, 1999). Interestingly, a systematic review of 25 articles related to convergent validity of pedometers reported that pedometers correlate strongly with different accelerometers (r = 0.86) and observation (r = 0.82) and correlate moderately with

different measures of energy expenditure (r = 0.68) (Tudor-Locke, Williams, Reis, & Pluto, 2004).

In terms of reliability, Jago et al. (2006) observed no significant difference in the number of step counts recorded by three Yamax pedometers and one accelerometer located in different places on the body during the same activity in boys ages 11 to 15 years. Another study showed no significant difference in outputs recorded by two pedometers worn by adults during the same activity (Bassett et al., 1996). In addition, no differences were reported in accuracy between attachment locations in children (Ramirez-Marrero, Smith, Kirby, Leenders, & Sherman, 2002) and in preschool children (Louie & Chan, 2003). However, Graser, Pangrazi, and Vincent (2007) concluded the right side, posterior midline of the right thigh, and middle of back locations, compared to navel and anterior midline of the right thigh produced the most accurate pedometer step counts in normal, overweight, and obese children. The authors recommend the right side location because of ease of reading the pedometer during activity even though no significant differences existed between the sites.

With the use of pedometers, researchers are being confronted with a new set of methodological issues; the monitoring frame and reactivity. Vincent and Pangrazi (2002) reported that three to four days of monitoring are needed to obtain acceptable reliability levels (Intra-class correlations = 0.74) and five days of monitoring are needed to obtain an Intra-class correlation of 0.80 when monitoring elementary school children. Another study found that four days of monitoring is a sufficient length of time to determine habitual activity levels in children (Trost,

Pate, Freedson, Sallis, & Taylor, 2000). Reactivity was defined as a change in normal activity levels due to the participants' knowledge that their activity levels were being monitored. If reactivity occurred, a higher or lower activity count would be expected on Day 1 followed by a pattern of decreasing or increasing activity on consecutive days. However, reactivity was not found to be an issue among children wearing pedometers in studies with either sealed (Vincent & Pangrazi, 2002) or unsealed pedometers (Ozdoba, Corbin, & Le Masurier, 2004).

Based upon these findings, there are distinct advantages to using pedometers. First, pedometers are a cost-effective alternative to accelerometers and heart rate monitors. Second, pedometers provide valid measures of overall total physical activity rather than being limited to measures of single-domain activity. Finally, they are useful for documenting changes in activity and for rank ordering children in physical activity participation. However, limitations exist. One of the disadvantages of using pedometers is that they cannot assess water-based activities and may underestimate non-locomotor type activities such as skating and cycling (Loucaides, Chedzoy, & Bennett, 2003). They also do not provide information about the frequency, intensity, or duration of physical activity. In addition, step counts may be influenced by body size and speed of locomotion (Trost, 2001).

Use of Pedometers to Assessing Physical Activity in Children

Pedometers have been used in many studies to assess physical activity of children and youth. Computer searches using PubMed were conducted in the English-language literature to investigate published studies examining habitual physical activity measured by pedometer. Keywords used were child* or youth

and pedomet*. The search was finalized on April 2008. Only 22 of 66 studies investigated free-living pedometer-determined physical activity on the basis of daily life (see Table 2). Studies were not further considered if they (a) did not report data of total daily steps, (b) only tested the reliability and validity, and (c) were conducted for the purpose of intervention.

Sample size, age, monitoring days, and mean step/day data were summarized in Table 2. Specifically, sample sizes ranged from 30 to 1964 children or youth, and their ages spanned between 5 and 18 years. Three to seven monitoring days were employed and Yamax brand pedometers were used in most studies. Boys accumulated more steps/day on weekdays and weekends than girls. For instance, boys took approximately 12,000 to 16,000 steps/day on weekdays and 12,000 to 13,000 steps/day on weekends while girls took approximately 10, 000 to 14,000 steps/day on weekdays and from 10,000 to 12,000 steps/day on weekends. Interestingly, overweight children took less steps/day than normal weight children, and children had higher mean steps/day recorded on weekdays.

The Canadian Fitness and lifestyle Research Institute (CFLRI) has conducted a large-scale national study, the Canadian Physical Activity Levels Among Youth (CANPLAY). The CANPLAY study randomly selected over 23,000 children and youth aged 5 to 19 years and collected pedometer data on the number of daily steps taken by them across Canada between 2005 and 2007 (see Figure 3). According to the study, Canadian children and youth took an average of 11,356 steps (11,946 steps for boys and 10,735 steps for girls) per day in 2005-2006 and 11,685 steps (12,420 steps for boys and 10,969 steps for girls) per day in 2006-

2007. In terms of age, children aged 5 to 10 years (12,441 steps) took more steps than children aged 11 to 14 years (11,762 steps), who in turn took more steps than those aged 15 to 19 years (10,301 steps) between 2006 and 2007. Interestingly, the activity levels of children are associated with the education level of parent, the activity level of parent, and the child's participation in organized sport and physical activity.

One study has suggested that the number of recommended daily steps in association with BMI-referenced standards is 12,000 steps/day for girls and 15,000 steps/day for boys in children aged 6 to 12 years (Tudor-Locke et al., 2004). However, 71% of children and youth do not accumulate enough steps per day to meet the recommendations related to a healthy weight, and 84% do not meet the criteria of accumulating at least 12,000 steps for girls and 15,000 steps daily for boys (CFLRI, 2007). Moreover, 91% of children do not take enough daily steps to meet Canada's guidelines for children and youth which recommend 90 minutes of moderate to vigorous physical activity per day; roughly equivalent to 16,500 steps daily.

Few studies have assessed pedometer determined physical activity levels among Korean children (see Table 3). An (2007) found that elementary school boys aged 10-13 years attained 15,748 ± 3,817 steps daily and accumulated significantly higher steps/day during weekdays (19,370 ± 4,386) than weekends (12,125 ± 3,248). Similarly, one study has reported both boys and girls were significantly more active on weekdays than on weekend days (Chun & Oh, 2007). In this study, the mean of weekday pedometer-determined physical activity was

14,358 steps per day in boys and 8,367 steps per day in girls. The corresponding values for weekend days were 12,188 in boys and 7,674 in girls. Lee and Kim (2007) also assessed the daily steps of elementary school children (grade 3 and 5) in rural Korea. The mean number of steps per day for children was 17,585 ± 5,051, and daily steps of boys (18,924 ± 6,083) were higher than that of girls (16,615 ± 3,988).

Researchers have suggested that accumulating 12,000 steps/day for girls and 15,000 steps/day for boys is associated with a healthy weight (Tudor-Locke et al, 2004), and found that boys who accumulated 13,000 steps per day engaged in 60 minutes or more of moderate physical activity (Rowlands & Eston, 2005). Based on these recommendations, most children in the previously described studies participate in moderate physical activity in terms of daily steps taken. Yet, the majority of Korean youth are insufficiently active according to The National Health Nutrition Survey (2005).

Summary

Researchers and practitioners need valid and reliable measures of youth physical activity, but the difficulty of developing such instruments has been well documented (Bauman, Bellew, Vita, Brown, & Owen, 2002). A variety of methods have been used to assess physical activity behaviour in children. Self-report instruments have become an invaluable tool for physical activity research because of their minimal expense, practicality and ease of administration. However, children have difficulty accurately recalling past physical activity behaviour due to their less developed cognitive skills (Baranowski, 1988). Self-

reported estimates of total physical activity exceed actual levels of physical activity (Hagstromer, Oja, & Sjostrom, 2007), and social desirability can also lead to over-estimation of physical activity (Warnecke et al, 1997). Therefore, objective measurements are required to investigate levels of physical activity (Strycker et al., 2007). Pedometers are well acknowledged as a simple, accurate means to measure daily step activity, and have been demonstrated as an appropriate tool for assessing physical activity in children (Sirard & Pate, 2001).

Selecting proper measurements to assess physical activity is critical and is dependent on the explicit research purposes such as explaining descriptive studies of populations, investigating correlates and predictors of physical activity, or evaluating the effectiveness of interventions. No single instrument appears to measure physical activity adequately. Therefore, multiple assessments (e.g. pedometers along with physical activity questionnaires) can be useful to obtain more accurate data (Wood, 2000). Sallis and Saelens (2000) have suggested that the key role of self-reports may be to assess the context and type of physical activity in when used in combination with objective measures. Moreover, using a combination of objective measures with self-report is most likely to provide a more reliable overall assessment of physical activity in children even if only applied to a sub-sample of the study population (Telford, Salmon, Jolley, & Crawford, 2004). Although a number of different methods have been used to assess physical activity in children (Welk et al, 2000), the existing data on Korean children's physical activity are insufficient because of a lack of standardized measures. Therefore, the use of multiple measurements and the development of

standardized questionnaires should help enable the accurate assessment of current levels of physical activity among Korean children.

In conclusion, the recent evidence suggests that physical activity plays an important role in determining weight status and obesity prevention in youth (Atlantis et al., 2006). Multiple factors related to correlates of physical activity should be identified to increase physical activity levels and decrease sedentary behaviours in children. However, little research has examined the relationship between socio-cultural factors and health-related behaviours in Korean childhood. Therefore, a study is needed to investigate how personal, socio-cultural, and environmental factors are associated with the levels of physical activity and sedentary behaviours among Korean children in Korea and Canada.

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Table 1. Physical activity assessment methods

Type	Methods
Criterion Methods	Doubly Labelled Water
	Indirect Calorimetry
	Direct Observation
Objective Methods	Pedometers
	Accelerometers
	Heart Rate Monitoring
Subjective Methods	Self-report Questionnaires

Table 2. Use of pedometers assessing physical activity in children and youth

Reference & Country	Sample	Age	Monitoring days	Boys steps	Girls steps
Al-Hazzaa (2007) Saudi	296 boys	8-12	3 weekdays	Obese: 10602±4800 Non-obese: 14271±5576	N/A
Cox (2006) New Zealand	45 boys 46 girls	5-11	3 days	15606±4601	13031±3079
Duncan (2006) New Zealand	536 boys 579 girls	5-12	5weekdays 2 weekend days	Weekday: 16132±3864 Weekend: 12702±5048	Weekday: 14124±3286 Weekend: 11158±4309
Duncan (2007) New Zealand	515 boys 454 girls	5-12	5weekdays 2 weekend days	Overweight: 16106±3208 Non-overweight: 14238±3343	Overweight: 12555±3169 Non-overweight: 14176±2728
Duncan (2007) England	101 boys 107 girls	9.3	2 weekdays 2 weekend days	Weekday: 14111±4163 Weekend: 10854±4966	Weekday: 13159±3423 Weekend: 9922±4061
Eisnmann (2007) United states	269 boys 339 girls	9.6	7 days	12709±3384	10834±2562
Le Masurier (2006) United states	111 boys 112 girls	12-14	4 weekdays	11589±3270	10232±2517
Loucaides (2004) Cyprus	129 boys 127 girls	11-12	4 days (Summer) 4 days (Winter)	14531±4901 13583±4313	16450±5134 12436±3610
Mikami (2003) Japan	30 boys	11-12	3 days	Obese: 8729±1450 Non-obese: 17915±3208	
Ng (2006) Canada	34 boys 48 girls	9-12	2 school days	15808±5167	11115±3322
Oliver (2006) New Zealand	29 boys 32 girls	8-10	3 weekdays	18055±5938	14719±5891
Pangrazi (2003) United states	37 boys 56 girls	8-9	4 weekdays	13050±4756	9945±3416

Reference	Sample	Age	Monitoring days	Boys steps	Girls steps
Raustorp (2007) Sweden	183 boys 153 girls	7-9	4 weekdays	15991±3085	13788±2881
	85 boys 83 girls	7-9	4 weekdays	16973±3572	15141±2664
Reed (2004) United states	120 boys 97 girls	Grade 6-8	3 days	Grade 6: 10229±4379 Grade 7: 12047±4404 Grade 8: 6912±7443	Grade 6: 7782±3610 Grade 7: 10751±4137 Grade 8: 11397±7106
Romaon (2004) France	246 boys 232 girls	7-18	7 days	8103 - 10829	7332 - 8778
Rowe (2007) Scotland	129 boys 163 girls	Grade 5-8	6 days	10513±4083	8650±2799
Rowlands (1999) United Kingdom	17 boys 17 girls	8-10	6 days	16035±5998	12728±4026
Southard (2006) United states	63 boys 37 girls	9-11	A week	Normal weight: 11099 At risk of overweight: 8681 Overweight: 7732	
Tudor-Locke (2004) United states	325 boys 386 girls	6-12	4 weekdays	Normal weight Age 6: 17548±1580 Age 7: 16878±2469 Age 8: 16939±2138 Age 9: 16520±3184 Age 10: 15118±4203 Age 11: 16707±4179 Age 12: 17074±2904	Normal weight Age 6: 13246±3122 Age 7: 13421±3843 Age 8: 12210±2357 Age 9: 13445±2869 Age 10: 12290±3105 Age 11: 13625±2899 Age 12: 13405±2104
Australia	278 boys 285 girls			Overweight/obese	Overweight/obese
Sweden	365 boys 324 girls			Age 6: 12886±2610 Age 7: 13796±3731 Age 8: 14290±3067 Age 9: 14172±4067 Age 10: 12552±3318 Age 11: 13296±2807 Age 12: 12342±3440	Age 6: 10388±3016 Age 7: 11530±3317 Age 8: 10735±2993 Age 9: 11136±3491 Age 10: 11217±2678 Age 11: 10539±3140 Age 12: 10612±2117

Reference	Sample	Age	Monitoring days	Boys steps	Girls steps
Tudor-Locke (2006) United states	28 boys 53 girls	11-12	4 weekdays	16421±5444	12332±3056
Wickel (2007) United states Sweden Australia	195 boys 254 girls 257 boys 252 girls 229 boys 256 girls	11-12	4 weekdays	United states: 13458±3050 Sweden: 15938±3356 Australia: 14361±3193	United states: 11138±2582 Sweden: 13440±3025 Australia: 11693±2661
Ziviani (2008) Australia	26 boys 33 girls 9 boys 13 girls	6-8 8-10	2 weekdays 2 weekend days	Weekday: 10330±5156 Weekend: 16766±2964 Weekday: 13694±3708 Weekend: 18586±6603	Weekday: 12038±4900 Weekend: 13886±3784 Weekday: 10212±3423 Weekend: 13699±5067

Table 3. Use of pedometers assessing physical activity in Korean children

Reference	Sample	Age	Monitoring days	Boys steps	Girls steps
Lee (2007)	21 boys 29 boys	9.96	5 days	18924±6083	16615±3988
				Grade 3rd: 19314±5105 Grade 5th: 15712±4358 Normal group: 19378±5174 Overweight group: 15846±4846	
Chun (2007)	60 boys 95 girls	12-13	A week	Weekday: 14358 Weekend: 8367	Weekday: 12188 Weekend: 7674
An (2007)	107 boys	10-13	A week	A week: 15748±3817 Weekdays: 19370±4386 Weekend: 12125±3248 School: 7767±2062 After school: 10395±2067	N/A
An (2007)	152 boys 132 girls	11.37	A week	A week: 24889±5161 Weekdays: 19942±4513 Weekend: 12395±3631 School: 8045±2026 After school: 10639±2784	A week: 23284±4638 Weekdays: 18480±4307 Weekend: 11784±2375 School: 6927±1939 After school: 10437±2393
Kim (2005)	40 girls	14.90	5 days	N/A	A week: 9509±1988 A week: 11162±1135

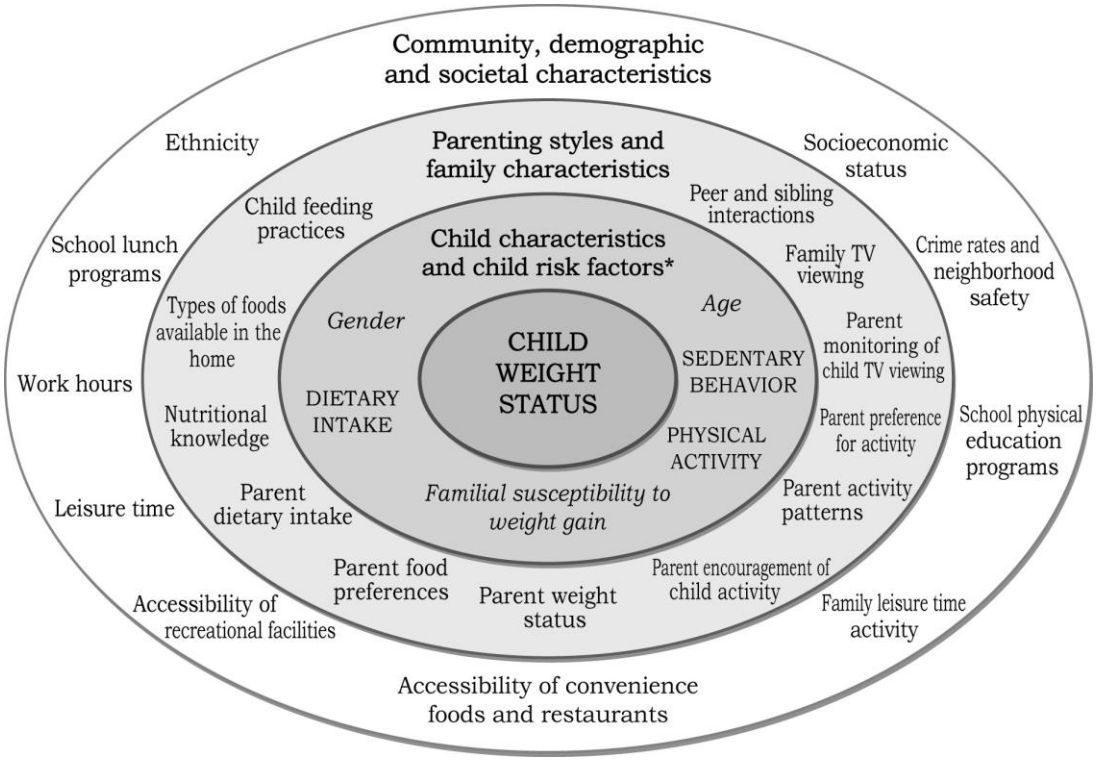

Figure 1. Ecological model of predictors of childhood overweight (Davison & Birch, 2001)

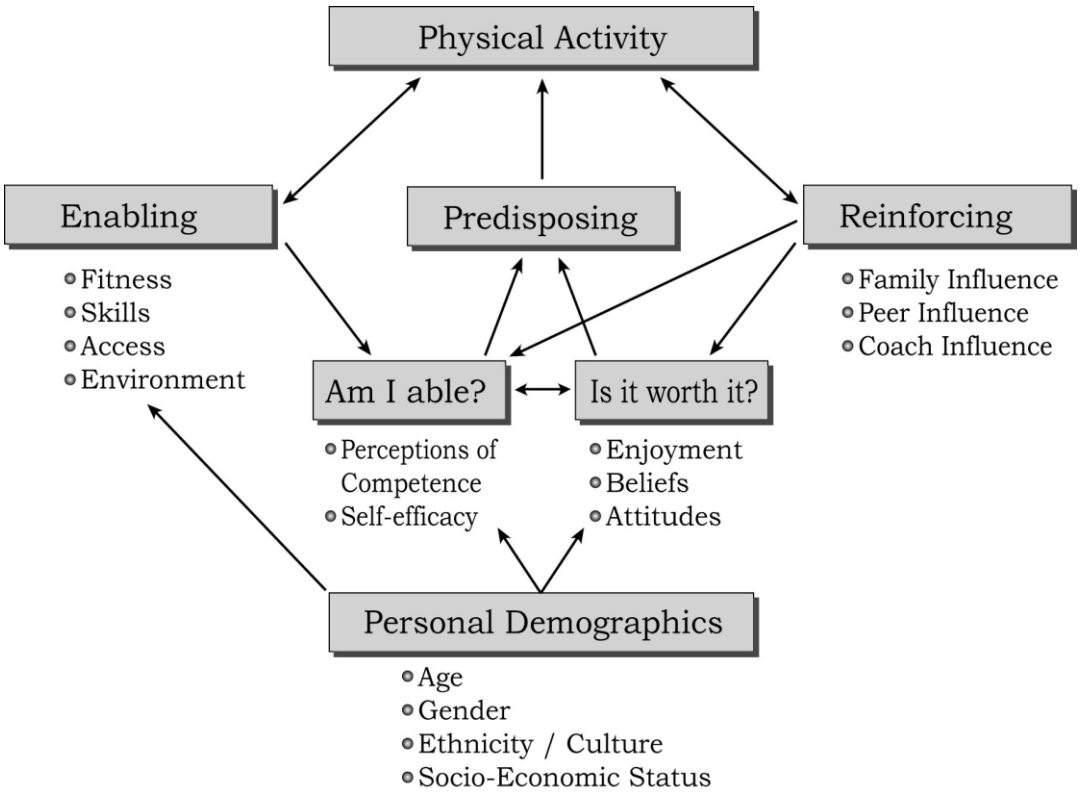

Figure 2. A conceptual diagram of the Youth Physical Activity Promotion Model (Welk, 1999)

Figure 3. Mean number of steps for children and youth by child's age and gender (CFLRI, 2007).

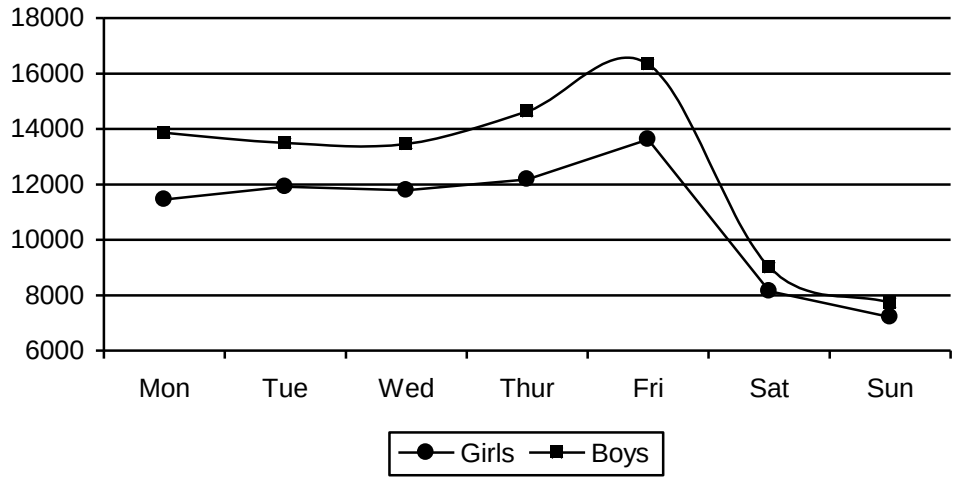

Figure 4. Mean number of steps for Korean children (Chun & Oh, 2007).

APPENDIX 2. INFORMATION LETTER AND CONSENT FORM

(ENGLISH AND KOREAN)

UNIVERSITY OF ALBERTA

Faculty of Physical Education and Recreation

P417 Van Vliet Centre
Edmonton, Alberta, Canada T6G 2H9

INFORMATION LETTER

Title: A Comparative Study of the Determinants of Physical Activity among Korean children in Korea and Canada

Investigators: Jong Gil Lee, MA, John C, Spence, PhD
P4-17 Van Vliet Centre, Faculty of Physical Education & Recreation, University of Alberta, Edmonton, Alberta, T6G 2H9, (780) 492-2004

Dear Parent or Guardian:

As part of my PhD degree at the University of Alberta, I am doing a study on physical activity in children. I would like to compare health practices such as physical activity, eating habits, or inactivity between Korean children and Korean-Canadian children.

Your child is being invited to take part in a study that is looking at the relationship between environments and health practices in childhood. This study will investigate the physical activity levels, the number of daily steps taken, inactivity, food eaten, height, weight and waist size among Korean children in Korea and Canada.

I am looking for children for my study through the Korean language school and in the Sunday schools of local Korean churches in Vancouver and Toronto. Information will be obtained through a survey which will ask questions about levels of physical activity and inactivity (such as time spent watching movies or TV, playing video games, surfing the Internet as well as time spent reading or studying at home). Your child will fill out the surveys during class time at the Korean school / Sunday school. This should take about 50 minutes to finish and I will collect them once they are done. Your child may also be asked to wear a step counter for 7 days in a row (five weekdays and two weekend days) so we can find out the number of steps he or she takes per day. Before wearing a step counter, a training class will be held for children where they will learn how to wear a step counter

and how to record their daily steps. Parent's place of birth, age, occupation, education level, and income will also be recorded.

I believe that there are three benefits you can get from taking part in this research. First, by taking part, the research may help your child become more aware of his or her current levels of physical activity and inactivity. As a result, children may be motivated to increase their physical activity and decrease inactivity. Also, this study will help us determine the current levels of physical activity among Korean children in Korea and Canada. Finally, results from this study will help future physical activity plans aimed at reducing obesity by increasing physical activity among children. In terms of risks, measuring height, weight, and waist circumference may be uncomfortable for some children, however, there will be no long-term risks.

Your child's identity will be kept confidential throughout this process. To ensure confidentiality, personal information will be stored in a locked filing cabinet to which only the researchers have access. Information is normally kept for a period after publication, after which it will be destroyed. Your child is free to quit the study at any time without consequence. Your child is also free to decide not to answer any question(s). If your child wishes to quit the study, your child's information can be removed upon your request.

If you have any questions about this study, you should contact Dr. Kelvin Jones, Chair of the PER-ALES NS REB at 780-492-0302.

Thank you very much for taking the time to consider helping me with my study.

Jong Gil Lee, MA
Graduate student

PARENT CONSENT FORM

Title of Project: A Comparative Study of the Determinants of Physical Activity among Korean children in Korea and Canada

Principal Investigator: Jong Gil Lee **Phone Number: (780) 707-3884**

	Yes	No
Do you understand that you and your child have been asked to participate in a research study?	☐	☐
Have you read and received a copy of the attached Information Sheet?	☐	☐
Do you understand the benefits and risks involved in taking part in this research study?	☐	☐
Have you had an opportunity to ask questions and discuss this study?	☐	☐
Do you understand that you are free to withdraw your child from the study at any time, without having to give a reason and without affecting your child's future medical care?	☐	☐

Who explained this study to you?_____

Child's Birthdates _____

I agree for my child to take part in this study: YES ☐ NO ☐

I agree to take part in this study: YES ☐ NO ☐

Signature of Parent or Guardian _____ Date & Time _____

Signature of Investigator or Designee _____ Date & Time _____

THE INFORMATION SHEET MUST BE ATTACHED TO THIS CONSENT FORM AND A COPY GIVEN TO THE RESEARCH SUBJECT

UNIVERSITY OF ALBERTA

Faculty of Physical Education and ecreation

P417 Van Vliet Centre
Edmonton, Alberta, Canada T6G 2H9

연구 안내문

연구제목: A Comparative Study of the Determinants of Physical Activity among Korean children in Korea and Canada

연구자: Jong Gil Lee, MA, John C, Spence, PhD
P4-17 Van Vliet Centre, Faculty of Physical Education & Recreation, University of Alberta, Edmonton, Alberta, T6G 2H9, (780) 492-2004

부모님 또는 가디언들께

저는 캐나다 알버타 대학에서 박사과정 연구로 어린이들의 신체활동 수준에 대한 연구를 하고 있습니다. 저는 특히 한국 어린이들과 한국계 캐나다인 어린이들의 건강과 관련된 행동 수준을 (신체활동, 음식 섭취 습관, 또는 비신체활동: TV, 컴퓨터 이용시간 등) 비교할 예정입니다.

귀하의 자녀를 이 연구에 초대하고자 합니다. 이 연구에서는 한국과 캐나다에 살고 있는 한국 어린이들의 신체활동 수준, 하루에 걷는 걸음 수, 비 신체활동 수준 (TV, 컴퓨터 이용시간), 음식 섭취 습관, 키, 몸무게, 그리고 허리 둘레를 조사할 것입니다.

저는 밴쿠버와 토론토에 있는 한인교회와 한국어 학교의 어린이들을 통해 연구를 진행하고자 합니다. 어린이들은 교회/학교에서 설문지를 작성한 후에 제출하고 신체측정을 할 예정입니다.

이 설문지 조사에 응답하시므로 세가지 유익한면이 있을 겁니다. 첫째, 이 설문지 조사에 응답하므로, 귀하의 자녀는 자신의 현 신체활동 수준과 앉아서 하는 활동 수준을 더 잘 인식하여 앞으로 신체활동을 늘리고, 비 신체활동(TV, 컴퓨터 이용시간)들을 줄일려는

동기 부여를 받을 것입니다. 둘째로 이 연구는 한국과 캐나다에 살고 있는 한국 어린이들의 현재 신체활동 수준을 정확히 파악하여 어린이 건강에 기여할 것입니다. 마지막으로 이 설문조사의 결과들은 어린이들의 신체활동을 증가시킴으로써 한인 어린이들의 비만과 질병을 줄이는 미래 연구에 도움이 될 것입니다.

연구조사 과정 동안 귀하의 자녀의 이름과 신분은 비밀로 보장될 것입니다. 비밀 보장을 위해, 개인정보들은 저만 이용할 수 있는 잠긴 파일 케비넷에 저장될 것입니다. 정보들은 출판기간까지 잠시 저장되었다가, 그 이후 파기될 것입니다. 귀하의 자녀들은, 원한다면 어느때라도 이 연구참여를 그만둘 수 있고, 어떤 질문에라도 응답하기를 거부할 수 있습니다. 만약 귀하의 자녀가 중도에 참여를 그만둔다면, 귀하의 요청에 의해 어린이의 정보는 이 연구에서 제외될 수 있습니다.

연구에 도움을 주셔서 진심으로 감사 드리며, 연구에 대한 질문이 있으시면 연락주십시요. Dr. Kelvin Jones, Chair of the PER-ALES NS REB at 780-492-0302.

연구자 이종길 드림.

이메일: jongl@ualberta.ca

전화: 1-780-707-3884

부모님 동의서

Title of Project: A Comparative Study of the Determinants of Physical Activity among Korean children in Korea and Canada

Principal Investigator: Jong Gil Lee **Phone Number: (780) 707-3884**

Part 2: 예 아니오

귀하와 귀하의 자녀가 이 연구에 초대 되었다는 것을 알고 계십니까? ☐ ☐

귀하께서는 같이 보낸 연구 안내문을 받아 읽어 보셨습니까? ☐ ☐

귀하께서는 이 연구 참여로 인한 유익한점과 불 이익 한 점들을 잘 알고 계십니까? ☐ ☐

귀하께서는 이 연구에 대해 질문하고 토의하는 기회들을 가져 보셨습니까? ☐ ☐

귀하의 지녀가 언제든지 참여를 거부할 수 있고, 결과에 상관없이 중간에 그만 둘 수도 있고, 귀하의 요청에 따라 개인정보도 삭제될 수 있다는 사실을 알고 계십니까? ☐ ☐

누가 이 연구에 대해 설명해 주었습니까? _____

귀하 자녀의 생년월일: _____년_____월_____일

나는 나의 아이가 이 연구에 참여할 것을 동의합니다. 예 ☐ 아니오 ☐

나는 이 연구에 참여할 것을 동의합니다. 예 ☐ 아니오 ☐

부모님 싸인 _____ 날짜 _____

연구자 싸인 _____ 날짜 _____

APPENDIX 3. QUESTIONNAIRES FOR PARENTS

(ENGLISH AND KOREAN)

A Questionnaire for Parents

These questions are about you and your household.

1. Please write the first initial of your child's first and last name.

First	Last

For example:
If your name is Eunjoo Lee

E	L
First	Last

2. What is your gender?

□ Male

□ Female

3. What is the highest level of education that you have attained?

□ Some high school

□ Completed high school

□ Some university or college

□ Completed university/ college

□ Some graduate school (e.g., master's degree or PhD)

□ Completed graduate school

4. What is your employment status?

□ Employed □ Self-employed □ Out of work

□ Homemaker □ Student □ Retired

5. What is your annual household income before taxes?

□ <$20,000 □ $20-39,999 □ $40-59,999

□ $60-79,999 □ $80-99,999 □ >$100,000

6. How long have you been living in Canada?

□ less than one year □ 2-3 years □ 4-5 years

□ 6-7 years □ 8-9 years □ 10 or more years

부모님 설문지

이 설문지는 귀하와 귀하의 가정에 대한 것 입니다.

1. 귀하 자녀의 이름과 성의 영문 이니셜은 무엇입니까?

이름 성

예: 만약 귀하 자녀의 이름이 **E**unjoo **L**ee 이면

E	L

이름 성

2. 귀하의 성별은 무엇입니까?

□ 남자 □ 여자

3. 귀하의 최종학력은 무엇입니까?

□ 고등학교 중퇴 □ 고등학교 졸업

□ 대학교 또는 전문대학 중퇴 □ 대학교 또는 전문대학 졸업

□ 대학원 중퇴 (예, 석사 또는 박사) □ 대학원 졸업

4. 귀하의 직업은 무엇입니까?

□ 직장인 □ 자영업 □ 무직

□ 주부 □ 학생 □ 은퇴

5. 귀하 가정의 연 수입은 총 얼마입니까?

□ 2,200 만원 미만 □ 2,300 – 4,400 만원 □ 4,500 – 6,600 만원

□ 6,700 – 8,800 만원 □ 8,900 – 1 억 천만원 □ 1 억 천만원 이상

■ 다음 각 식품 혹은 각 식품을 주재료로 조리한 음식을 귀하의 자녀가 얼마나 자주 드시는지 응답해주십시오.

식품 및 음식명 \ 섭취빈도 (회)		1일			1주			1달		1년	거의 안 먹음	비고
		3	2	1	4~6	2~3	1	2~3	1	6~11		
곡류	1.쌀	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	2.잡곡(보리 등)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	3.라면(인스턴트 자장면 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	4.국수(냉면, 우동, 칼국수 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	5.빵류(모든 빵 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	6.떡류(떡볶이, 떡국 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	7.과자류	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
두류서류	8.두부(국, 찌개, 부침, 조림, 순두부 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	9.콩류(콩밥, 콩자반 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	10.두유	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	11.감자(국, 볶음, 조림, 튀김, 찐감자 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	12.고구마(군고구마, 찐고구마, 튀김, 맛탕 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
육류난류	13.쇠고기(국, 탕, 찌개, 편육, 장조림, 구이, 볶음, 비프까스, 튀김, 찜 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	14.닭고기(삼계탕, 백숙, 찜, 튀김, 조림, 볶음 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	15.돼지고기(찌개, 구이, 볶음, 돈까스, 튀김 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	16.햄, 베이컨, 소시지(핫도그 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	17.달걀	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	

식품 및 음식명 / 섭취빈도 (회)		1일			1주			1달		1년	거의 안 먹음	비고
		3	2	1	4~6	2~3	1	2~3	1	6~11		
생선류	18.고등어	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	19.참치	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	20.조기(굴비 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	21.명태(북어, 동태, 생태, 코다리 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	22.멸치	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	23.어묵류(오뎅)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	24.오징어(마른 오징어 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	25.조개류	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	26.젓갈류	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
채소류	27.배추(국, 전, 김치 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	28.무(국, 생채, 나물, 깍두기, 동치미, 단무지 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	29.무청	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	30.콩나물(무침, 국 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	31.시금치(국, 나물 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	32.오이(생채, 오이소박이, 오이지 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	33.고추(생것, 전, 볶음 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	34.당근(생것, 튀김, 주스 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	35.호박(나물, 전, 찌개 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	36.양배추(김치, 국, 쌈, 볶음, 생것 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	37.토마토(생것, 주스 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	38.버섯류(볶음, 무침, 찌개, 전 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
해조류	39.미역(국, 무침, 줄기볶음 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	40.김(구이, 무침, 김밥 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	

식품 및 음식명 / 섭취빈도 (회)		1일			1주			1달		1년	거의 안 먹음	비고
		3	2	1	4~6	2~3	1	2~3	1	6~11		
과일류	41.귤(금귤, 주스, 통조림 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	42.감, 곶감	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	43.배	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	44.수박	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	45.참외	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	46.딸기	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	47.포도(주스, 통조림 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	48.복숭아(주스, 통조림 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	49.사과(주스 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	50.바나나	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	51.오렌지(주스 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
우유유제품	52.우유(저지방우유, 탈지우유, 가공우유, 분유 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	53.요구르트(액상, 반고형 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	54.아이스크림	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
음료	55.탄산음료(콜라, 사이다, 환타 포함)	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	56.커피	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	57.녹차	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
기타	58.햄버거	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	59.피자	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	
	60.튀긴 음식	⑨	⑧	⑦	⑥	⑤	④	③	②	①	○	

APPENDIX 3. QUESTIONNAIRES FOR STUDENTS

(ENGLISH AND KOREAN)

A Questionnaire for Students

Before you start the questionnaire, please read the following instructions:

1. There are no right or wrong answers to the questionnaire. Everyone's answers are going to be different. The most important thing is that you think about each question based upon how you feel, and answer truthfully.
2. Your answers will be confidential. This means that, although you will write your name on the questionnaire, we will not tell anyone else what you wrote – not your parents, your teachers, or your friends. Thanks again for being part of this important survey!

A few questions about you…

1. Please write the first initial of your first and last name.

First Last

For example:
If your name is Eunjoo Lee

E	L

First Last

2. Are you a boy or girl?

□ Boy □ Girl

3. What grade are you in?

□ grade 4 □ grade 5 □ grade 6

□ grade 7 □ grade 8 □ grade 9

4. What is your date of birth?

Month *Day* *Year*

5. How long have you been living in Canada?

□ less than one year □ 2-3 years □ 4-5 years

□ 6-7 years □ 8-9 years □ 10 or more years

Physical Activity Questionnaire

We are trying to find out about your level of physical activity from ***the last 7 days*** (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember: 1. There are no right and wrong answers — this is not a test.
2. Please answer all the questions as honestly and accurately as you can — this is very important.

---

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one circle per row.)

	No	1-2	3-4	5-6	7 times or more
Skipping	o	o	o	o	o
Rowing/canoeing	o	o	o	o	o
In-line skating	o	o	o	o	o
Tag	o	o	o	o	o
Walking for exercise	o	o	o	o	o
Bicycling	o	o	o	o	o
Jogging or running	o	o	o	o	o
Aerobics	o	o	o	o	o
Swimming	o	o	o	o	o
Baseball, softball	o	o	o	o	o
Dance	o	o	o	o	o
Football	o	o	o	o	o
Badminton	o	o	o	o	o
Skateboarding	o	o	o	o	o
Soccer	o	o	o	o	o
Street hockey	o	o	o	o	o
Volleyball	o	o	o	o	o
Floor hockey	o	o	o	o	o
Basketball	o	o	o	o	o
Ice skating	o	o	o	o	o
Cross-country skiing	o	o	o	o	o
Ice hockey/ringette	o	o	o	o	o
Taekowndo/Judo	o	o	o	o	o
Other:_____	o	o	o	o	o
Other:_____	o	o	o	o	o

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (Check one only.)

I don't do PE---------- O
Hardly ever---------- O
Sometimes ---------- O
Quite often ---------- O
Always---------- O

3. In the last 7 days, what did you do most of the time *at recess*? (Check one only.)

Sat down (talking, reading, doing schoolwork-------- O
Stood around or walked around ---------- O
Ran or played a little bit ---------- O
Ran around and played quite a bit ---------- O
Ran and played hard most of the time ---------- O

4. In the last 7 days, what did you normally do *at lunch* (besides eating lunch)? (Check one only.)

Sat down (talking, reading, doing schoolwork-------- O
Stood around or walked around ---------- O
Ran or played a little bit ---------- O
Ran around and played quite a bit ---------- O
Ran and played hard most of the time ---------- O

5. In the last 7 days, on how many days *right after school*, did you do sports, dance, or play games in which you were very active? (Check one only.)

None ---------- O
time last week ---------- O
2 or 3 times last week ---------- O
4 times last week ---------- O
5 times last week ---------- O

6. In the last 7 days, on how many *evenings* did you do sports, dance, or play games in which you were very active? (Check one only.)

None ---------- O
time last week ---------- O
2 or 3 times last week ---------- O
4 times last week ---------- O
5 times last week ---------- O

7. *On the last weekend*, how many times did you do sports, dance, or play games in which you were very active? (Check one only.)

None ---------- O
1 time ---------- O
2 — 3 times ---------- O
4 — 5 times ---------- O
6 or more times ---------- O

8. Which *one* of the following describes you best for the last 7 days? Read *all five* statements before deciding on the *one* answer that describes you.

A. All or most of my free time was spent doing things that involve little Physical effort .....Ọ

B. I sometimes (1 — 2 times last week) did physical things in my free time (e.g., played sports, went running, swimming, bike riding, did aerobics) .....Ọ

C. I often (3 — 4 times last week) did physical things in my free time .....Ọ

D. I quite often (5 — 6 times last week) did physical things in my free time……... Ọ

E. I very often (7 or more times last week) did physical things in my free time…... Ọ

9. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday.....	O	O	O	O	O
Tuesday.....	O	O	O	O	O
Wednesday.....	O	O	O	O	O
Thursday.....	O	O	O	O	O
Friday.....	O	O	O	O	O
Saturday.....	O	O	O	O	O
Sunday.....	O	O	O	O	O

10. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Check one.)

Yes .....Ọ
No .....Ọ

If Yes, what prevented you? _____

Following are some questions about the things you do sitting or lying down

Think about a normal *school week*, and write down how long you spend doing the following activities before and after school each day.

For example:

	Monday		Tuesday		Wednesday		Thursday		Friday	
	Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes
Watching TV?	1	3 0		0	1	0 0		3 0	3	0 0

	Monday		Tuesday		Wednesday		Thursday		Friday	
	Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes
Watching TV?										
Watching videos / DVDs?										
Using the computer for fun?										
Using the computer for doing homework?										
Doing homework not on the computer?										
Reading for fun?										
Being tutored (private institutes included)?										
Travel (car/bus/train)?										
Doing crafts or hobbies?										
Sitting around (chatting with friend/on the phone/chilling)?										
Playing/practicing a musical instrument?										
Going to church?										

Think about a normal *weekend*, and write down how long you spend doing the following activities.

	Saturday		Sunday	
	Hours	Minutes	Hours	Minutes
Watching TV?				
Watching videos / DVDs?				
Using the computer for fun?				
Using the computer for doing homework?				
Doing homework not on the computer?				
Reading for fun?				
Being tutored (private institutes included)?				
Travel (car/bus/train)?				
Doing crafts or hobbies?				
Sitting around (chatting with friend/on the phone/chilling)?				
Playing/practicing a musical instrument?				
Going to church or Saturday school?				

Many people in Canada have ancestors who came from another country. Families come to Canada at different times. Maybe you and your parents moved to Canada. Maybe your parents came to Canada, when they were kids. Maybe your grandparents' grandparents were the ones who came to Canada.

Write the name(s) of the country (or countries) that your family came from:

_____

When you think about this country....

1. I am most comfortable being with people from	☐ Canada	☐ Korea	☐ Both	☐ Other/ Neither
2. My best friends are from	☐ Canada	☐ Korea	☐ Both	☐ Other/ Neither
3. The people I fit in with best are from	☐ Canada	☐ Korea	☐ Both	☐ Other/ Neither
4. My favorite music is from	☐ Canada	☐ Korea	☐ Both	☐ Other/ Neither
5. My favorite TV shows are from	☐ Canada	☐ Korea	☐ Both	☐ Other/ Neither
6. The holidays I celebrate are from	☐ Canada	☐ Korea	☐ Both	☐ Other/ Neither
7. The food I eat at home is from	☐ Canada	☐ Korea	☐ Both	☐ Other/ Neither
8. The way I do things and the way I think about things are from	☐ Canada	☐ Korea	☐ Both	☐ Other/ Neither

In this part of the questionnaire, many of the items mention games and sports. Games and sports are any physical activity where you move your body for exercise or play. Examples of some games and sports are bowling, bicycling, badminton, climbing, Frisbee, jumping rope, rollerblading, swimming, gymnastics, skateboarding, climbing, and ball games such as baseball, basketball, and soccer. These are examples of only some games and sports – there are lots of others.

Example Question:

Please check only ONE of the four boxes per question that is the MOST appropriate for you.

Really true for me	Sort of true for me				Really true for me	Sort of true for me
☐	☐	Some kids like hot dogs	**BUT**	Other kids don't like hot dogs very much	☐	☐

In the example question, if you really like hot dogs, you should check very left side of the box.

	Really true for me	Sort of true for me				Really true for me	Sort of true for me
1.	☐	☐	Some kids are proud of themselves physically	**BUT**	Other kids don't have much to be proud about physically	☐	☐
2.	☐	☐	Some kids like playing outdoor games and sports	**BUT**	Other kids don't like playing outdoor games and sports	☐	☐
3.	☐	☐	Some kids get told by other kids that they are not very good at games and sports	**BUT**	Other kids are told that they are good at games and sports	☐	☐
4.	☐	☐	Some kids do very well at all kinds of games and sports	**BUT**	Other kids don't feel they are very good when it comes to games and sports	☐	☐
5.	☐	☐	Some kids don't like getting sweaty when they exercise or play hard	**BUT**	Other kids don't mind getting sweaty when they exercise or play hard.	☐	☐
6.	☐	☐	Some kids are happy with how they are and what they can do physically	**BUT**	Other kids are unhappy with how they are and what they can do physically	☐	☐

	Really true for me	Sort of true for me				Really true for me	Sort of true for me
7.	☐	☐	Some kids wish they could be a lot better at games and sports	**BUT**	Other kids feel they are good enough at games and sports	☐	☐
8.	☐	☐	Some kids don't like getting out of breath when they play hard	**BUT**	Other kids don't mind getting out of breath when they play hard	☐	☐
9.	☐	☐	Some kids have parents who play games and sports with them	**BUT**	Other kids have parents who don't play games and sport with them	☐	☐
10.	☐	☐	Some kids feel really tired after they exercise or play hard	**BUT**	Other kids don't feel so tired after they exercise or play hard	☐	☐
11.	☐	☐	Some kids don't feel very confident about themselves physically	**BUT**	Other kids feel really confident about themselves physically	☐	☐
12.	☐	☐	Some kids wish they didn't have to play games and sports	**BUT**	Other kids wish they could play more games and sports	☐	☐
13.	☐	☐	Some kids get teased by other kids when they play games and sport	**BUT**	Other kids don't get teased when they play games and sports	☐	☐
14.	☐	☐	Some kids think they could do well at just about any new game or sport activity they haven't tried before	**BUT**	Other kids are afraid they might not do well at games and sports they haven't ever tried	☐	☐
15.	☐	☐	Some kids like to burn a lot of energy by playing hard	**BUT**	Other kids don't like to burn energy by playing hard	☐	☐
16.	☐	☐	Some kids have parents who really help them to be good at games and sports	**BUT**	Other kids have parents who don't help them very much at games and sports	☐	☐

	Really true for me	Sort of true for me				Really true for me	Sort of true for me
17.	☐	☐	Some kids don't enjoy exercise very much	**BUT**	Other kids enjoy exercise a whole lot	☐	☐
18.	☐	☐	Some kids have a positive feeling about themselves physically	**BUT**	Other kids feel somewhat negative about themselves physically	☐	☐
19.	☐	☐	For some kids, games and sports is their favorite thing	**BUT**	For other kids, games and sports is not their favorite thing	☐	☐
20.	☐	☐	Some kids don't make many friends when they play games and sports	**BUT**	Other kids make a lot of friends when they play games and sports	☐	☐
21.	☐	☐	Some kids feel they are better than others their age at games and sports	**BUT**	Other kids don't feel that they can play as well	☐	☐
22.	☐	☐	Some kids feel bad when they run hard	**BUT**	Other kids feel good when they run hard	☐	☐
23	☐	☐	Some kids think that they will feel really good after they exercise or play hard	**BUT**	Other kids think that they will feel bad after they exercise or play hard	☐	☐
24.	☐	☐	Some kids wish they could feel better about themselves physically	**BUT**	Other kids always seem to feel good about themselves physically	☐	☐
25.	☐	☐	Some kids look forward to playing games and sports	**BUT**	Other kids don't look forward to playing games and sports	☐	☐
26.	☐	☐	Some kids are popular with other kids when they play games and sports	**BUT**	Other kids are not very popular when they play games and sports	☐	☐
27.	☐	☐	In games and sports, some kids usually watch instead of play	**BUT**	Other kids usually play rather than watch	☐	☐

	Really true for me	Sort of true for me				Really true for me	Sort of true for me
28.	☐	☐	Some kids have parents who practice games and sports skills with them a lot	**BUT**	Other kids have parents who hardly ever practice games and sports skills with them	☐	☐
29.	☐	☐	Some kids really don't like to exercise	**BUT**	Other kids do like to exercise	☐	☐
30.	☐	☐	Some kids are very satisfied with themselves physically	**BUT**	Other kids are often dissatisfied with themselves physically	☐	☐
31.	☐	☐	Some kids don't do well at new outdoor games and sports	**BUT**	Other kids are good at new games and sports right away	☐	☐
32.	☐	☐	Some kids are among the last to be chosen for games and sports	**BUT**	Other kids are usually picked first	☐	☐
33.	☐	☐	Some kids have access to sports facilities close to their home	**BUT**	Other kids don't have access to sports facilities close to their home	☐	☐
34.	☐	☐	Some kids have play grounds or parks within 10 minute walking distance from home	**BUT**	Other kids don't have play grounds or parks within 10 minute walking distance from home	☐	☐
35.	☐	☐	Some kids feel their neighbors are safe from strangers	**BUT**	Other kids don't feel that their neighbors are safe from strangers	☐	☐
36.	☐	☐	Some kids feel their neighbors are safe from traffic	**BUT**	Other kids don't feel that their neighbors are safe from traffic	☐	☐
37.	☐	☐	Some kids participate in organized sport clubs such as soccer, taekwondo, or ballet	**BUT**	Other kids don't participate in any organized sport clubs	☐	☐
38.	☐	☐	Some kids walk or ride their bike to school	**BUT**	Other kids travel to school by car, bus, or subway	☐	☐

학생 설문지

설문지를 시작하기 전에 다음 지시사항을 읽어 주세요:

1. 설문지에 맞고 또는틀린 답은 없습니다. 모든 사람들의 응답은 차이가 있을 수 있습니다. 가장 중요한 것은 여러분이 느끼고 생각한 대로 진실되게 각 문항에 대해 응답하는 것 입니다.

2. 여러분의 응답은 비밀이 보장됩니다. 여러분이 설문지에 이름을 쓰지만 다른 누구에게도 여러분의 설문 조사 내용을 공개하지 않습니다. 여러분의 부모님, 선생님, 또는 친구에게도요. 다시한번 설문 조사에 응답해주셔서 감사합니다!

여러분에 대한 몇 가지 질문들…

1. 이름과 성의 영문 이니셜은 무엇입니까?

이름 성

예: 만약 당신의 이름이 Eunjoo Lee 이면

E	L

이름 성

2. 성별은 무엇입니까?

□ 남자 □ 여자

3. 몇 학년 입니까?

□ 4 학년 □ 5 학년 □ 6 학년

□ 중학교 1 학년 □ 중학교 2 학년 □ 중학교 3 학년

4. 생년월일은 언제입니까?

5. 캐나다에 얼마나 오랫동안 살고 있습니까?

□ 1 년 이내 □ 2-3 년 □ 4-5 년

□ 6-7 년 □ 8-9 년 □ 10 년 이상

어린이 신체활동 설문지

우리는 지난 7 일 동안 (지난 주) 당신의 신체 활동의 수준에 대해 알아보려고 합니다. 신체활동은 당신으로 하여금 땀을 나게하고, 당신의 다리가 피곤케 느껴지게 하는 스포츠 또는 춤 등을 말하며, 또는 잡기놀이, 줄넘기, 달리기, 등산 등과 같이 당신으로 하여금 숨차게 하는 게임들을 포함합니다.

기억하세요:

1. 이 설문지에는 맞고 틀린 답이 없습니다. – 이것은 테스트가 아닙니다.
2. 할 수 있는 한 정직하고 정확하게 모든 질문에 답하세요 – 이것은 매우 중요합니다.

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1. 당신의 여유시간의 신체활동: 지난 7 일 (지난 주) 동안 당신은 아래의 활동 중 어떤 것을 했습니까? 만약 했으면 몇 번이나 하였나요? (매 줄마다 한 써클만 표시하세요.)

	안했음	1-2 번	3-4 번	5-6 번	7 번 이상
줄넘기……	o	o	o	o	o
노젓기/커누잉……	o	o	o	o	o
인라인 스케이팅……	o	o	o	o	o
잡기놀이……	o	o	o	o	o
걷기 운동……	o	o	o	o	o
자전거 타기……	o	o	o	o	o
조깅 또는 달리기……	o	o	o	o	o
에어로빅……	o	o	o	o	o
수영……	o	o	o	o	o
야구, 소프트 볼……	o	o	o	o	o
춤……	o	o	o	o	o
미식축구……	o	o	o	o	o
배드민턴……	o	o	o	o	o
스케이드 보오딩……	o	o	o	o	o
축구……	o	o	o	o	o
스트리트 하키……	o	o	o	o	o
배구……	o	o	o	o	o
플로워 하키……	o	o	o	o	o
농구……	o	o	o	o	o
아이스 스케이팅……	o	o	o	o	o
크로스 컨츄리스키……	o	o	o	o	o
아이스 하키……	o	o	o	o	o
태권도, 유도 등 무도……	o	o	o	o	o
그외 다른 활동					
( )……	o	o	o	o	o
( )……	o	o	o	o	o

2. 지난 7 일동안, 체육 시간에, 당신은 얼마나 자주 활동적이었습니까? (열심히 노는 것, 뛰는 것, 점핑, 던지기등) (하나만 체크 하세요.)

활동하지 않음……ㅇ
거의 없음……ㅇ
때때로……ㅇ
매우 자주……ㅇ
항상……ㅇ

3. 지난 7 일 동안, 당신은 학교에서 쉬는 시간에 보통 무엇을 하였습니까? (하나만 체크하세요.)

앉아 있었음 (말함, 독서, 숙제함)……ㅇ
주위에 서 있거나, 주위를 걸어 다님……ㅇ
달렸거나 약간 놀았음 ……ㅇ
주위를 달리거나 꽤 놀았음……ㅇ
달렸거나 대부분의 시간을 열심히 놀았음……ㅇ

4. 지난 7 일 동안 당신은 점심시간에 보통 무엇을 하였습니까 (점심 먹는 것 이외에)? (하나만 체크하세요.)

앉아 있었음 (말함, 독서, 숙제함)……ㅇ
주위에 서 있거나, 주위를 걸어 다님……ㅇ
달렸거나 약간 놀았음 ……ㅇ
주위를 달리거나 꽤 놀았음……ㅇ
달렸거나 대부분의 시간을 열심히 놀았음 ……ㅇ

5. 지난 7 일동안, 학교가 끝난 직후 당신은 얼마나 많은 날 동안 매우 활동적인 스포츠나, 춤 또는 게임을 하였습니까? (하나만 체크하세요.)

없음 ……ㅇ
지난 주에 한번 ……ㅇ
지난 주에 2 번 또는 3 번……ㅇ
지난 주에 4 번……ㅇ
지난 주에 5 번……ㅇ

6. 지난 7 일동안, 당신은 얼마나 많은 저녁시간 동안 매우 활동적인 스포츠나 춤 또는 게임을 하였습니까? (하나만 체크하세요.)

없음 ……ㅇ
지난 주에 한번 ……ㅇ
지난 주에 2 번 또는 3 번……ㅇ
지난 주에 4 번 ……ㅇ
지난 주에 5 번 ……ㅇ

7. 지난 주말 동안, 당신은 얼마나 자주 매우 활동적인 스포츠나, 춤, 또는 게임을 하였습니까? (하나만 체크하세요.)

없음……ㅇ
한번……ㅇ
2-3 번 ……ㅇ
4-5 번 ……ㅇ
6 번 또는 더 이상 ……ㅇ

8. 다음 중 어느 것이 지난 7 일 동안 당신을 가장 잘 묘사합니까? 모든 다섯 문장을 읽은 후에 당신을 가장 잘 묘사하는 문장 하나를 선택하세요.

A. 모든 또는 대부분의 내 자유시간에 나는 거의 신체활동을 하지 않았다 ……ㅇ
B. 나는 때때로 (지난 주 1-2 번) 나의 자유시간에 신체활동을 했다 (예: 스포츠, 달리기, 수영, 자전거 타기, 에어로빅) ……ㅇ
C. 나는 자주 (일주일에 3-4 번) 내 자유시간에 신체적인 활동을 했다 ……ㅇ
D. 나는 꽤 (일주일에 5-6 번) 신체적인 활동을 했다 ……ㅇ
E. 나는 매우 자주 (지난 주에 7 번 또는 그 이상) 신체적인 활동을 했다 ……ㅇ

9. 당신이 얼마나 자주 신체적인 활동을 했는지 지난 주 각각의 날마다 표시하세요. (스포츠, 게임, 춤, 또는 어떤 다른 신체적인 활동)

	없음	매우약간	중간	자주	매우자주
월요일……	ㅇ	ㅇ	ㅇ	ㅇ	ㅇ
화요일……	ㅇ	ㅇ	ㅇ	ㅇ	ㅇ
수요일……	ㅇ	ㅇ	ㅇ	ㅇ	ㅇ
목요일……	ㅇ	ㅇ	ㅇ	ㅇ	ㅇ
금요일……	ㅇ	ㅇ	ㅇ	ㅇ	ㅇ
토요일……	ㅇ	ㅇ	ㅇ	ㅇ	ㅇ
일요일……	ㅇ	ㅇ	ㅇ	ㅇ	ㅇ

10.지난 주 당신은 아팠습니까? 또는 당신의 평상시 신체적인 활동을 못하도록 만든 어떤 이유가 있었습니까? (하나만 체크하세요.)

예……ㅇ
아니오……ㅇ

만약 예이면, 그 이유가 무었입니까? _____

다음 질문은 여러분이 앉아 있거나 누워 있을 때 하는 행동에 대한 것 입니다.

평소 학교에 다니는 주중을 생각해 보세요. 여러분이 학교 가기전이나 갔나 온 후에 아래 보기에 나와 있는 행동들을 얼마나 오래동안 하는지 요일별로 기록해 주세요.

예를 들면:	월요일	화요일	수요일	목요일	금요일
	시간 분	시간 분	시간 분	시간 분	시간 분
TV 시청 시간?	1 3 0	0	1 0 0	3 0	3 0 0

	월요일	화요일	수요일	목요일	금요일
	시간 분	시간 분	시간 분	시간 분	시간 분
TV 시청 시간?					
비디오 또는 DVD 시청 시간?					
재미로 컴퓨터 하는 시간?					
컴퓨터로 숙제하는 시간?					
컴퓨터를 사용하지 않고 숙제하는 시간?					
재미로 책 읽는 시간?					
개인교습 시간 (학원 포함)?					
교통수단 이용 시간 (차/버스/지하철) ?					
만들기 또는 취미생활 하는 시간?					
앉아서 친구들과 이야기 또는 전화하는 시간?					
음악 악기로 연주 또는 연습 하는 시간?					
교회에 가는 시간?					

평소 주말을 생각해 보세요. 여러분이 아래 보기에 나와 있는 행동들을 얼마나 오래동안 하는지 기록해 주세요.

	토요일	일요일
	시간 분	시간 분
TV 시청 시간?		
비디오 또는 DVD 시청 시간?		
재미로 컴퓨터 하는 시간?		
컴퓨터로 숙제하는 시간?		
컴퓨터를 사용하지 않고 숙제하는 시간?		
재미로 책 읽는 시간?		
개인교습 시간 (학원 포함)?		
교통수단 이용 시간 (차/버스/지하철) ?		
만들기 또는 취미생활 하는 시간?		
앉아서 친구들과 이야기 또는 전화하는 시간?		
음악 악기로 연주 또는 연습 하는 시간?		
교회 또는 주말 학교에 가는 시간?		

캐나다에 있는 많은 사람들은 다른 나라에서 온 조상들을 갖고 있습니다. 그들은 각각 다른 시점에 캐나다에 왔는데요. 아마도 여러분과 여러분의 부모님들께서 어렸을 때 캐나다에 왔을 경우도 있고, 혹 할아버지의 할아버지께서 캐나다에 오셨을 경우도 있을 겁니다.

여러분의 가족들이 어느나라에서 왔는지 나라 이름을 쓰십시요:

_____

여러분들이 이 나라를 생각할 때....

1. 나는 _____에서 온 사람들과 가장 편하다	☐ 캐나다	☐ 한국	☐ 캐나다와 한국 모두	☐ 그외 다른 나라
2. 나의 가장 친한 친구들은 _____ 출신이다	☐ 캐나다	☐ 한국	☐ 캐나다와 한국 모두	☐ 그외 다른 나라
3. 내가 가장 잘 어울리는 사람들은 _____ 사람들이다	☐ 캐나다	☐ 한국	☐ 캐나다와 한국 모두	☐ 그외 다른 나라
4. 나의 좋아하는 음악은 _____에서 온 것이다	☐ 캐나다	☐ 한국	☐ 캐나다와 한국 모두	☐ 그외 다른 나라
5. 나의 좋아하는 TV 프로그램들은 _____것이다	☐ 캐나다	☐ 한국	☐ 캐나다와 한국 모두	☐ 그외 다른 나라
6. 내가 기념하는 휴일들은 _____ 것이다	☐ 캐나다	☐ 한국	☐ 캐나다와 한국 모두	☐ 그외 다른 나라
7. 집에서 먹는 음식은 _____음식이다	☐ 캐나다	☐ 한국	☐ 캐나다와 한국 모두	☐ 그외 다른 나라
8. 내가 생각하고 행동하는 방식은 _____방식이다	☐ 캐나다	☐ 한국	☐ 캐나다와 한국 모두	☐ 그외 다른 나라

이 설문지에서는 게임과 스포츠에 대한 질문들이 많이 있습니다. 게임과 스포츠는 운동이나 놀이를 할 때 당신의 몸을 움직이며 하는 신체적 활동입니다. 예를 들면 볼링, 자전거타기, 배드민턴, 등산, 던지기 놀이, 줄넘기, 롤러블레이딩, 수영, 체조, 스케이트보딩 그리고 배구, 농구, 축구 같은 구기종목들이 있습니다. 이것들은 단지 게임과 스포츠의 몇 가지의 예입니다 –이외의 다른 것들도 많이 있습니다.

예 질문: 각 질문의 4개의 박스 중에 하나만 선택하세요.

여러분을 가장 잘 설명하는 왼쪽 또는 오른쪽의 박스 하나만 선택하세요, 질문에 따라 여러분은 어떤 아이들 또는 다른 아이들에 해당될 수도 있습니다.

나와 아주 같음	나와 약간 같음				나와 약간 같음	나와 아주 같음
☐	☐	어떤 아이들은 핫도그를 좋아합니다	**그러나**	다른 아이들은 핫도그를 그다지 좋아하지 않습니다	☐	☐

위 질문에서 여러분이 만약 핫도그를 정말 좋아하면, 제일 왼쪽 박스에 체크를 하셔야 합니다.

	나와 아주 같음	**나와 약간 같음**				**나와 약간 같음**	**나와 아주 같음**
1.	☐	☐	어떤 아이들은 그들 자신을 신체적으로 자랑스러워합니다	**그러나**	다른 아이들은 신체적으로 자랑스러워 하지 않습니다	☐	☐
2.	☐	☐	어떤 아이들은 실외게임이나 밖에서 하는 스포츠를 좋아합니다	**그러나**	다른 아이들은 실외게임이나 밖에서 하는 스포츠를 좋아하지 않습니다	☐	☐
3.	☐	☐	어떤 아이들은 다른 아이들에게 그들이 게임이나 스포츠를 잘 하지 못한다는 이야기를 듣습니다	**그러나**	다른 아이들은 다른 아이들에게 그들이 게임이나 스포츠를 잘한다고 이야기를 듣습니다	☐	☐
4.	☐	☐	어떤 아이들은 모든 종류의 게임이나 스포츠를 매우 잘합니다	**그러나**	다른 아이들은 게임이나 스포츠에서 그들이 매우 잘한다고 느끼지못합니다	☐	☐
5.	☐	☐	어떤 아이들은 그들이 열심히 운동할 때 땀나는 것을 좋아하지 않습니다	**그러나**	다른 아이들은 그들이 열심히 운동할 때 땀나는 것이 괜찮습니다	☐	☐
6.	☐	☐	어떤 아이들은 그들이 신체적으로 어떤 상태인지, 무엇을 할수있는지에 대해 만족해 합니다	**그러나**	다른 아이들은 그들이 신체적으로 어떠한 상태인지, 그들이 무엇을 할 수 있는지에 대해 만족해 하지 않습니다	☐	☐

	나와 아주 같음	나와 약간 같음			나와 약간 같음	나와 아주 같음
7.	☐	☐	어떤 아이들은 그들이 게임과 스포츠에서 훨씬 더 잘할수있기를 바랍니다	**그러나** 다른 아이들은 그들이 게임과 스포츠에서 충분히 잘한다고 생각합니다	☐	☐
8.	☐	☐	어떤 아이들은 그들이 열심히 운동할 때 숨이 차는 것을 좋아하지 않습니다	**그러나** 다른 아이들은 그들이 열심히 운동할 때 숨이 차는 것이 괜찮습니다	☐	☐
9.	☐	☐	어떤 아이들은 부모님들은 게임과 스포츠를 같이합니다.	**그러나** 다른 아이들의 부모님들은 게임과 스포츠를 같이하지 않습니다	☐	☐
10.	☐	☐	어떤 아이들은 그들이 열심히 운동한 후에 매우 피곤해합니다	**그러나** 다른 아이들은 그들이 열심히 운동한 후에 많이 피곤해하지 않습니다	☐	☐
11.	☐	☐	어떤 아이들은 그들 자신에 대해 신체적으로 자신감을 느끼지못합니다	**그러나** 다른 아이들은 그들 자신에 대해 신체적으로 자신감을 느낍니다	☐	☐
12.	☐	☐	어떤 아이들은 그들이 게임과 스포츠를 하고 싶어하지 않습니다	**그러나** 다른 아이들은 그들이 더 많은 게임과 스포츠를 하고 싶어합니다	☐	☐
13.	☐	☐	어떤 아이들은 그들이 게임과 스포츠를 할 때 다른 아이들에게 놀림을 받습니다	**그러나** 다른 아이들은 그들이 게임과 스포츠를 할 때 다른 아이들에게 놀림을 받지 않습니다	☐	☐
14.	☐	☐	어떤 아이들은 그들이 처음으로 해보는 게임이나 스포츠활동에서도 잘할수있다고 생각합니다	**그러나** 다른 아이들은 그들이 처음으로 해보는 게임이나 스포츠활동에서 잘하지못할까봐 두려워합니다	☐	☐
15.	☐	☐	어떤 아이들은 열심히 플레이를 하면서 많은 에너지를 쓰기를 좋아합니다	**그러나** 다른 아이들은 열심히 플레이를 하면서 많은 에너지를 쓰기를 좋아하지 않습니다	☐	☐
16.	☐	☐	어떤 아이들의 부모님들은 그들이 게임과 스포츠를 잘 할 수 있도록 도와주십니다.	**그러나** 다른 아이들의 부모님들은 그들이 게임과 스포츠에 하는데 많이 도와 주지 않습니다.	☐	☐

	나와 아주 같음	나와 약간 같음				나와 약간 같음	나와 아주 같음
17.	☐	☐	어떤 아이들은 운동 연습을 그다지 즐기지 않습니다	**그러나**	다른 아이들은 운동 연습을 많이 즐깁니다	☐	☐
18.	☐	☐	어떤 아이들은 신체적으로 그들 자신에 대해 긍정적인 느낌을 가지고 있습니다	**그러나**	몇 아이들은 신체적으로 그들 자신에 대해 약간의 부정적인 느낌을 가지고 있습니다	☐	☐
19.	☐	☐	어떤 아이들은 게임과 스포츠를 가장 좋아합니다	**그러나**	다른 아이들은 게임과 스포츠를 가장 좋아하지는 않습니다	☐	☐
20.	☐	☐	어떤 아이들은 그들이 게임이나 스포츠를 할 때 많은 친구를 사귀지 않습니다	**그러나**	몇 아이들은 그들이 게임이나 스포츠를 할 때 많은 친구를 사귑니다	☐	☐
21.	☐	☐	어떤 아이들은 자신이 같은 나이인 친구들보다 게임과 스포츠를 더 잘한다고 생각합니다	**그러나**	다른 아이들은 같은 나이인 친구들보다는 게임과 스포츠를 잘 못한다고 생각합니다	☐	☐
22.	☐	☐	어떤 아이들은 그들이 열심히 달릴 때 기분이 좋지 않습니다	**그러나**	다른 아이들은 그들이 열심히 달릴 때 기분이 좋습니다	☐	☐
23	☐	☐	어떤 아이들은 그들이 열심히 운동한 후에 정말 기분이 좋을거라고 생각합니다	**그러나**	다른 아이들은 그들이 열심히 운동한 후에 기분이 나쁠거라고 생각합니다	☐	☐
24.	☐	☐	어떤 아이들은 그들이 신체적으로 그들 자신에 대해서 좀 더 자신감을 갖기 원합니다.	**그러나**	다른 아이들은 신체적으로 그들 자신에 대해서 항상 자신감이 있는 것 처럼 보입니다.	☐	☐
25.	☐	☐	어떤 아이들은 게임이나 스포츠를 하는 것을 기대합니다	**그러나**	다른 아이들은 게임이나 스포츠를 하는 것을 기대하지 않습니다	☐	☐
26.	☐	☐	어떤 아이들은 게임이나 스포츠를 할 때 다른 아이들에게 인기가 많습니다	**그러나**	어떤 아이들은 게임이나 스포츠를 할 때 다른 아이들에게 인기가 별로 없습니다	☐	☐
27.	☐	☐	어떤 아이들을 게임이나 스포츠 하는 것보다는 주로 보고 있습니다	**그러나**	다른 아이들은 게임이나 스포츠를 보고 있기보다는 플레이를 합니다	☐	☐

	나와 아주 같음	나와 약간 같음				나와 약간 같음	나와 아주 같음
28.	☐	☐	어떤 아이들의 부모님들은 그들과 함께 게임이나 스포츠 기술을 연습 합니다.	**그러나**	다른 아이들의 부모님들은 그들과 함께 게임이나 스포츠 기술을 연습 하지 않습니다	☐	☐
29.	☐	☐	어떤 아이들은 정말로 운동하기를 좋아하지 않습니다	**그러나**	다른 아이들은 운동하기를 좋아합니다	☐	☐
30.	☐	☐	어떤 아이들은 신체적으로 그들 자신을 매우 만족스러워합니다	**그러나**	몇 아이들은 신체적으로 그들 자신을 불만족스러워합니다	☐	☐
31.	☐	☐	어떤 아이들은 새로운 실외 게임이나 스포츠를 잘 하지 못합니다	**그러나**	다른 아이들은 새로운 실외 게임이나 스포츠를 잘 합니다	☐	☐
32.	☐	☐	어떤 아이들은 게임이나 스포츠를 할 때 가장 나중에 뽑힙니다.	**그러나**	다른 아이들은 게임이나 스포츠를 할 때 보통 첫번째로 뽑힙니다	☐	☐
33.	☐	☐	어떤 아이들은 집 근처에 갈 수 있는 스포츠 센터가 있습니다.	**그러나**	다른 아이들은 집 근처에 갈 수 있는 스포츠 센터가 없습니다.	☐	☐
34.	☐	☐	어떤 아이들은 10 분 안에 걸어서 갈 수 있는 놀이터나 공원이 있습니다.	**그러나**	다른 아이들은 10 분 안에 걸어서 갈 수 있는 놀이터나 공원이 없습니다.	☐	☐
35.	☐	☐	어떤 아이들은 그들의 동네가 낯선 사람들로부터 안전하다고 생각합니다.	**그러나**	다른 아이들은 그들의 동네가 낯선 사람들로부터 안전하다고 생각하지 않습니다.	☐	☐
36.	☐	☐	어떤 아이들은 그들의 동네 주위에 교통이 안전하다고 생각합니다.	**그러나**	다른 아이들은 그들의 동네가 주위에 교통이 안전하다고 생각하지 않습니다.	☐	☐
37.	☐	☐	어떤 아이들은 축구, 태권도, 발레등을 배우러 스포츠 클럽이나 학원에 다닙니다.	**그러나**	다른 아이들은 어떠한 스포츠 클럽이나 학원도 다니지 않습니다.	☐	☐
38.	☐	☐	어떤 아이들은 학교에 걸어 다니거나 자전거를 타고 다닙니다.	**그러나**	다른 아이들은 학교에 차, 버스 또는 지하철을 타고 다닙니다.	☐	☐