THE EFFECTIVENESS OF BEHAVIORAL INTERVENTION PROGRAMS UTILIZING SELF-CONTROL, SELF-EFFICACY, AND IMPLEMENTATION INTENTION FOR MODIFYING PSYCHOLOGICAL VARIABLES, EATING BEHAVIOR AND PHYSICAL ACTIVITY, AND BMI IN ELEMENTARY SCHOOLCHILDREN, BANGKOK

A DISSERTATION

BY

PATCHAREE DUANGCHAN

Presented in Partial Fulfillment of the Requirements for the
Doctor of Philosophy Degree in Applied Behavioral Science Research
at Srinakharinwirot University
May 2010

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Patcharee Duangchan

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AN ABSTRACT

BY

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Patcharee Duangchan. (2010). *The Effectiveness of Behavioral Intervention Programs Utilizing Self-control, Self-efficacy, and Implementation Intention for Modifying Psychological Variables, Eating Behavior and Physical Activity, and BMI in Elementary Schoolchildren, Bangkok*. Dissertation, Ph.D. (Applied Behavioral Science Research). Bangkok: Graduate School, Srinakharinwirot University. Advisor committee: Assoc. Prof. Dr. Dusadee Yolao, Prof. Ann Macaskill, Asst. Prof. Dr. Ungsinun Intarakamhang, Assoc. Prof. Chittiwat Suprasonsin.

The aims of this experimental research were to 1) examine the effectiveness of the individual Self-control, Self-efficacy, and Implementation Intention (SSII) Healthy Eating Intervention Program and SSII-Physical Activity Intervention Program in developing self-efficacy, self-control, healthy eating behavior, physical activity, and thereby combating obesity-related Type 2 diabetes; 2) examine the effectiveness of the SSII-Healthy Eating Intervention and Physical Activity intervention programs at the end of intervention implementation in terms of ordering effects and combined effects; and 3) provide a test of the PBC in predicting actual behavior change in relation to healthy eating behavior and physical activity. The sample of this study was 41 students, aged 9-11 years, who met the inclusion criteria and consented to participate in the study; which 21 of those were studying in Sawadeewittaya School (School A), and other 20 were studying in Watditsahongsaram School (School B). The study measures included knowledge about obesity-related Type 2 diabetes, healthy eating behavior, healthy eating self-efficacy, healthy eating self-control, physical activity, physical activity self-efficacy, physical activity self-control, and affective beliefs and readiness to change behavior. The study interventions were the SSII-Healthy Eating Intervention Program, and the SSII-Physical Activity Intervention Program. Each of the two interventions was created using the self-efficacy, self-control, and implementation intention principles. Each school had the interventions implemented in a different order. The measurements of dependent variables were conducted on 3 times: baseline, after the first intervention, after the combined interventions. Data analysis was performed using SPSS for Windows. The statistical tests were descriptive statistics, one-way repeated measures ANOVA, one-way multivariate analysis of covariance (MANCOVA), and multiple regression.

According to research hypotheses, results demonstrated that:

1. After the individual SSII-Healthy Eating Intervention Program; mean scores of knowledge about obesity-related Type 2 diabetes, healthy eating self-efficacy, healthy

eating self-control, and healthy eating behavior significantly increased from the baseline and BMI significantly decreased.

2. After the individual SSII-physical activity Intervention Program; mean score of physical activity significantly increased from the baseline whereas BMI showed a significant decrease.

3. In School A, the combined effects of the SSII-Healthy Eating and Physical Activity Intervention Programs on two dependent variables: knowledge about obesity-related Type 2 diabetes, and healthy eating behavior; were greater than that of the individual SSII-Healthy Eating Intervention. Whereas in School B, the combined effects of the SSII-Physical Activity and Healthy Eating Intervention Programs on just knowledge about obesity-related Type 2 diabetes were greater than that of the individual SSII-Physical Activity Intervention.

4. There were significant differences in dependent variables associated with school after adjustment for differences in knowledge, physical activity self-efficacy, and BMI prior to the intervention. Univariate analysis showed that after the combined intervention programs, there were differences in healthy eating self-efficacy and physical activity self-control between the School A and the School B, where the School A provided higher healthy eating self-efficacy and less physical activity self-control than the School B.

5. Reduction in BMI was not significantly correlated with increases in both self-efficacy and self-control in relation to healthy eating behavior and physical activity. Regarding an increase in healthy eating behavior, it was not significantly predicted by increases in self-efficacy and self-control, but was significantly predicted by a decrease in intention to perform healthy eating behavior. In turn, increase in intention to perform healthy eating behavior was significantly predicted by increase in healthy eating self-efficacy. In contrast, increase in physical activity was significantly predicted by increases in physical activity self-efficacy and physical activity self-control, with only physical activity self-control was a significant predictor.

. (2553). *ประสิทธิผลของโปรแกรมปรับเปลี่ยนพฤติกรรมที่ประยุกต์ใช้แนวคิดการควบคุมตนเอง การรับรู้ความสามารถของตนเอง และการแปลงเจตนาสู่การกระทำ เพื่อปรับเปลี่ยนตัวแปรทางจิต พฤติกรรมการบริโภคอาหารและการเคลื่อนไหวออกกำลัง และดัชนีมวลกาย ในเด็กนักเรียนชั้นประถมศึกษา กรุงเทพมหานคร.* . . ( ). :

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CHAPTER 1

INTRODUCTION

Background

Childhood obesity is an epidemic in both developed and developing countries. Some countries in Asia showed an increase in obesity rate among children; for example, China 11.3%, Malaysia 8.4%, Japan, 21.7% in boys and 17.4% in girls, and Singapore 19.4% in boys and 14.6% in girls. In Thailand, results from a nation-wide survey of 47,389 grade 6 students from 268 elementary schools in the urban settings in 2005 found that 16.7% of students are overweight and obese (Ladda Mo-suwan. 2008).

Obesity is the most important risk factor for the development of Type 2 diabetes in children which is now a major health problem globally. The increasing prevalence of overweight or obesity parallels the prevalence of Type 2 diabetes (Hannon, Rao, & Arslanian. 2005: 473-480). In the United States, Type 2 diabetes was diagnosed in 4% of children in 1990 but 8-45% of children in ethnically diverse patient populations in 2001, of whom 85% were obese at the time of diagnosis. In Japan, the incidence of Type 2 diabetes among elementary school children in Tokyo increased 10-fold from 0.2 per 100,000 in 1976 to 2 per 100,000 in 1995. In junior high school children, the incidence of Type 2 diabetes increased from 7.2 per 100,000 in 1976-1980 to 13.9 per 100,000 in 1991-1995. In addition, it was shown that 80% of the children with Type 2 diabetes were obese (Pinhas-Hamiel & Zeitler. 2005: 693-700; Erhardt & Molnár. 2004: 155; Lieberman. 2003: 348). A similar increase in the number of children and youths with Type 2 diabetes has been observed in many parts of the world, including America, Asian-pacific region, Europe, and Middle East (Pinhas-Hamiel & Zeitler. 2005: 693-700; Botero & Wolfsdorf. 2005: 281).

In Thailand, the prevalence of Type 2 diabetes has also increased. A report from Siriraj Hospital, Bangkok, revealed that the proportion of new cases of Type 2 diabetes in newborn children up to 14 years of age rose from 5% in 1987-1996 to 17.9% in 1997-1999, indicating an eight fold increase. The mean age of diabetic patients was 11.6 ± 2.1 years and mean BMI was 29 $\pm$ 6.1 kg/m^2. The increasing numbers of Type 2 diabetes in children parallels the rise in the prevalence of childhood obesity (Pat Mahachoklertwattana. 2006: 771-773; Pinhas-Hamiel & Zeitler. 2005: 694). Results from a multi-center, hospital-based study, determining prevalence of Type 2 diabetes in Thai diabetic patients who were

diagnosed when under 18 years showed that 18.4% of the diabetic patients had Type 2 diabetes.

Similarly, data at Ramathibodi Hospital, Bangkok, revealed only 4 cases of Type 2 diabetes diagnosed during the 10-year period of 1990 to 1999 but 23 cases were found between 2000 and 2005, a 6-year period. The number had increased comparably by about ten fold. These data demonstrated that Type 2 diabetes accounted for 12% of childhood diabetes during 1990-1999. This number increased to 40% during 2000-2005, indicating a trend towards an increased frequency of Type 2 diabetes in children and adolescents in recent years. For type 1 diabetes, in the same period, the numbers were also increased but only by about two fold (Pat Mahachoklertwattana. 2006: 771-773). In addition, during 2000-2005, 100 moderately to severely obese children, aged 8-18 years, were screened for Type 2 diabetes using the oral glucose tolerance test. Results showed that 20% had impaired glucose tolerance and 3% had asymptomatic diabetes (Pat Mahachoklertwattana. 2006: 771-773).

Increasing rates of obesity and Type 2 diabetes among children and adolescents will have considerable long-term implications for the affected individuals. The results of the 5th National Nutrition Survey in Thailand in 2003-2004 found high blood pressure (> 140/90 mmHg) and dyslipidemia, which is closely related to overweight or obesity in youths aged from 15-19 years old (Sangsom Sinawat. 2008: 17-18). If the prevalence of childhood obesity is continuously increasing, Type 2 diabetes and its associated complications will emerge at an earlier age. Complications of Type 2 diabetes include progressive neuropathy, retinopathy leading to blindness, nephropathy leading to chronic renal failure, and atherosclerotic cardiovascular disease leading to stroke and myocardial infraction. In addition to their impact on physical well-being, the economic, social, and psychological impact of these conditions is enormous and not only on individuals but also their families (Lieberman. 2003: 348; Hannon et al. 2005: 473-480; Pat Mahachoklertwattana. 2006: 771-773). Therefore, prevention of childhood obesity and Type 2 diabetes is essential because earlier prevention leads to earlier reduction of related mortality and morbidity of the Thai population in the future.

Factors known to be associated with the high prevalence of Type 2 diabetes include diets high in fat and low in dietary fiber intake, low level of physical activity, genetic predisposition, and obesity (Saksvig, Gittelsohn, Harris, Hanley, Valente, & Zinman. 2005). It has been suggested, therefore, that prevention of childhood obesity and Type 2 diabetes should include diet, physical activity, and behavioral approaches which are more likely to be

effective if parent or family members are included (Grey et al. 2004: 10). The American Diabetes Association (ADA) has recommended that primary prevention of Type 2 diabetes in youth needs to be a focus for families, schools, and communities, with a special emphasis on at risk youth (Mcknight-Menci. 2005: 100).

The study 1 (Patcharee Duangchan. 2007) using the Theory of Planned Behavior (TPB) (Ajzen, 1991, 2002) to determine the factors that may predict engagement with physical activity and healthy eating behavior and obesity in fourth grade schoolchildren, aged 9-11 years, in four demonstration schools, Bangkok, showed a high prevalence of being at risk of obesity and obesity (16.45% and 13.93% respectively) in the population. The TPB proposes that the likelihood of someone engaging in a particular behavior can be predicted by their intention to perform that behavior. Intention, in turn, is predicted by 3 independent variables namely attitude, subjective norm, and perceived behavioral control (PBC). The TPB has proved useful in explaining or predicting a variety of health-related behaviors including diet and exercise. Results from the above study also support the applicability of the theory, where attitude, subjective norm and PBC of physical activity significantly predicted intention to perform physical activity, explaining 70.2% of the variance. For healthy eating behavior, the TPB explained 69.1% of variance in intention where subjective norm and PBC were significant predictors. In addition, the results demonstrated that intention and PBC together accounted for 22.3% and 23.4% of variance in physical activity and healthy eating behavior respectively where, however, only PBC was a significant predictor of both physical activity and healthy eating behavior. It is likely that for the reduction of risk factors of Type 2 diabetes among schoolchildren, there is a need for an appropriate intervention program, particularly to enhance PBC and thereby help to prevent chronic disease in the future.

As Ajzen (2002) suggested, there were two components of PBC namely self-efficacy and controllability which were also measured in the study. Thus, to verify the predictability of PBC in actual behavioral change, it is logical that any intervention program aiming to enhance PBC will also enhance self-efficacy and controllability related to the targeted behaviors. Self-efficacy is defined as individuals' beliefs about their capabilities to perform particular behaviors in any given set of circumstances (Morrison & Bennett, 2006). Self-efficacy beliefs determine how people feel, think, motivate themselves and behave which greatly influences what they actually achieve in terms of diet or exercise for example. (Bandura. 1994; Bandura. 1997: 37). Previous studies (Thidarat chotik-Anuchid. 2005; Holcomb et al. 1998; Saksvig et al. 2005; Grey et al. 2004) developed demonstrably

effective intervention programs aimed to promote diet and physical activity using four main sources of self-efficacy (Bandura. 1977).

Self-control is also considered to be a component in the behavioral management of obesity (Craighead, Kazdin, & Mahoney. 1976; Kazdin. 2001). Generally, self-control refers to those behaviors that people intentionally undertake to achieve selected outcomes (Kazdin. 2001). Self-control can refer to the ability to change one's inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them (Tangney, Baumeister, & Boone. 2004). Research has suggested that there are large individual differences in levels of self-control (Tangney et al. 2004). It is likely that people with high self-control will perform better in diet and exercise interventions. Previous studies support the effectiveness of self-control in diet and exercise using different techniques of self-control (Trevino et al. 1998; Teufel & Ritenbaugh. 1998; Saksvig et al. 2005; Cotton et al. 2006; Bernet et al. 2002).

As it has been shown in the study 1 (Patcharee Duangchan. 2007) that the TPB constructs can only partly explain variability in physical activity and healthy eating behavior, whereas intention did not significantly predict such behaviors, it is logical that there could be factors moderating the intention-behavior relation such as habits, past behaviors, ability, and unexpected situations (de Nooijer, de Vet, Brug, & de Vries. 2006: 25; Sheeran. 2002: 1-36; Sheeran & Orbell. 2000: 283-289). Implementation intention (Gollwitzer. 1993, 1999) has been shown to enhance the prediction of behavior provided by the TPB, to reduce the impact of habit on future behavior (Sheeran & Orbell. 2000: 283-289, to enhance people's ability to self-regulate their behavior (Webb & sheeran. 2003: 279-286), and to strengthen the intention-behavior relationship (Latimer, Martin Ginis, & Arbour. 2006: 274; Milne, Orbell, & Sheeran. 2002; Prestwich, Lawton, & Conner. 2003). In addition, as suggested by meta-analyses, implementation intention is effective in promoting goal achievement with a medium to large effect size ($d = 0.65$) across a wide range of health behaviors, across a range of samples and measures of behaviors (Webb & Sheeran. 2003: 280; Sheeran, Aubrey, & Kellett. 2007: 854). Therefore, it is likely that implementation intention may be beneficial for increasing physical activity and healthy eating behavior among schoolchildren given the weak intention-behavior relationships.

In Thailand, there has been a behavioral program developed for adolescents aged 12-16 years attending a diabetic clinic (Thidarat chotik-Anuchid. 2005), but there has yet to be a program specifically for schoolchildren using self-efficacy, self-control, and implementation intention. The aim of this study was to develop a behavioral intervention

program to reduce risk factors of obesity-related Type 2 diabetes in schoolchildren, aiming to enhance self-efficacy and self-control in relation to healthy eating behavior and physical activity, which are both components of the PBC, and thereby improve healthy eating behavior and physical activity. The effectiveness of these intervention programs was also evaluated.

Objectives

1. To examine the effectiveness of the individual Self-control, Self-efficacy, and Implementation Intention (SSII) Healthy Eating Intervention Program and SSII-Physical Activity Intervention Program in developing self-efficacy, self-control, healthy eating behavior, physical activity, and thereby combating obesity-related Type 2 diabetes.
2. To examine the effectiveness of the SSII-Healthy Eating Intervention and Physical Activity intervention programs at the end of intervention implementation in terms of ordering effect and combined effects.
3. To provide a test of the PBC in predicting actual behavior change in relation to healthy eating behavior and physical activity.

Research questions

1. Will the SSII-Healthy Eating Intervention Program improve knowledge, self-efficacy, self-control and healthy eating and thereby help to prevent childhood obesity-related Type 2 diabetes?
2. Will the SSII-Healthy Eating Intervention Program reduce BMI?
3. Will the SSII-Physical Activity Intervention Program improve knowledge, self-efficacy, self-control and physical activity and thereby help to prevent obesity- related Type 2 diabetes?
4. Will the SSII-Physical Activity Intervention Program reduce BMI?
5. Will the combined SSII-Healthy Eating Intervention and Physical Activity Intervention Programs have a greater impact than the individual programs delivered on their own? This will be measured by reduction in BMI?
6. Will School A, who is first implemented with SSII-Healthy Eating Intervention, provide less BMI than School B, who is first implemented with SSII-Physical Activity Intervention.

7. More generally, how good is the PBC at predicting actual behavior change in relation to healthy eating behavior and physical activity?

The expected outcomes, impacts and benefits of the research

This study would yield information not only about the effectiveness of the individual SSII-Healthy Eating and Physical activity intervention but also about the combined effect of the two interventions and any effects related to the order in which the interventions are implemented. This information would be useful for schools, families, health professionals, and related organizations to reduce/modify risk factors of obesity-related Type 2 diabetes in schoolchildren.

Scope of the study

Population and sample

The population of this study was fourth to fifth grade obese schoolchildren in elementary schools, Bangkok.

The sample of this study was 20 obese students selected from each of the two elementary schools, Bangkok: Sawadeewittaya School and Watditsahongsaram School, providing a pooled sample of 40 students.

The inclusion criteria were as follows, children:

1. Aged between 9-11 years;
2. Defined as obese by a BMI-for-age $\geq$ 85th percentile (CDC. 2005);
3. Assent to participate in the study and their parent or guardians consent to their participation in the study;
4. Have not experienced in participating any intervention programs related to obesity;
5. Have low or inappropriate exiting levels of healthy eating behavior and physical activity.

Study variables

There were 3 types of study variables including psychological, behavioral, and anthropometric variables which are presented below.

1. Psychological variables:
   1.1 Knowledge about obesity and Type 2 diabetes
   1.2 Healthy eating self-efficacy
   1.3 Physical activity self-efficacy
   1.4 Healthy eating self-control
   1.5 Physical activity self-control
   1.6 Affective beliefs and readiness to change behaviors
2. Behavioral variables
   2.1 Healthy eating behavior
   2.2 Physical activity
3. Anthropometric variables:
   3.1 BMI

Definition

Specific definition

1. The SSII-Healthy Eating Intervention Program

The SSII-Healthy Eating Intervention Program is defined as learning activities aiming to enhance self-efficacy and self-control related to *healthy eating behavior*, and thereby to enhance healthy eating behavior. This intervention is created using the self-efficacy, self-control, and implementation intention principles, and informed by a review of the literature. The intervention consists of six weekly, 90-minute activity lessons in food skills and knowledge. The lessons will incorporate traditional learning styles (lecture) and practical experiences, and use interactive and cooperative learning techniques such as games and cooking.

2. The SSII-Physical Activity Intervention Program

The SSII-Physical Activity Intervention Program is defined as learning activities aiming to enhance self-efficacy and self-control related to *physical activity*, and thereby to enhance physical activity. This intervention is created using self-efficacy, self-control, and implementation intention principles, and informed by a review of the literature. The intervention consists of six weekly, 90-minute activity lessons in exercise and physical activity skills and knowledge. The lessons will incorporate traditional learning styles (lecture)

and practical experiences, and use interactive and cooperative learning techniques such as games.

3. Effectiveness of behavioral intervention programs

Effectiveness of behavioral intervention programs is defined as positive changes of dependent variables of the present study including psychosocial and behavioral variables, and anthropometric variables after the implementation of SSII-Healthy Eating Intervention and Physical Activity Intervention Programs. This will be measured by questionnaires and scientific instruments.

4. Obesity-related Type 2 diabetes

Obesity-related Type 2 diabetes is defined as Type 2 diabetes for which obesity is a significant risk factor. The risk of type 2 diabetes increases with the degree and duration of obesity.

5. Type 2 diabetes

Type 2 diabetes or diabetes mellitus Type 2 is one of the two major types of diabetes. It is defined as a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. The World Health Organization definition of Type 2 diabetes is for a single raised glucose reading with symptoms, otherwise raised values on two occasions, of either: fasting plasma glucose $\geq$ 126 mg/dl; or with a glucose tolerance test, two hours after the oral dose a plasma glucose $\geq$ 200 mg/dl. Type 2 diabetes can often be prevented by proper nutrition and regular exercise (Wikipedia. 2009).

Operational definition

Psychological variables

1. Knowledge about obesity-related Type 2 diabetes

Knowledge is defined as students' capabilities to recognize and understand information about risk factors, symptoms, prevention and treatment, and health consequences of obesity and Type 2 diabetes learned from the intervention program. To assess their knowledge, the participants will be asked to respond to a true-false type test containing questions corresponding to the knowledge definition. The test is adapted from

previous research (Kullanit Sakdisupa. 2004; Thidarat chotik-Anuchid. 2005). Each item will be scored 1 for the right answer, and scored 0 for the wrong answer. The correct items will be randomized to prevent response set. Scores will be summated for the overall knowledge, with higher scores indicating greater knowledge of obesity and Type 2 diabetes.

2. Perceived Behavioral Control (PBC)

PBC is a variable in the TPB. In this study, PBC is defined as self-efficacy and self-control related to the targeted behaviors which are separately defined as follows.

2.1 Healthy eating self-efficacy

Healthy eating self-efficacy is defined as students' beliefs about their capabilities to perform specific behaviors corresponding to the definition of healthy eating behavior in any given set of circumstances. To assess the healthy eating self-efficacy, the participants will be asked to rate how confident/sure they are that they could eat fruit and vegetables, avoid fast food, fatty food and snacks, and avoid sugary foods and sugar-sweetened soft drinks. This follows established procedure in the research literature (Parcel, Edmundson, Perry, Feldman, O'Hara-Tompkins, Nader, et al. 1995: 26; Sallis, Pinski, Grossman, Patterson, & Nader. 1988: 285-6). Reponses will be made on a 5-point Likert-type scale from 'very sure I could not do it' (score = 1) to 'very sure I could do it' (score = 5). Scores will be summated for the overall healthy eating self-efficacy, with higher scores indicating greater healthy eating self-efficacy.

2.2 Physical activity self-efficacy

Physical activity self-efficacy is defined as students' beliefs about their capabilities to perform specific behaviors corresponding to the definition of physical activity in any given set of circumstances. To assess the healthy eating self-efficacy, the participants will be asked to rate how confident/sure there are that they could exercise daily for at least 30 minutes, be physically active in any free time to the extent that it causes sweating, and avoid inactivity such as TV viewing. This follows established procedure in the research literature (Parcel et al. 1995: 26; Sallis et al. 1988: 285-6). Reponses will be made on a 5-point Likert-type scale from 'very sure I could not do it' (score = 1) to 'very sure I could do it' (score = 5). Scores will be summated for the overall physical activity self-efficacy, with higher scores indicating greater physical activity self-efficacy.

2.3 Healthy eating self-control

Healthy eating self-control is defined as students' beliefs about their control over the specific behaviors corresponding to the definition of healthy eating behavior, and their ability to change their unhealthy eating behavior to healthy eating behavior. To assess the healthy eating self-control, the participants will be asked to rate 1) how much they believe that they can control themselves to eat fruit and vegetables, avoid fast food, fatty food and snacks, and avoid sugary foods and sugar-sweetened soft drinks, and 2) how much each of specific eating behaviors reflects their current behavior. This follows established procedure in the research literature (Ajzen. 2002; Tangney et al. 2004; Brandon, Oescher, & Loftin. 1990). Responses will be made on a 5-point Likert-type scale ranging from 'strongly disagree' (score = 1) to 'strongly agree' (score = 5). Scores will be summated for the overall healthy eating self-control, with higher scores indicating greater healthy eating self-control.

2.4 Physical activity self-control

Physical activity self-control is defined as students' beliefs about their control over the specific behaviors corresponding to the definition of physical activity, and their ability to change their physical inactivity to physical activity. To assess the physical activity self-control, the participants will be asked to rate 1) how much they believe that they can control themselves to exercise daily for at least 30 minutes, physically active in any free time which causes sweating, and avoid inactivity such as TV viewing, and 2) how much each of specific physical activity reflects their current behavior. This follows established procedure in the research literature (Ajzen. 2002; Tangney et al. 2004; Brandon et al. 1990). Responses will be made on a 5-point Likert-type scale ranging from 'strongly disagree' (score = 1) to 'strongly agree' (score = 5). Scores will be summated for the overall physical activity self-control, with higher scores indicating greater physical activity self-control.

3. Affective beliefs and readiness to change behavior

Affective beliefs and readiness to change behavior are defined as 1) students' feelings, such as happiness and enjoyment about diet, physical activity, and body weight; 2) students' motivation to participate in the intervention or readiness to change their behaviors. To assess affective beliefs and readiness to change, the participants will be asked to

respond to items relating to their affective beliefs and readiness to change their eating behavior and physical activity. The items used are based on the elicitation study with the schoolchildren aged 9-11 yeas as part of Study 1 and the recommendation from previous literature (Ashley. 2008; Conner & Spark. 2005; Daley, Copeland, Wright, & Wales. 2005).

Behavioral variables

4. Healthy eating behavior

Healthy eating behavior is defined as students' eating-related actions which are detailed as follows: 1) eat fruit and vegetables; 2) eat whole grain/cereal products; 3) avoid fast foods, fatty foods, and snacks, 4) avoid sugary foods and sugar-sweetened drinks; 5) eat well-balanced diet according to the 5 food groups. To assess eating behavior, an 11-item questionnaire was used covering all food groups as defined. The items were specially designed for Study 1 following the guidelines provided by Ajzen (2002) and Francis et al. (2004), piloted, and used with schoolchildren aged 9-11 years. Each food was rated on the frequency it was eaten, (everyday = 1; sometimes = 2, never = 3). The participants were asked, "Over the past week, how often did you eat.....?" Some items were reverse scored. To compute an overall measure of healthy eating behavior, each score of the 11 food groups was summated, with higher scores indicating greater eating behavior.

5. Physical activity

The physical activity is defined as any individuals' activities which are detailed as follows: 1) daily exercises for at least 30 minutes; 2) physically active in any free time to the extent that it causes sweating; 3) avoid inactivity such as TV viewing. To assess physical activity, an 8-item questionnaire covering the three groups of activities was used. The items were specially designed for Study 1 following the guidelines provided by Ajzen (2002) and Francis et al. (2004), piloted, and used with schoolchildren aged 9-11 years. Frequency of occurrence was rated on a scale of 0 (never) to 7 (everyday). E.g., "Over the past week, how many days per week did you.....?" An additional 16 sporting activities were also added in the questionnaire. E.g., "Over the past week, did you……?". To respond, participants ticked the activities they did. Scores were summated to give an overall measure of physical activity.

Anthropometric variables

6. BMI

BMI is defined as weight (kilograms) divided by height (meters) squared. BMI percentile for age and sex, age 2-20 years, will be derived using the Center for Disease Control growth charts (CDC. 2006). Regarding the CDC charts, obesity is defined as a measured BMI $\geq 95^{th}$ percentile, and at risk of obesity is defined as $85^{th} \leq$ BMI < 95^{th} percentile.

Conceptual framework of the study

The present study was generated based on results of the study 1 (Patcharee Duangchan. 2007) which used the TPB (Ajzen, 1991, 2002) to determine the factors that may predict engagement with physical activity and healthy eating behavior and obesity in fourth grade schoolchildren, aged 9-11 years, in four demonstration schools, Bangkok. The TPB proposes that the likelihood of someone engaging in a particular behavior can be predicted by their intention to perform that behavior. Intention, in turn, is predicted by 3 independent variables namely attitude, subjective norm, and perceived behavioral control (PBC). The results found that attitude, subjective norm and PBC of physical activity significantly predicted intention to perform physical activity, explaining 70.2% of the variance. For healthy eating behavior, the TPB explained 69.1% of variance in intention where subjective norm and PBC were significant predictors. In addition, the results demonstrated that intention and PBC together accounted for 22.3% and 23.4% of variance in physical activity and healthy eating behavior respectively where, however, only PBC was a significant predictor of both physical activity and healthy eating behavior. Overall, the study 1 suggested that there was a need for an appropriate intervention program, particularly to enhance PBC and thereby help to prevent obesity and other chronic diseases in the future. Ajzen (2002) suggested that there were two components of PBC namely self-efficacy and controllability. Thus, to verify the predictability of PBC in actual behavioral change, it is logical that any intervention program aiming to enhance PBC will also enhance self-efficacy and controllability related to the targeted behaviors.

From the study 1, the TPB constructs can only partly explain variability in physical activity and healthy eating behavior, whereas intention did not significantly predict such behaviors, it is logical that there could be factors moderating the intention-behavior relation. Implementation intention (Gollwitzer. 1993, 1999) has been shown to enhance the

prediction of behavior provided by the TPB. Therefore, it is likely that implementation intention may be beneficial for increasing physical activity and healthy eating behavior among schoolchildren given the weak intention-behavior relationships.

A need for an appropriate intervention to enhance self-efficacy and controllability in relation to healthy eating behavior and physical activity, together with the limitation of weak intention-behavior relationships lead to the conceptual framework of this study which was presented in Figure 1. As shown in the figure, the study interventions, as they were independent variables, were developed using self-efficacy, self-control, and implementation intention principles.

As suggested by Bandura (1997: 79-115) and previous studies, sources from which self-efficacy are thought to develop; including mastery experience, vicarious experience (Modelling), and verbal persuasions were incorporated in the development of the present study interventions. Regarding self-control, as suggested in the literature (Kazdin. 2001), techniques of stimulus control, self-monitoring, and peer discussion were applied in the development of the study interventions. Finally, forming implementation intention (Gollwitzer. 1993, 1999) by asking students to plan their behavior as the form '*If situation X are encountered, then I will perform goal-directed behavior Y*' was also incorporated.

The effects of those interventions on dependent variables; including psychological, behavioral, and anthropometric variables, would be determined for both schools of the study sample.

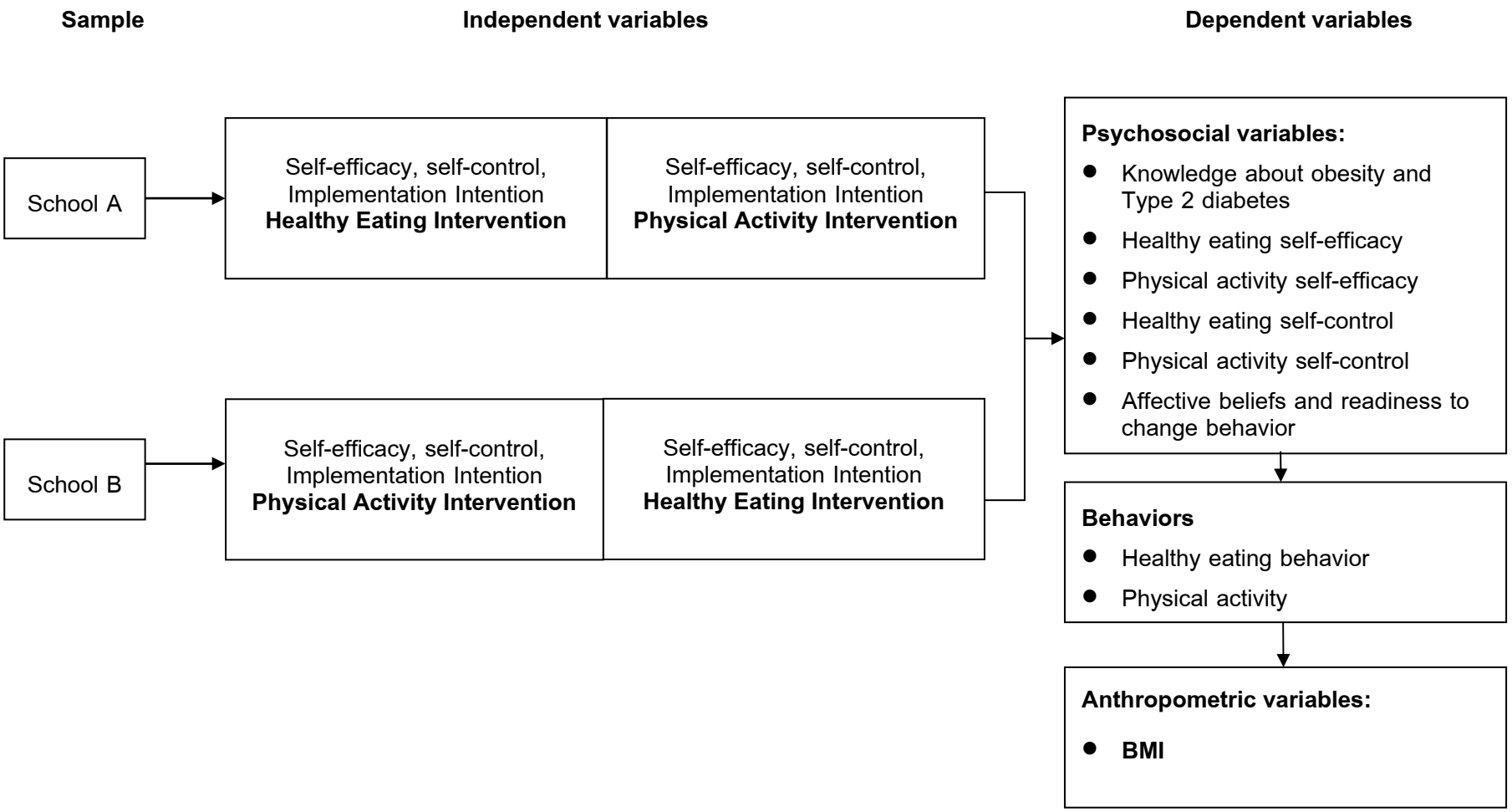

FIGURE 1 Conceptual framework of the study

Hypotheses

1. After the SSII-Healthy Eating Intervention Program:
    1.1 Knowledge, self-efficacy, self-control, and healthy eating behavior of the sample would increase.
    1.2 BMI of the sample would decrease.
2. After the SSII-Physical Activity Intervention Program:
    2.1 Knowledge, self-efficacy, self-control and physical activity of the sample would increase.
    2.2 BMI of the sample would decrease.
3. The combined effects of the SSII-Healthy Eating and Physical Activity Intervention Program on behavior would be greater than that of the individual programs.
4. School A, where the SSII-Healthy Eating intervention program was first implemented, would have a lower BMI than School B, where the SSII-Physical Activity intervention was firs implemented.
5. The reductions in BMI, and increases in healthy eating behavior and physical activity would be accompanied by increases in self-efficacy and self-control if the PBC is good at predicting actual behavior change.

CHAPTER 2

LITERATURE REVIEW

The literature review will be presented as follow;

1. Obesity and Type 2 diabetes in children and adolescents
    - 1.1 Prevalence of Type 2 diabetes and the link between obesity and Type 2 diabetes
    - 1.2 Definition and assessment of Type 2 diabetes
    - 1.3 Risk factors of Type 2 diabetes
        - 1.3.1 Genetic risk factors
            - Family history
            - Ethnic group
        - 1.3.2 Lifestyle risk factors
            - Overweight/obesity
            - Physical inactivity/sedentary behavior
            - Unhealthy eating behavior
            - Parental influence
    - 1.4 Modification/reduction of risk factors to prevent obesity-related Type 2 diabetes
        - 1.4.1 Guideline for the prevention
        - 1.4.2 Component of the prevention
2. Theories used for the development of the study interventions
    - 2.1 Self-efficacy
        - 2.1.1 Principles and concepts of self-efficacy
        - 2.1.2 Effectiveness of intervention programs based on *self-efficacy*
    - 2.2 Self-control
        - 2.2.1 Principles and concepts of self-control
        - 2.2.2 Effectiveness of intervention programs based on *self-control*
    - 2.3 Implementation intention
        - 2.3.1 Principles and concepts of implementation intention
        - 2.3.2 Effectiveness of intervention programs based on *implementation intention*

Prevalence of Type 2 diabetes and the link between obesity and Type 2 diabetes

There are a large number of co-morbidities associated with obesity, but there is clear evidence that obesity has a strong positive relationship with the risk of Type 2 diabetes (Webber. 2004: 1-11). In children and adolescents, Type 2 diabetes is now a major health problem globally, in which the increasing prevalence of Type 2 diabetes parallels the prevalence of overweight or obesity (Berry, Urban, & Grey. 2006: 89; Hannon, Rao, & Arslanian. 2005: 473-480). In the United States, Type 2 diabetes was diagnosed in 4% of children in 1990 but in between 8% and 45% of children in ethnically diverse patient populations in 2001, of whom 85% were obese at the time of diagnosis. In Japan, the incidence of Type 2 diabetes among elementary school children in Tokyo increased 10-fold from 0.2 per 100,000 in 1976 to 2 per 100,000 in 1995. In junior high school children, the incidence of Type 2 diabetes increased from 7.2 per 100,000 in 1976-1980 to 13.9 per 100,000 in 1991-1995. In addition, it was shown that 80% of the children with Type 2 diabetes were obese (Pinhas-Hamiel & Zeitler. 2005: 693-700; Erhardt & Molnár. 2004: 155; Lieberman. 2003: 348). Lobstein & Jackson-leach (2006) reviewed the numbers of children aged 10-17 years with obesity-related diseases and co-morbidities in the European Union (EU) and found that over 20,000 obese children in the EU have Type 2 diabetes, while over 400,000 have impaired glucose tolerance, a precursor of diabetes. A similar increase in the number of children and young people with Type 2 diabetes has been observed in many parts of the world, including America, Asian-Pacific region, Europe, and the Middle East (Pinhas-Hamiel & Zeitler. 2005: 693-700; Botero & Wolfsdorf. 2005: 281).

In Thailand, the prevalence of Type 2 diabetes has also increased. A report from Siriraj Hospital, Bangkok, revealed that the proportion of new cases of Type 2 diabetes in newborn children to 14 years of age rose from 5% in 1987-1996 to 17.9% in 1997-1999, indicating an eight fold increase. The mean age of diabetic patients was 11.6 ± 2.1 years and mean BMI was 29 ± 6.1 kg/m^2. The increasing numbers of Type 2 diabetes in children parallels the rise in the prevalence of childhood obesity (Pat Mahachoklertwattana. 2006: 771-773; Pinhas-Hamiel & Zeitler. 2005: 694). Results from a multi-center, hospital-based study, determining prevalence of Type 2 diabetes in Thai diabetic patients who were diagnosed when under 18 years showed that 18.4% of the diabetic patients had Type 2 diabetes.

Similarly, data at Ramathibodi Hospital, Bangkok, revealed only 4 cases of Type 2 diabetes were diagnosed between 1990 and 1999 but 23 cases were found between 2000 and 2005, a 5-year period. The number had increased comparably by about ten fold. These data demonstrated that Type 2 diabetes accounted for 12% of childhood diabetes during 1990-1999. This number increased to 40% during 2000-2005, indicating a trend towards an increased frequency of Type 2 diabetes in children and adolescents in recent years. For type 1 diabetes, in the same period, the numbers were also increased but only by about two fold. In addition, during 2000-2005, 100 moderately to severely obese children, aged 8-18 years, were screened for Type 2 diabetes using the oral glucose tolerance test. Results showed that 20% had impaired glucose tolerance and 3% had asymptomatic diabetes (Pat Mahachoklertwattana. 2006: 771-773).

Definition and assessment of Type 2 diabetes

Type 2 diabetes is one of the metabolic syndromes, which comprises glucose intolerance, Type 2 diabetes, hypertension, dyslipidemia, stroke and cardiovascular diseases (Hannon et al. 2005: 474; McTernan & Kumar. 2004: 51). Type 2 diabetes is defined as an insulin deficiency resulting from insulin resistance or a secretory defect in the pancreas (Berry et al. 2006: 89). Genetic and environmental factors influence the development of insulin resistance and Type 2 diabetes, which are evidenced to have a strong relationship with obesity (Hannon et al. 2005: 474). In the past, children and adolescents were predominantly diagnosed with Type 1 diabetes. Currently, as the literature mentioned above, there is an increasing number of children and adolescents diagnosed with Type 2 diabetes. The features differentiate Type 1 and Type 2 diabetes is shown in Table 1 (Berry et al. 2006: 89).

TABLE 1 Classification of Type 1 and Type 2 diabetes

Details	Prevalence in Type 1 diabetes	Prevalence in Type 2 diabetes
Family history		
- Parent	Low	High (45%-80%)
- First-or second-degree relative	Low (5%)	High (74%-100%)
Ethnic group		
- African American	Low	High
- Hispanic	Low	High
- Native American	Low	High
- Non-Hispanic White	High	Low
Overweight	Low (24%)	High (85%)
Recent weight loss	High	Low
Polyphagia	High	Low
Polydipsia	High	Low
Polyuria	High	Low
Ketoacidosis at diagnose	High (20%-40%)	Low (5%-25%)
Acanthosis nigricans	Low	High (70%-90%)
Polycystic ovarian syndrome	Low	High
Hypertension	Low	High
Dyslipidemia	Low	High
Age	12-14 years	8-19 years

The American Diabetes Association (ADA) and the American Academy of Pediatrics (AAP) recommends screening for Type 2 diabetes among children as follows (Vivian. 2006: 297-306; Hannon et al. 2005: 474-475).

Criteria

- Overweight or at risk of overweight:
  - BMI > 85th percentile for age and gender; or
  - Body weight for height > 85th percentile; or
  - Body weight > 120% of ideal for height.
- Plus any two of the following risk factors:

- Family history of Type 2 diabetes in first- or second-degree relatives;
- Race/ethnicity as American Indian, Black, Hispanic, Asian, and Pacific Islander;
- Signs of insulin resistance or conditions associated with insulin resistance (Acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome).

- Age of screening initiation:

  Ten years or at onset of puberty if puberty occurs at a younger age
- Frequency of testing: every two years
- Test: fasting plasma glucose. Alternative tests including causal plasma glucose and oral glucose tolerance test are also suggested. Plasma glucose criteria for the diagnosis of impaired glucose tolerance and diabetes are presented in Table 2.

TABLE 2 Plasma glucose criteria for the diagnosis of impaired glucose tolerance and diabetes

Plasma glucose	Normal	Impaired	Diabetes
Fasting	< 100 mg/dL	100-125 mg/dL (IFG)	≥ 126 mg/dL
Oral glucose-tolerance test, 2 h PG	< 140 mg/dL	140-199 mg/dL (IGT)	≥ 200 mg/dL
Causal	-	-	≥ 200 mg/dL + symptoms

Note. IFG=impaired fasting glucose; 2 h PG=plasma glucose at 2 hours postingestion of glucose; IGT=impaired glucose tolerance; symptoms=polyuria, polydipsia, weight loss

Risk factors of Type 2 diabetes

Genetic risk factors

Family history

A genetic factor is associated with the development of Type 2 diabetes. It is shown that children are at greater risk of Type 2 diabetes if they have a first- or second-degree relative with Type 2 diabetes (Berry et al. 2006: 89; McKnight-Menci, Sababu, & Kelly. 2005: 97). Previous research reviewing the global prevalence of Type 2 diabetes in children

and adolescents showed that 48-99% of Type 2 diabetes patients have a family history of Type 2 diabetes (Pinhas-Hamiel & Zeitler. 2005: 693-700; Hale. 2004: 17-30). For example, in Japan, a study investigating the annual incidence of Type 2 diabetes among schoolchildren found that the frequency of a family history of Type 2 diabetes in first- and second-degree relative was 56.5% (Urakami, Harada, Kubota, Owada, Nitadori, & Kitakawa. 2005: 1876-81). A study of Type 2 diabetes patients aged 9–15 years at a diabetes speciality center in Chennai, India, reported a positive family history of diabetes in all cases (Ramachandran, Sivasankari, Snehalatha, Vijay, & Satyavani. 2003: 1022-5). In the United States, the Pima Indians have reported at least one parent with Type 2 diabetes in all cases under the age of 25 years (McKnight-Menci et al. 2005: 97). In Singapore, 80% of Type 2 diabetes patients with a mean age of 12 years reported a family history of Type 2 diabetes. In Germany, a history of diabetes in at least one parent was reported in 76.4% of cases. Similar figures were found in other countries including New Zealand, Australia, United Arab Emirates, Argentina, and Canada (Pinhas-Hamiel & Zeitler. 2005: 693-700).

Ethnic group

Ethnic group is shown to be one factor moderating the development of Type 2 diabetes. The literature demonstrated high prevalence of Type 2 diabetes in children and adolescents of American Indian, Pima Indian, Hispanic, African American, and Asian origin (Vivian. 2006: 297). For example, among Pima Indians, from 1967–1976 to 1987–1996, the estimated prevalence of Type 2 diabetes in 15–19 year olds significantly rose in both boys and girls: for boys, the increase was 24 to 38 per 1000 (up 58%), and for girls 27 to 53 per 1000 (up 96%). Findings were similar among the 10–14 year olds; for boys, the increase was 0 to 14 per 1000, and for girls 7 to 29 per 1000 (up 314%) (Fagot-Campagna, Burrows, & Williamson. 1999: 85). A report from the ADA showed that the African American children aged 7-11 years had insulin levels significantly higher than white children with the same age. In addition, the BMI levels of African and Mexican American girls aged 6-24 years were significantly higher than that of white girls (Amschler. 2002: 40). A study conducted in the United Stated with 167 obese children of Caucasian, African American, and Hispanic origin showed that 16%, 27%, and 26% of Caucasian, African American, and Hispanic were diagnosed as pre-diabetes respectively (Vivian. 2006: 298). A study examining Type 2 diabetes in children and adolescents aged 10-16 years from the United Kingdom in 2000 found that most patients were Pakistani, Indian, or Arabic in origin.

Similarly, a study in Leeds, UK showed that 40% of the Type 2 diabetes patients aged 10-19 years were South Asian in origin (Pinhas-Hamiel & Zeitler. 2005: 695). A cross-sectional study of the prevalence of Type 2 diabetes using the ADA guidelines in 1,066 fifth grade elementary schoolchildren in Texas showed that 22.6% of the children were at risk of Type 2 diabetes, but African American and Hispanic children were almost 8 times more likely to be at risk when compared to Caucasian children (odds ratio = 7.41 and 7.87) (Urrutia-Rojas & Menchaca. 2006: 189-94).

Possible explanations for the ethnic differences of the prevalence of Type 2 diabetes are genetic and environmental factors. Among Pima Indians, the high prevalence of Type 2 diabetes may be due to the possession of what is called a ‘‘thrifty phenotype’’ (Fagot-Campagna et al. 1999: 84; Vivian. 2006: 298; Webber. 2004: 8). As defined by Webber (2004: 8), “The thrifty phenotype hypothesis suggests that the epidemiological associations between poor fetal and infant growth and the subsequent development of Type 2 diabetes results from the effects of poor nutrition in early life, which produces permanent changes in glucose and insulin metabolism. These changes lead to reduced insulin secretion and increased insulin resistance and hence predispose to Type 2 diabetes”.

The ethnic differences in the risk of Type 2 diabetes between African American and Caucasian children may be due to insulin action, which is likely to be explained by either genetic or environmental factors. However, from the literature, it seems that environmental factors such as diet, physical activity, and socioeconomic status could not clearly explain the lower insulin sensitivity and higher acute insulin response in African-American children compared with Caucasian children. Another study examined whether genetic admixture explained these ethnic differences. The analysis indicated that greater African-American genetic admixture was significantly related to lower insulin sensitivity ($p < 0.001$) and higher fasting insulin ($p < 0.01$) (Goran, Ball, & Cruz. 2003: 1420). This provides initial evidence that these ethnic differences may have a genetic basis.

Lifestyle risk factors

Overweight/obesity

The prevalence of Type 2 diabetes has increased globally and this parallels the prevalence of childhood obesity. Obesity is the major risk factor in the development of Type 2 diabetes and is also one of the clinical features of the disease (McKnight-Menci et al. 2005: 98). It is generally true that 70-88% of Type 2 diabetes patients are obese. However,

these figures are different across populations. For example, in the United Stated, a study using BMI to screen Type 2 diabetes patients found that 88% of the patients with high insulin levels had a BMI score of 3 or higher of the standard deviation (McKnight-Menci et al. 2005: 100). Another report by the National Institute of Health (NIH) found that 85% of the Pima children and adolescents with Type 2 diabetes were obese at diagnosis (Fagot-Campagna et al. 1999: 87). In New York, a report from the Montefiore Medical Center showed that the mean BMI of Type 2 diabetes patients, with amean age of 14 ± 2.3 years, was 34.4 ± 9 kg/m^2. In Austria, results from the national study of Type 2 diabetes patients from 1999 to 2001 showed that all diabetes children were overweight (Pinhas-Hamiel & Zeitler. 2005). A similar figure was found in Japan, where 83.4 % of schoolchildren with Type 2 diabetes were obese. (Urakami et al. 2005).

Obesity is a predominant risk factor for Type 2 diabetes with the risk increasing in parallel with increases in obesity. One possible explanation for this may be due to the relationship between high visceral fat in obese children and insulin action. It is likely that insulin-mediated glucose disposal will decrease when the visceral fat in the body is high. This may make the child more at risk for developing Type 2 obesity (Amscher. 2002: 39-40). It is consistent with Tuomilehto, Lindstrom, & Silventoinen (2004: 80), who claimed that Type 2 diabetes patients usually have excess fat cells. Another study examining the relationships between total body fat, visceral fat, and insulin sensitivity in Hispanic children found that both total body fat and visceral fat independently contribute to lower insulin sensitivity, and thereby to the development of Type 2 diabetes (Goran et al. 2003: 1418).

Physical inactivity/sedentary behavior

Currently, the environment and lifestyle of people has changed. Convenient transport, different occupations, and entertainments such as TV, computer, and electronic gadgets have lead to an increase in sedentary behaviors, and thereby affect the balance of energy intake and energy expenditure. Decreased physical activity over a long period results in an imbalance of energy with excess energy being stored as fat in adipose tissue (Tuomilehto et al. 2004: 80). Previous studies suggested that children are more sedentary, less involved in daily exercise, and spend up to six hour per day in physically inactive pursuits such as watching TV and using a computer (Amscher. 2002: 40; Hale. 2004: 17-30). Consistent with this, a study of physical inactivity of girls aged 16-17 years in the United State showed that physical activity levels over ten years were declining, with 56% of

black girls and 31% of white girls reporting physical inactivity (Alberti, Kaufman, zimmet, Silink, Shaw, & Bloomgarden. 2004: 1803).

Physical inactivity/sedentary behaviors are associated with the increase of obesity, but physical activity has protective effects on not only obesity but also diabetes (Crawford & Ball. 2002: S718-21; Webber. 2004: 7). The previous literature suggested that sedentary behaviors such as watching TV and playing computer games are associated with the prevalence of obesity (Liebman et al. 2006; Proctor et al. 2003: 827-33; Sidik & Ahmad. 2004; Slyper. 2004: 2540-7). A cross-sectional study of the prevalence of Type 2 diabetes using the ADA guideline in 1,066 fifth grade elementary schoolchildren in Texas showed that children who spent 2 or more hours per day watching TV or playing video games were 73% more likely to be at risk of Type 2 diabetes (Urrutia-Rojas & Menchaca. 2006: 191). Another study suggested that each hour per week spent watching TV was associated with an increase in weight of 0.3 kg (95% CI: 0.1-0.5 kg) whereas each hour of exercise per week resulted in a decrease of 2.0 kg (95% CI: -3.0-1.0 kg) (Jebb & Krebs. 2004: 35). Consistent with this, in Thailand, Patima Pornpojamarn (2003) identified factors influencing childhood obesity in elementary schools in urban Bangkok. The sample was 174 students studying in grade 4-6 from schools located in Ratchatavee district of Metropolitan Bangkok and Dusit district under the Elementary School Office, Ministry of Education. Results showed that children's television viewing and game playing of more than 5 hours/day had a positively significant correlation with obesity in children.

A number of studies supported the protective effects of physical activity on obesity and Type 2 diabetes. One study demonstrated that when participants were instructed to decrease their sedentary behaviors they were even more successful in weight loss than a group that were instructed to undertake physical activity but not specifically told to decrease their sedentary activity, however long-term, introducing physical activity was more successful for weight control in children (Cooke & Gately. 2004). Consistently, studies of obese individuals found that continued physical activity, even frequent short walking instead of driving or climbing stairs instead of taking an elevator, helps in maintaining the reduced weight (Sarafino. 2007)

Children who engaged in moderate or vigorous exercise weekly for 8-15 weeks had a reduced risk of diabetes with improved plasma glucose levels (Hale. 2004: 17-30; Webber. 2004: 7). A study examining the relationship between physical activity and insulin sensitivity in 357 children aged 10-16 years found that physical activity had a significant negative correlation with fasting insulin and a positive correlation with insulin sensitivity. This

means that increasing physical activity among children may reduce fasting insulin and improve insulin sensitivity and thereby reduce the incidence of Type 2 diabetes (Schmitz, Jacobs, Hong, Steinberger, Moran, & Sinaiko. 2002: 1310-16). Consistent with this, a study determining the relationships between total and central body fat, physical activity, and insulin resistance in children aged 9-11.5 years found that total and central body fat were positively associated with insulin resistance whereas physical activity was negatively associated with insulin resistance (Krekoukia, Nassis, Psarra, Skenderi, Chrousos, & Sidossis. 2007: 206-13). These findings support that reducing body fat and increasing physical activity may help to reduce the incidence of Type 2 diabetes. Goran et al. (2003: 1421-2) reviewed the studies examining the influence of physical activity on the development of Type 2 diabetes in children aged 5-14 years. In those studies, the physical activities used are increasing lifestyle activity, daily exercise on at least 3 days per week, an aerobic training program, and resistance training. The period of the intervention program ranged from 8 weeks to 5 months. Overall, the results showed the significant effects of physical activity in improving fasting insulin level, insulin sensitivity, percentage of body fat, and body strength which thereby help to prevent Type 2 diabetes.

As suggested in the previous literature, it is likely that sedentary behaviors are associated with the risk of Type 2 diabetes whereas increasing physical activity, especially engaging in moderate or vigorous exercise daily, will reduce the risk of Type 2 diabetes by reducing body weight and improve insulin action.

Unhealthy eating behavior

As lifestyles have changed, it appears that dietary patterns have also changed. Previous studies showed an increase in soft drinks, snacks and fast foods, and a decrease in vegetables or fibers in children's diets. For example, a study that examined trends in snacking behaviors in children found that the number of snacking occasions, defined as foods consumed within a 15-min period, as distinct from a meal, increased by 24–32% in all age categories (2–5, 6–11, and 12–18 years) (St-Onge, Keller, & Heymsfield. 2003). In Thailand, a report from the Nutrition Division (2006) revealed that 92.5% of school children in Bangkok aged 8-14 years consumed fast food, and 26% consumed snacks and soft drinks every day whereas the consumption of fruit and vegetable is less than the government recommended number of portions. Similarly, in England, the average fruit and vegetable intake of children aged 5-15 was 2.6 portions in girls and 2.5 portions in boys.

These figures were less than the portion recommended by the World Health Organization (WHO) which recommends eating at least five portions a day of fruit or vegetables (Office of Communications. 2007).

It appears that dietary factors are associated with both obesity and the development of Type 2 diabetes (Webber. 2004: 7). Slyper (2004: 2540-7) reviewed studies examining the association between diet and BMI in schoolchildren. It was generally found that sweetened soft drinks were significantly associated with an increase in BMI, but fat intake was not significantly associated with BMI changes. Inconsistently, a meta-analysis on 19 low-fat, dietary interventions lasting between 2 and 12-months showed that low-fat diets resulted in weight loss and this effect was clear in the sample with a higher initial body weight (Tuomilehto et al. 2004: 80-81). Two research papers suggested that the type of fat may explain these different results, which trans-fatty acids or polysaturated fats being more likely to increase the risk of obesity and Type 2 diabetes than polyunsaturated fat or vegetable fat (Goran et al. 2003: 1423; Webber. 2004: 7).

Other studies demonstrated the relationship between diet and insulin action. For example, a study examined the relationship between insulin sensitivity and consuming fat and carbohydrate in African American and Caucasian children (Vivian. 2006: 298). Results showed that insulin sensitivity had a significant negative relationship with fat and carbohydrate consumption. In addition, African American children significantly consumed more fat and thereby had lower insulin sensitivity than Caucasian children. Another study testing the relationship between diet and insulin action found the positive relation between fruit and carbohydrate intake and insulin sensitivity (Lindquist et al. 2000: 725-32). The type of carbohydrate, whether refined or whole grain, may help to explain the difference in the results regarding carbohydrates. Previous research examining the effects of whole grain and refined grain on the risk of Type 2 diabetes found that refined grain had a significant positive correlation with the risk of Type 2 diabetes whereas whole grain or cereal had a negative correlation, and consuming 3 portions of whole grain per day would significantly reduce the risk of Type 2 diabetes (relative risk = 0.63; 95% CI: 0.51-0.76) (Liu. 2002: 298-306).

It is likely that, despite the differences in the type of nutrients, three aspects of diet are relevant for obesity and the development of Type 2 diabetes; energy intake, energy density, and portion size. Energy density or the bulk of food consumed is an important determinant of energy intake. As suggested by the literature, energy-dense foods are high in fat because fat (37kJ/g) has more than twice as much energy as protein (17kJ/g) or

carbohydrate (16kJ/g) (Jebb & Krebs. 2004: 35-40). Thus, it is logical that low-fat foods contain less energy than full-fat foods, with equivalent in bulk. Regarding the portion size, it generally increases across types of foods such as fast food, soft drinks, ready-meals, and snacks. This may be because of the marketing strategies of the manufacturers. The changes in lifestyle from home cooking to pre-prepared microwave-meals or other convenience foods may be another explanation and this change has paralleled the increase of obesity. These foods tend to contain more calories and also require less energy to prepare. In the UK, the demand for ready-meals increased 44% between 1990 and 2002, while the increase across Europe as whole was 29% (Office of Communications. 2007).

Fast food typically includes all of the things that nutritionists warn against: 'saturated and transfats', high glycemic index, high energy density, and large portion size (Sidik & Ahmad. 2004). One longitudinal trial in young adult women found that the consumption of one additional fast food meal per week was associated with an increase in energy intake of 56 kcal/day and a weight gain of 0.72 kg over and above the average weight gain that naturally occurs over a 3-year period. Similarly, soft drinks generally contain high energy and sugar which is evidenced as a risk factor for obesity (Jebb & Krebs. 2004: 40).

As suggested in the previous literature, it is likely that replacing foods having trans-fatty acids with polyunsaturated fats; consumption of whole grain carbohydrates, fiber, and low-energy foods, and eating small portion sizes of food would lead to a lower risk of Type 2 diabetes.

Parental influences

Parents may play a role in contributing to the risk of obesity in their children. A survey asking the public who should have more responsibility for making children eat healthily (Office of Communications. 2007), showed that 55% said parents/family, followed by food manufacturers (16%) and school (14%). Parents may influence the risk of obesity in their children through factors such as the development of food preferences, food availability, role modeling eating behaviors or physical activity, and their response to media exposure especially food advertising (Jebb & Krebs. 2004: 40). For example, with regard to role modeling of eating, parents may influence their children eating styles with regard to the types of food consumed, how, where, and at what speed it is eaten (Munsch et al. 2007). Davison and Birch (2002) determined whether obese families, defined in terms of parents' weight, activity and dietary patterns, can be used to predict children's risk of obesity. Their

results showed that girls from obese families had significantly higher BMI and skinfold thickness than girls from non-obese families. In addition, mothers and fathers in the obese family reported higher levels of dietary intake and lower levels of physical activity than the mothers and fathers in non-obese families.

Consistent with this, a number of studies in Thailand support the parental influences on childhood obesity. For example, Churdchaipume (1999) studied factors related with obesity in 870 students in the Mattayom 1-6 classes in Chantaburi. Results indicated that the paternal obesity significantly related to the child obesity. Duangkaew and Apacappakul (2000) studied the weight of junior high school students. The sample was 557 schoolchildren aged 10-13 years in Hardyai Wittayalaisomboonkallaya School. Results showed that the obesity problem in the children's families had an effect on the children's weight. The obesity in the children came from the fact that there was obesity in the family, in which the chance of obesity was 2.23 times higher than the normal group of children who grew up in families with no records of previous obesity. In addition, Pornpojamarn (2003) identified the influence of parental child rearing practices on childhood obesity in elementary schools in urban Bangkok. The sample was 174 students studying in grade 4-6 and their respective parents from schools located in Ratchatavee district of Metropolitan Bangkok and Dusit district under the Primary School Office, Ministry of Education. Results showed that the authoritarian parental rearing practice was significantly correlated with obese children. In addition, parents with a BMI of more than 25 kg/m^2 had a positively significant correlation with obese children.

The socioeconomic status of the family may be another factor used to explain parental influence on childhood obesity which was supported by previous studies, suggesting that poorer families may not afford healthy diets and may not be as well educated about dietary factors (Lamerz et al. 2005; Hawkins, Cole, & Law. 2007; Xie et al. 2007; Collins, Pakiz & Rock. 2007). In Thailand, previous research also supported the socioeconomic status of the family on childhood obesity. For example, Langendijk et al. (Pornpojamarn. 2003; cited Langendijk et al. 2000) studied the prevalence and patterns of obesity in 864 children aged 7-9 years in urban Khonkaen, Northeast Thailand. Results showed that the average monthly income had an effect on obesity. In the obese group, whose family's monthly income was more than or equal to 30,000 baht, they would have 2.22 times a chance to become obese of the normal group whose family's monthly income was less than 30,000 baht. Another research (Sakamoto, Wansorn, Jontisirin, & Marue. 2001) studied epidemic obesity in preschool children in Thai society. The sample was 1,157

students aged 4-6 years in Saraburi province. Results demonstrated that education level and family income were related with obesity, in which the group with higher socio-economic level would have higher obesity rate than the group with the lower level.

Television influences

The literature suggests that hours spent watching TV are associated with an increase in obesity and also increasing the risk of Type 2 diabetes. One explanation, as mentioned above, is that watching TV is a sedentary behavior which needs less energy. Watching TV may be related to the consumption of high-energy foods such as snacks, prepared meals, and fast foods (Alberti et al. 2004: 1803; Office of Communications. 2007). Another explanation is that watching TV exposes children to advertisements for fast food, snacks, and salty foods. In the United State, children's programming in the TV was shown to contain 10 food advertisements hourly, twice as much as in adults' programming (Alberti et al. 2004: 1803). Food advertisements on TV have both direct and indirect effects on children such as influencing their food preferences, food choices, food consumption, and attitudes to food. These factors were supported by previous studies (Borzekowski & Robinson. 2001: 42-6; Office of Communications. 2007).

Modification/reduction of risk factors to prevent obesity-related Type 2 diabetes

Guidelines for the prevention

As lifestyle factors for the risk of Type 2 diabetes are unhealthy eating behavior, physical inactivity, obesity, and parental influence, it appears that the prevention of Type 2 diabetes should be targeted on body weight, diet, physical activity, and involvement of family members. Previous research also support the effectiveness of involving family and using behavioral approaches in the prevention interventions aimed at diet and physical activity (Epstein, Paluch, Roemmich, & Beecher. 2007: 381-91; Grey et al. 2004: 10; Mcknight-Menci. 2005: 100; White et al. 2004: 1050-9). In addition, it is likely that interventions directed to reduce obesity also reduce the incidence of Type 2 diabetes in obese individuals with impaired glucose tolerance (Tuomilehto, Lindstrom, & Silventoinen. 2004).

Consistent to the evidenced-based findings, the ADA recommends the general guidelines for the prevention of Type 2 diabetes in children and adolescents as presented in Table 3 (Berry, Urban, & Grey. 2006: 3-10).

TABLE 3 Comparison of primary, secondary, and tertiary prevention

Level of prevention	Guidelines
Primary prevention	- School-based behavioral interventions - Community-based interventions - Family and individual interventions
Secondary prevention	- Eating and exercise behavior modification in adolescents with pre-diabetes - Medications - Bariatric surgery
Tertiary prevention	- Normalize blood glucose levels - Medication (oral or insulin) - Weight loss - Exercise - Aggressive treatment of hypertention and hyperlipidemia to prevent comorbidities

Components of the prevention

Previous studies reviewed/analyzed components or issues regarding the prevention interventions of obesity. For example, Epstein et al. (2007) comparing efficacy of a number of previous studies on the childhood obesity interventions suggested that, to be more effective, children' BMI should be reduced to below 85^{th} percentile, not being at risk for overweight. In addition, age and sex were predictors of the long term BMI changes, with younger children aged < 10.33 years shower more changes in BMI than the children aged > 10.33 years, and girls showed more changes in BMI than boys.

Dorsten (2004) reviewed studies on behavioral lifestyle modification and generally found that interventions involved group-led weekly or twice weekly meetings focusing on healthy diets, physical activity, and instruction in behavioral change techniques. Program length contained two sections, an active instructional phase which commonly lasted 6-26

weeks, and a follow-up phase which extended to one year or more. The healthy diet change strategies includes improving food choice; decreasing food portion size; and changing environments, cognitions, or emotions associated with unhealthy eating behavaior. The physical activity change strategy generally was exercise 30-40 minutes per day most days a week. The designed weight loss was 0.5-1.0 kg per week. In addition, it appears that few studies compared different combinations of diet and exercise versus diet or exercise alone, and some studies failed to demonstrate the combined effects of diet and exercise.

Sarafino (2007) reviewed techniques and components for weight loss. Typically, they are a group format with weekly meetings where participants submit records of their eating, are weighed, and receive information and feedback. In addition, they usually include the following components; nutrition and exercise counseling, self-monitoring, stimulus control techniques, changing the act of eating, behavioral contracting, giving rewards for increased physical activity and for decreased sedentary behavior, providing contact by telephone to assess progress and give advice, and involving parents in the intervention program. Moreover, motivation or readiness to change is also discussed and it is suggested that interventions that are tailored to the motivational readiness of individuals to change their behavior are more effective than nontailored programs. Therefore as part of the baseline measurement, students' readiness to change (behavioral intentions) will be assessed.

A study (Wilfley, Tibbs, Van Buren, Reach, Walker, & Epstein. 2007: 521-32) analyzed the efficacy of randomized controlled trial interventions in the treatment of childhood obesity. Overall, the interventions involved group-led weekly, biweekly, or twice weekly meetings with parent involvement. Each session lasted between 20 and 90 minutes with the involvement of a therapist such as a dietitian, pediatrician, psychologist, physical education instructor, and counselor. Number of participants at baseline ranged from 5 to 50. Treatment length lasted between 3.5 and 24 weeks. The participants aged between 2 and 19 years. The interventions generally focused on diet, exercise, parent involvement, reinforcement, stimulus control, and self-monitoring with one control group and one treatment group of diet and exercise or paralleled groups of diet or exercise alone.

As suggested in the previous literature, the intervention programs for preventing obesity-related Type 2 diabetes are generally group meetings focusing on healthy diet, physical activity, and involvement of parents and behavioral approaches such as

reinforcement, stimulus control, and self-monitoring. Program length contained two sections, an active instructional phase and a follow-up phase, with the differences of program length across studies. In addition, it is likely more effective if a therapist such as a dietitian, sport scientist, and psychologist are included in the interventions. Finally, it appears that there is a need of studies comparing different combinations of diet and exercise versus diet or exercise alone.

Theories used for the development of the study interventions

This section reviews the literature regarding theories used for developing the study interventions and their applications on diet and exercise. A study 1 (Patcharee Duangchan. 2007) used the Theory of Planned Behavior (TPB) (Ajzen, 1991) to determine the factors that may predict engagement with physical activity and healthy eating behavior and obesity in fourth grade schoolchildren, aged 9-11 years, in four demonstration schools, Bangkok. The TPB proposes that the likelihood of someone engaging in a particular behavior can be predicted by their intention to perform that behavior. Intention, in turn, is predicted by 3 independent variables namely attitude, subjective norm, and perceived behavioral control (PBC). The TPB has proved useful in explaining or predicting a variety of health-related behaviors including diet and exercise. Results from the above study also support the applicability of the theory, where attitude, subjective norm and PBC of physical activity significantly predicted intention to perform physical activity, explaining 70.2% of the variance. For healthy eating behavior, the TPB explained 69.1% of variance in intention, where subjective norm and PBC were significant predictors. In addition, the results demonstrated that intention and PBC together accounted for 22.3% and 23.4% of variance in physical activity and healthy eating behavior respectively where, inconsistent with the TPB, only PBC was a significant predictor of both physical activity and healthy eating behavior.

As demonstrated from the previous study that PBC was the dominant predictor of physical activity and healthy eating behavior, it is likely that for the prevention of Type 2 diabetes and its primary risk factor, obesity, among schoolchildren in the demonstration schools, there is a need for an appropriate intervention program, particularly to enhance PBC and thereby help to prevent chronic disease in the future. As Ajzen (2002) suggested, there are two components of PBC namely self-efficacy and controllability which were also measured in the study. Thus, to verify the predictability of PBC in actual behavioral change,

it is logical that any intervention programs aiming to enhance PBC will also enhance self-efficacy and controllability related to the targeted behaviors.

It has also been shown in the previous study that the TPB constructs can only partly explain variability in physical activity and healthy eating behavior, whereas intention did not significantly predict such behaviors. Thus, it is logical that there could be factors moderating the intention-behavior relation such as habits, past behaviors, ability, and unexpected situations (de Nooijer, de Vet, Brug, & de Vries. 2006: 25; Sheeran. 2002: 1-36; Sheeran & Orbell. 2000: 283-289). Implementation intention (Gollwitzer. 1993, 1999) has been shown to enhance the prediction of behavior provided by the TPB, to reduce the impact of habit on future behavior (Sheeran & Orbell. 2000: 283-289, to enhance people's ability to self-regulate their behavior (Webb & sheeran. 2003: 279-286), and to strengthen the intention-behavior relationship (Latimer, Martin Ginis, & Arbour. 2006: 274; Milne, Orbell, & Sheeran. 2002; Prestwich, Lawton, & Conner. 2003). In addition, as suggested by meta-analyses, implementation intention is effective in promoting goal achievement with a medium to large effect size (d = 0.65) across a wide range of health behaviors, across a range of samples and measures of behaviors (Webb & sheeran. 2003: 280; Sheeran, Aubrey, & Kellett. 2007: 854). Therefore, it is likely that implementation intention may be beneficial for increasing physical activity and healthy eating behavior among schoolchildren given the weak intention-behavior relationships.

The literature regarding the principle and evidence-based efficacy of self-efficacy, self-control, and implementation intention related to healthy eating behavior and physical activity are presented below.

Principles and concepts of self-efficacy

Self efficacy originated as part of Bandura's Social Cognitive Theory (Bandura. 1997; Macaskill. 2008), and according to this theory, human motivation and action are regulated by forethought or anticipation. These anticipatory mechanisms are considered to involve outcome expectancies; situation-outcome expectancies and action-outcome expectancies, and perceived self-efficacy. Situation-outcome expectancies represent expectations or beliefs about the social events that cannot be affected by the individual themselves whereas action-outcome expectancies represent outcomes that are a consequence of an individual's own actions. Self-efficacy represents individuals' beliefs

about their capabilities to perform particular behaviors in any given set of circumstances (Morrison & Bennett. 2006). Self-efficacy beliefs determine how people feel, think, motivate themselves and behave which greatly influence what they actually achieve in terms of diet or exercise for example (Bandura. 1997: 37). As proposed by Bandura, there are three dimensions of self-efficacy: *magnitude*, or the level of performance an individual believes he/she is capable of; *strength*, or the degree of confidence an individual has in his/her ability to perform a behavior; and *generality*, or the degree to which the efficacy belief applies to one or more specific behaviors.

Behavior is predicted by self-efficacy together with outcome expectancies. It is suggested that an individual will 1) be more inclined to behave in the specified way and 2) try to perform the behavior if he/she believes both that the behavior will have a particular desired effect, and that he/she is able to perform the behavior (Sutton, Baum, & Johnston. 2005: 156; Albery & Munafò. 2008: 112). The causal relationship between self-efficacy and outcome expectancies is presented in Figure 2 (Bandura. 1997: 22).

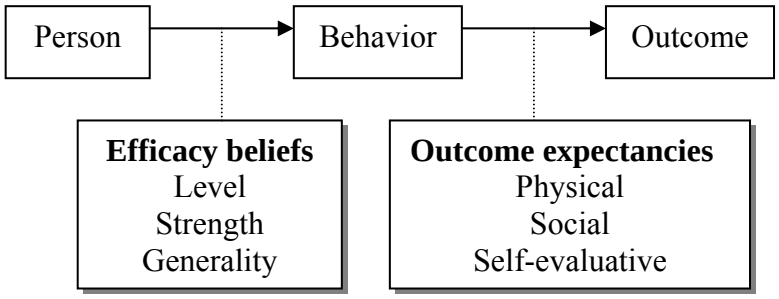

FIGURE 2 Relationship between self-efficacy and outcome expectancies

As shown in Figure 2, in a given situation, self-efficacy varies in level, strength, and generality. The outcome expectancies that happen following a given behavior can be either positive or negative, physical, social, and/or self-evaluation effects.

Individuals have been shown to vary greatly in their levels of self-efficacy related to specific tasks (Macaskill. 2008; Bandura (1997: 20) suggested that the different combinations of self-efficacy and outcome expectancies will result in different psychosocial and emotional effects as shown in Figure 3.

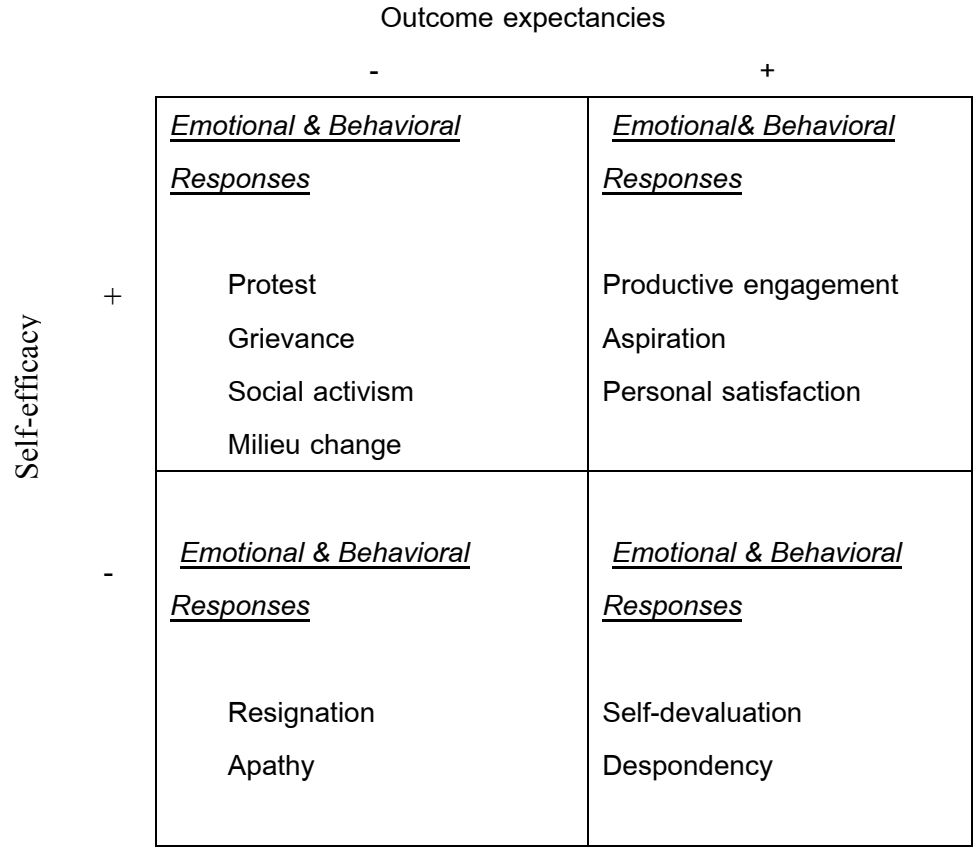

FIGURE 3 The effects of different combinations of self-efficacy and outcome expectancies on behavior and affective states. The pluses and minuses represent positive and negative qualities of self-efficacy and outcome expectancies.

For example believing that they have the skills necessary to engage in positive protest to effect change (positive self-efficacy) but thinking that protest is unlikely to achieve change (negative outcome expectancy). With regard to healthy eating behavior, children may believe that they can change to healthy eating behavior (positive self-efficacy) but they also believe that there is no point asking their mother to provide healthy meals as she will not discuss it with them (negative outcome), so the child may feel resigned to eating unhealthily and/or has a sense of grievance so they do not discuss it with their mother (negative outcome).

Sources of self-efficacy

Bandura identified four main sources from which self-efficacy beliefs are thought to develop. These are; mastery experience; vicarious experience (Modelling); verbal persuasions; and physiological factors (Macaskill. 2008; Bandura. 1997: 79-115).

1. Mastery experience is an interpreted result of how well one performs in a specific situation which leads to a sense of competence. It is the most influential source of self-efficacy because it provides the objective evidence of whether one can process whatever it takes to succeed. To simply explain, success builds one's self-efficacy whereas failure lowers it. Bandura suggested that building a sense of self-efficacy through mastery experience creates the cognitive and self-regulative facility for effective performance. These are facilitated by breaking down complex skills into easily mastered subskills and organizing them hierarchically.

2. Vicarious experience or modelling, although it is a weaker source than mastery, is useful when individuals are uncertain about their own abilities, or have limited prior experience. To simply explain, "If they can do it, I can do it as well". This source involves comparing themselves with another, and when they see that person succeed their own self-efficacy will increase. Alternately if the other person fails, then their own self-efficacy will decrease. This process is obviously more effective when the other person is a similar model to themselves, for example one of their peers. Modes of modelling influences including actual modelling, symbolic modelling, videotaped self-modelling, cognitive self-modelling, coping modelling, and modelling via computer graphics, are shown to be effective in enhancing self-efficacy and improve performance.

3. Verbal Persuasions are weaker than the other two but still influential. This source involves exposure to the verbal persuasions of others, specifically encouragements or discouragements. These persuasions then, can have a strong effect on our confidence, indeed, we can all remember a time when someone's encouragement or discouragement directly effected our belief in our abilities. To simply explain, positive persuasions (encouragement) increases self-efficacy, whereas negative persuasions (discouragement) decreases self-efficacy.

4. *Physiological factors*. In stressful or unusual situations, individuals usually experience signs of anxiety, stress, fatigue, arousal, and different mood states, perhaps even experiencing shakes, aches and pains, fear, nausea etc. An individual's perceptions of these responses then, can markedly affect their self-efficacy. In other words, individual's

can usually gauge their confidence by their emotional state, and if their self-efficacy is low to begin with, these physiological factors can lower it even further. Therefore, it is the individual's beliefs about the implications of these physiological responses that can alter self-efficacy rather than the power of the response itself.

Allen (2004: 807) demonstrated the relationship between the four sources of self-efficacy mentioned above, outcome expectancy, behavior, and outcome. This is presented in Figure 4. As shown in the figure, when an individual with Type 2 diabetes believes that he/she can get up early to exercise, based on some of the four sources of self-efficacy, and that exercise will improve his/her health, he/she will regularly exercise.

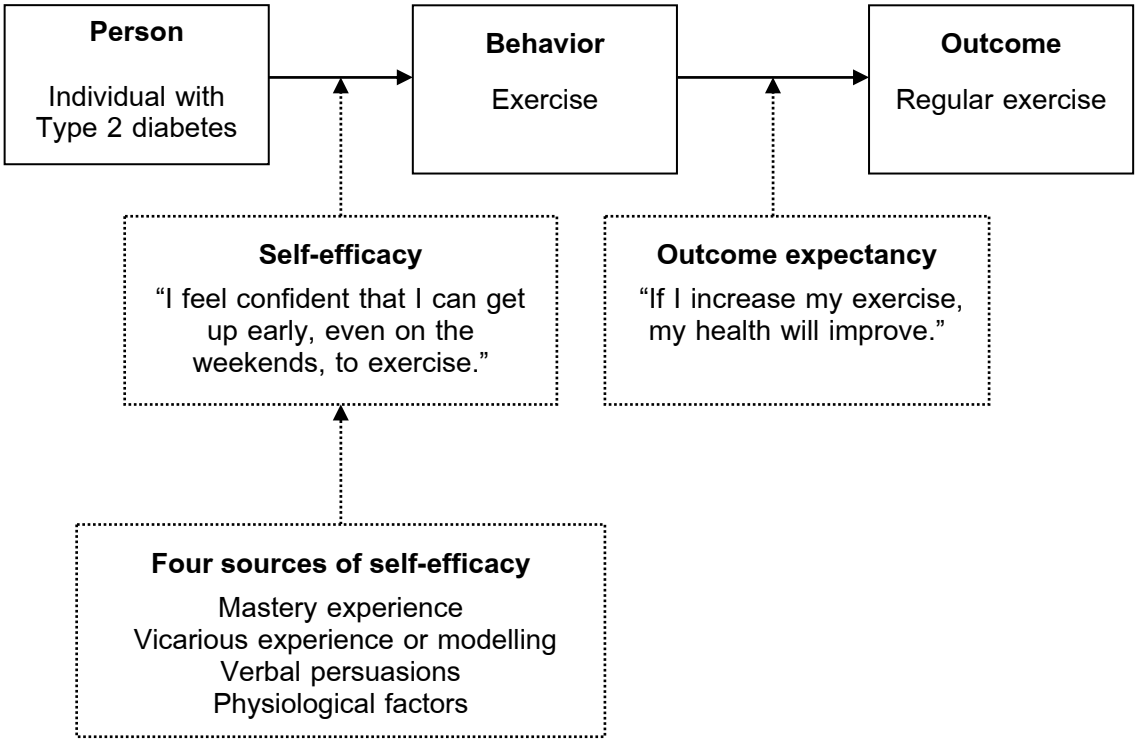

FIGURE 4 The relationship between sources of self-efficacy and behavior and outcome in Type 2 diabetes patients.

Behavioral strategies based on four sources of self-efficacy

Bandura (1977: 195) suggested activities for the development of self-efficacy based on the four sources mentioned above. This is presented in Table 4.

TABLE 4 Activities for the development of self-efficacy

Source of self-efficacy	Activities
1. Mastery experience	- Participant modeling
	- Performance desensitization
	- Performance exposure
	- Self-instructed performance
2. Vicarious experience or modelling	- Live modeling
	- Symbolic modeling
3. Verbal persuasions	- Suggestion
	- Exhortation
	- Self-instruction
4. Physiological factors	- Attribution
	- Relaxation
	- Symbolic desensitization
	- Symbolic expose

Consistent to what Bandura suggested, Allen (2004: 805-19) reviewed 13 studies about the intervention program to prevent Type 2 diabetes and summarized behavioral strategies based on four sources of self-efficacy as shown in Table 5.

TABLE 5 Behavioral strategies based on Bandura's four information sources

Self-efficacy sources	Behavioral strategies
1. Mastery experience	- Develop goals and exercise prescriptions with patients - Rehearse desired behaviors - Conducted brief guided walks to practice taking heart rates and pace setting - Teach group exercise classes - Use continuous glucose monitoring feedback to demonstrate the effect of exercise on blood glucose levels - Use pedometers to measure exercise and provide feedback - Use activity logs to provide feedback
2. Vicarious experience or modelling	- Use teachers (as role models) who have embraced exercise behaviors - Use videotapes of role models demonstrating exercise behavior and problem solving - Organize role models to start walking or group exercise programs
3. Verbal persuasions	- Describe the physiological benefits of exercise on blood glucose levels, independent of weight loss - Provide verbal encouragement of progress - Attribute accomplishments to each individual's own efforts - Incorporate significant others into the intervention to increase support and reinforce behaviors
4. Physiological factors	- Problem solve before physical discomforts related to exercise might arise - Assist in accurate interpretation of symptoms related to exercise (e.g. fatigue is normal when beginning to exercise but improve overtime) - Start relaxation training programs to decrease anxiety and feelings of physical inefficacy - Discuss relapse prevention strategies

Effectiveness of intervention programs based on self-efficacy

Self-efficacy has been shown to be a significant factor in health behaviors such as sexual behaviour (Naar-King, Wright, Parson, Frey, Templin, & Ondersma. 2006: 618-652; Newcomb, Locke, & Goodyear. 2003: 219-235), physical activity (Luszczynska & Sutton. 2006: 314-321; Resnick, Vogel, & Luisi. 2006: 17-29), healthy eating behavior (Nothwehr. 2007; Luszczynska, Tryburcy & Schwarzer. 2007: 630-638), weight control behaviors (Linde, Rothman, Baldwin, & Jeffrey. 2006: 282-291), and addiction (Shadel & Cervone. 2006: 91-96; Yzer & van den Putte. 2006: 356-361). Overall, it has been suggested that higher levels of self-efficacy were associated with decreased negative health behaviors and increased positive health behaviors. In addition to the significant positive association between self-efficacy and behaviors, it has also been found that self-efficacy was the principal predictor of behavioral modification success, for example, BMI in children and adolescents (O'Dea & Wilson. 2006: 796-805), and weight change in adults ((Linde et al. 2006). Examples of evidence-based efficacy of intervention programs applying some of the four sources of self-efficacy are as follows.

Focusing on diet and physical activity, previous studies developed demonstrably effective intervention programs aiming to promote diet and physical activity using four main sources of self-efficacy. For example, Holcomb et al. (1998: 282-288) determined the effectiveness of *Jump Into Action*, a school-based Type 2 diabetes intervention program, designed to improve knowledge, self-efficacy, and behaviors regarding Type 2 diabetes prevention. The sample is 1,114 fifth-grade students aged 10-12 years in 14 schools in Webb County on the Texas-Mexico border. The study design was quasi-experiment with a control group. The active instructional phase lasted three months and the follow-up phase was a month. Behavioral strategies designed to improve self-efficacy through *master experience* were 1) knowledge about the types, causes, risks, complications, incidence, facts, myths, and prevention of Type 2 diabetes which includes interactive and hands-on activities; 2) the nutrition section including information about the food pyramid, identifies high-fat and low-fat choices in each food group, food labels, and activities to develop student's abilities to make low-fat food choice; 3) the exercise section which emphasizes on regular exercise. Students were also recommended to set personal fitness goals. *Verbal persuasion* was encouraging students to pursue the set goals and maintain appropriate levels of daily activity. Results showed that there were significant changes for knowledge about diabetes, self-efficacy, healthy eating behavior, and exercise behavior between

pretest and posttest. The significant changes from posttest and follow-up were also observed for knowledge as well as diet and exercise self-efficacy.

Roach, Yadrict, Johnson, Boudreaux, Forsythe, & Billon (2003: 1357-1359) evaluated the intervention program designed to increase self-efficacy for weight loss. The sample was 73 students aged 18-23 years and were enrolled at a southern university. The instructional phase of intervention lasted 12 weeks. The study was a quasi-experiment with control group. Behavioral strategies designed to improve self-efficacy through *master experience* were 1) 12 one-hour weekly sessions on nutrition education which focus on topics related to healthy eating behavior; and 2) activities intended to increase self-efficacy for weight loss such as keeping a food diary. Results found that there was a significant relationship between change in self-efficacy and change in healthy eating behavior for the intervention group ($r = 0.388$, $p < .01$), but not for the control group. In addition, Change in self-efficacy was also significantly correlated with weight loss in the intervention group ($r = -0.536$, $p < .01$), but not in the control group. This study demonstrated that as self-efficacy improved, eating habits improved and weight loss was greater.

Grey et al. (2004: 10-15) evaluated the effectiveness of a program to prevent Type 2 diabetes among high-risk adolescents. The sample was 41 students aged 10-14 years who had family history of diabetes and BMI $\geq$ 95th percentile. The study was a quasi-experiment with control group. The active instructional phase lasted 16 weeks and the follow-up phase lasted a year. Behavioral strategies designed to improve self-efficacy through *master experience* were 1) the 45-minute weekly interactive nutrition curriculum which provided knowledge and skills on diet with the involvement of dietician. This includes activities such as 'Multi-Cultural Pyramids', 'Dining Out In The Fast Food Lane', Basics To Building Better School Lunches', and the 'Supermarket Tour'; 2) the 45- minute after school physical activity program which was scheduled two days a week over the 16-week period with a licensed personal trainer; 3) creation of weekly goals. *Verbal persuasions* were 1) involvement of parents or family members in the intervention for the support and reinforcement. Parents were also given information about food knowledge and skills, and were encouraged to be a partner with their children an additional three days per week at home to increase their physical activity and decrease sedentary behaviors; 2) verbal supportive from registered dietician about weekly goal of nutrition; 3) weekly telephone support on diet and exercise. Results showed that there were increases, but not significant,

in food choice skills and food knowledge and there were decreases in body fat, insulin, and glucose between baseline and follow-up.

Another pilot school-based Healthy Eating and Physical Activity Intervention was evaluated for its effectiveness in changing diet behavior, food knowledge, food self-efficacy, food preference, and food intention (Saksvig et al. 2005: 2392-2398). Physical activity results were not reported in this study. The study was a pretest/posttest, single-sample design. The sample was 122 Native Canadian students in the third, fourth, and fifth grades, Sandy Lake, Ontario. The active instructional phase was 16 weekly, 45-minutes teacher-led lessons and the follow-up phase lasted a year. Behavioral strategies designed to improve self-efficacy through *master experience* were knowledge and skills related to healthy eating behavior, physical activity, and diabetes which storytelling was incorporated to the lessons. Improving self-efficacy through *vicarious experience or modelling* were 1) video cooking club which provided opportunities for children to act as role models on preparation of healthy snacks; 2) 'Diabetes Kids' which was a radio show aired three times on the weekly children radio program. *Verbal persuasion* was the involvement of parents or family members in the intervention for the support and reinforcement in changing healthy eating behavior and physical activity. Parents were informed about the weekly radio show, were encouraged to turn off the TV, were demonstrated how to prepare healthy lunch and snacks for their children, were sent letters, and participated in the information boots during parent-teacher nights. Results showed that there were significant increases in diet behavior, food intention, food preference, knowledge, and food self-efficacy between baseline and follow-up.

Consistently, Trevino et al. (2005: 120-132) studied effect of the Bienestar Health Program, designed to reduce risk factors associated with the onset of Type 2 diabetes, on physical fitness in low-income Mexican American children. The sample was 561 fourth-grade students enrolled in nine elementary schools located in low-income inner-city neighborhoods of the San Antonio Independent School District. The study was an experimental design and the intervention lasted 8 months. Behavioral strategies through *master experience* were 1) Four interactive activities: students performing a dance act to introduce the Bienestar, a hands-on craft project to demonstrate how diabetes develop, a loteria (bingo) game to teach healthy eating, and salsa dancing class to demonstrate physical activity benefit; 2) 45-minute health classes which are based on instruction and experiential learning covering nutrition, physical activity, self-image, and diabetes; 3) The after school Health Club meeting once a week to reinforce classroom learning and promote physical activity which activities such as games, dancing, singing, art crafts, puppet shows,

and plays, are included. *Verbal persuasion* was involvement of parents or family members in the intervention. Results showed that there was difference in physical fitness change scores between the intervention and control group after the intervention period.

In Thailand, Thidarat chotik-Anuchid (2005) evaluated the effectiveness of an individual behavioural counselling program aiming to modify the lifestyle of obese children. The study sample was 33 abnormal/impaired glycemic or hypercholesterolemia children aged 9-19 years in the outpatient department, Ramathibodi Hospital, Bangkok. The study design was quasi-experimental, with 15 children in the treatment group and the rest in the control group. The active instructional phase was 6 months and the follow-up phase also lasted 6 months. Behavioral strategies designed to improve self-efficacy through *master experience* were 1) knowledge and skills related to healthy eating, physical activity, and Type 2diabetes; 2) aerobic exercise training; 3) skill needed for weight monitoring; and 4) creation of weekly goals and providing feedback. Improving self-efficacy through *Verbal persuasion* were 1) verbal support and reinforcement from the doctor; 2) telephone counseling and support. *Physiological arousal* activity was problem solving related to the non-achievement of healthy eating behavior and physical activity goals. In addition to self-efficacy sources, *outcome expectancy* was also used in this study through discussion about particular desired effects from modified lifestyle. Results showed that there were no significant differences in self-efficacy and outcome expectancy between the treatment and control groups. Due to the negative results obtained, emotional manipulation, with fun and child-appropriate activities was suggested for further studies.

As suggested in the previous literature, it appears that behavioral techniques used to improve self-efficacy were effective in weight loss and preventing Type 2 diabetes. Of four sources of self-efficacy, *master experience* is likely to be the most frequently used source. Behavioral strategies that were used are similar across studies which can be generally summarized as 1) knowledge about obesity and Type 2 diabetes; 2) nutrition knowledge and skills such as food choice, food preparation, and food labels learned by the interactive/fun activities; 3) exercise knowledge and skills; 4) setting weekly goals of diet and exercise; and 5) feedback providing. Regarding *modelling*, strategies used to develop self-efficacy include peer role model and role model demonstration such as for group exercise and for food preparation. For *verbal persuasions*, the strategies commonly are 1) involvement of parents or family members in the intervention for the support and

reinforcement; 2) verbal support from researcher, parents, and therapist such as dietitian, and exercise trainer; and 3) weekly telephone support on diet and exercise.

Derivation of the present study and contribution to the previous literature

The literature regarding self-efficacy reviewed above provides the following rationale for this study. *First*, it seems that there were few studies concerning self-efficacy together with outcome expectancies. As suggested by Bandura (1997: 20), the different combinations of self-efficacy and outcome expectancies will result in different psychosocial and emotional effects; where desired emotional and behavioral responses including productive engagement, aspiration, and personal satisfaction generally require both positive self-efficacy and positive outcome expectancies. Thus, to maximize the desired emotional and behavioral responses related to healthy eating behavior and physical activity in this study, the outcome expectancy concept; physical, social, and self-evaluative, will be also included in the model of intervention principles (as shown in Chapter 3). In addition, as emotional manipulation, with fun and child-appropriate activities has been suggested for further study focusing on children population, this idea will also be incorporated in the development of the present study interventions.

A *second* issue is that there were few studies examining the associations between the perception of self-efficacy for behaviors; healthy eating behavior and physical activity, and the outcomes/success of those behaviors such as BMI in schoolchildren. Particularly, the associations between self-efficacy of obesity-related Type 2 diabetes prevention behaviors and their objective outcome, fasting plasma glucose, have not been reported yet. Bandura and Simon (Linde et al. 2006: 283; cited Bandura & Simon. 1977) found that there was association between self-efficacy and weight change, and as suggested from the previous literature, this study will examine the associations between self-efficacy related to healthy eating behavior and physical activity and its outcomes to provide additional prospective data about these associations. The results will also assess the predictability of the TPB in actual behavior change, as self-efficacy is identified in the theory (this is one of the study objectives as seen in Chapter 1).

Principles and concepts of self-control

Self-control is also considered to be a component in the behavioral management of obesity (Craighead, Kazdin, & Mahoney. 1976; Kazdin. 2001; (Wilfley et al. 2007: 521-32;

Johnson et al. 1997: 257-261; Saelens, Sallis, Wilfley, Patrick, Cella, & Buchta. 2002: 22-32; White et al. 2004: 1050-1059). In addition, self-control is one of the cognitive skills that should be developed in the upper-elementary schoolchildren (approximately grade 4 to 5) because it has been suggested that lack of self-control is a prominent factor in explaining overeating, eating unhealthy foods, and performing sedentary behaviors (Riggs, Sakuma, & Pentz. 2007: 288-289). Research has suggested that there are large individual differences in levels of self-control (Tangney, Baumeister, & Boone. 2004). It is likely that people with high self-control will perform better in diet and exercise interventions.

Generally, self-control refers to those behaviors that people intentionally perform to achieve selected outcomes (Kazdin. 2001). Self-control may refer to the ability to change one's inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them (Tangney et al. 2004). As suggested in the literature, in the context of behavioral intervention, self-control has been applied primarily to behaviors that appear to have immediate positive consequences and delayed negative consequences such as eating behavior, smoking, sexual behaviors, and drinking alcohol (Kazdin. 2001). For example, excessive eating results in immediate positive outcome from the taste of food. However, the negative outcomes that follow the overeating, such as weight gain and physical discomfort, are delayed. People perform behaviors that counteract or appear to counteract the effects that would be expected from influences. For example, from the eating example, people refuse a dessert after a meal which appears to counteract the expected influences. Self-control has been also applied in behaviors that have immediate negative consequences and delayed positive consequences such as going to the dentist for cleanings and checkups, which may be uncomfortable in the present, to avoid serious dental problems in the future. Other examples are exercise or hard working in the present to obtain good health and good quality of life in the distant future.

Overall, self-control focuses on helping the individual perform against influences to achieve selected outcomes that he/she would like to obtain and involving the individual directly in administration or overcome of the influences.

Techniques of self-control

As suggested in the literature, there are several techniques used to train people how to control their own behaviors to achieve the desired outcomes. Major techniques

presented as follows are stimulus control, self-monitoring, and self-reinforcement and self-punishment (Kazdin. 2001).

Stimulus control

It is likely that a person performs behaviors by the influences of specific stimuli. As suggested in the literature, there are three related types of behavioral problems as presented below.

1) Behaviors that are under the control of stimuli which people want to change. For example, cigarette smoking may be under the control of many stimuli such as getting up in the morning, drinking coffee, talking with friends, studying, and being alone. It is cued by a variety of situations because it has been repeatedly associated with these situations. Because of these associations, the individual is likely to smoke a cigarette as these situations occur. The therapeutic goal is to eliminate the control that these stimuli exert over smoking.

2) Behaviors that are not controlled by particular stimuli. For example, students who have difficulty studying often have no particular setting, time, or cues associated with studying. Their studying is not consistently performed in the presence of any particular stimuli. The problem is experienced as difficulty in studying at one's desk or as being easily distracted wherever one studies. The therapeutic goal is to develop stimulus control over study behavior.

3) Behaviors that are under the control of inappropriate stimuli. Sexual deviance such as exhibitionism and fetishism is an example of this category. With these examples, sexual responses are controlled by stimuli that deviate from appropriate stimuli as determined by social standards. The therapeutic goal is to change the control that some stimuli exert over behavior and establish control of socially appropriate stimuli.

The use of stimulus control normally requires that a therapist consults with the participant to explain how stimulus control operates and to help the participant identify events that control or fail to control his/her behavior. Behavioral intervention may consist of helping the participant perform behavior under a new set of stimuli to develop stimulus control or helping the participant perform new behaviors under familiar stimuli to eliminate existing influences. For example, excessive eating may be under the control of seeing food or may not be controlled by particular stimuli. As suggested by the literature, stimulus control techniques used to eliminate the influences of stimulus (food) include shopping for

food with a list, and storing food out of sight. To develop stimulus control over eating; techniques such as eating only at home and only at the table (Kazdin. 2001; Sarafino. 2007), banning high-fat and high-sugar snacks in the schools, and offering low-caloric food for lunch and snacks (Sakvig et al. 2005), could be used.

Self-monitoring

Morrison & Bennett (2006: 120) defined self-monitoring or self-regulation as the process by which individual monitor and adjust their behavior, thoughts, and emotions in order to maintain a balance or a sense of normal function. Self-monitoring is not only included as a self-control technique, but also considered to be part of self-management. This technique consists of 2 activities; self-observation and self-recording. Self-observation is a systematic observing one's own behavior over time. Self-recording is a mean of keeping one's behavior actually performed, such as period, pattern, and circumstances which is normally noted as a diary. For example, food consumption diaries commonly instruct the person completing them to note the time which each meal or snack consumed, the location, whether anyone else was present, whether any particular cues exited, and the reasons for consumption. Some diaries will also ask the person to note whether he/she is experiencing positive or negative emotion (Kazdin. 2001: 309-310; Morrison & Bennett. 2006: 62-63).

It is likely that people rarely observe their own behavior in a systematic fashion. Therefore, when people are provided with the opportunity to observe their own behavior carefully, any changes may occur. However, the reasons that self-monitoring changes behaviors are not completely understood. The behavior changes may due to the self-monitoring itself which acts as reinforcement for the behavior. For example, people modify their consumption on the basis of their increase awareness of their intake (Morrison & Bennett. 2006: 63). The behavior changes may also due to any other actions that people do based on the self-recorded information. For example, weighing oneself may provide information that one is overweight and may initiate other actions, such as avoiding snack, exercise, until they achieve the desired weight. Self-monitoring can be applied in a variety of behaviors such as cigarette smoking, anxiety disorder, overeating, and studying. However, the literature suggested that self-monitoring by itself is a weak intervention (Kazdin. 2001: 310). Thus, it is used infrequently as a technique by it self. Instead, it is

usually combined with other techniques, especially, self-reinforcement and self-punishment, as presented below.

Self-reinforcement

Reinforcing consequences administered to oneself have also been used as self-control technique. The participants are trained to administer consequences to themselves dependent on behavior rather than receiving consequences from an external agent (such as a psychologist or dietitian).

As mentioned above, self-reinforcement is usually combined with self-monitoring which requires the participant to observe and record his/her behavior and determine whether it has met a criterion. The procedure of self-reinforcement combined with self-monitoring can be commonly summarized as follows.

1) The participant determines a behavioral goal required for reinforcement, in other words, determine what he/she expects to do;
2) The participant observes his/her behavior or what he/she actually does;
3) The participant records the actual behavior;
4) The participant compares whether the actual behavior meets the behavioral goal determined;
5) If the goal is met, the participant is given a reinforcer/reward.

In the application of self-reinforcement, the participant is free to reward himself/herself at any time when the expected behavior is actually performed. Sometimes, external agents may administer or give rewards to the participant. As suggested in the literature, who administers the rewards (oneself or someone else) may not be important. The importance is determining when to reinforce and for what behaviors. However, self-reinforcement is probably best achieved when the participant determines and administers the rewards by himself/herself (Kazdin. 2001: 314).

Self-punishment has been used infrequently and is usually combined with positive reinforcement (Mahony et al. 1973: 65-69; Belles & Bradlyn. 1987: 77-82). It is suggested that self-reinforcement has received more attention than self-punishment (Kazdin. 2001: 313). Punishment or encouraging self-punishment is also unethical in a study with children so is not considered further.

Effectiveness of intervention program based on self-control

Self-control techniques have been proved to be effective in improving eating behavior and exercise for many years. For example, Epstein, Wing, Koeske, & Valoski (1984: 429-437) examined the effects of family-based interventions on weight change. The sample was 53 families who had an obese child between the ages of 8 and 12 years. The participants were randomly assigned to one of three groups: diet, diet plus exercise, and waiting-list control. Self-control techniques including reinforcement, stimulus control, and self-monitoring, were implemented in the diet and diet plus exercise groups. For example, parents were paid for attendance at each of the intervention meetings and follow-up meetings. In addition, points were awarded to reinforce the children for behavior change, completing their assignment of the week, and weight loss of 0.5 to 1 lb (0.23 - 0.45 kg) per week, dependent upon the degree of obesity. Children's points were valid only if parents initialed their behavioral diary for that day, thus promoting regular review of behavior change by parent and child. These points were further exchanged for incentives. To develop stimuli control over eating behavior, the calorie controlled, nutritionally balanced Traffic Light Diet was implemented. Regarding exercise, the participants were encouraged to increase calorie expenditure gradually, from 200 kcal/day at week 1 to 400 kcal/day by week 12. Results showed that parents and children in both treatment groups had equal and significantly better weight change than those of the control group at 6 months. At 1 year, parents in the diet plus exercise group showed better weight losses than parents in the diet alone.

Consistent with this, Saelens et al. (2002: 22-32) evaluated the efficacy of behavioral weight control program in primary care. The sample was 44 overweight adolescents who were randomly assigned to either a behavioral weight control intervention or a typical care program which is a session of physician weight counseling. The instructional phase lasted four months and the follow-up phase was three months. The behavioral weight control intervention included diet, exercise, and parent involvement. Self-control techniques used in the intervention were reinforcement, stimulus control, and self-monitoring which the participants were given 10-20 minutes of telephone sessions weekly as well as mail contact. Results showed that children in the behavioral control weight group had better change in BMI z scores than children in the typical care group after the intervention. This finding was also evidenced at the 3-month follow-up.

A study reviewing Type 2 diabetes prevention intervention programs in children and adolescents (Burnet, Plaut, & Chin. 2002: 791) found that there were a number of studies using self-reinforcement as a self-control technique in the interventions. Examples of reinforcement evidenced in those studies included incentives and rewards, items with program logo, monetary rewards, family fun night, grocery certificates, lunch bags, recipe book, comic book, food list, stickers, magnifying glass, hats, and raffle for Disney trip.

Another pilot school-based Healthy Eating and Physical Activity Intervention was evaluated for its effectiveness in changing diet behavior, food knowledge, food self-efficacy, food preference, and food intention (Saksvig et al. 2005). Physical activity results were not reported in this study. The study was a pretest/posttest, single-sample design. The sample was 122 Native Canadian students in the third, fourth, and fifth grades, Sandy Lake, Ontario. In addition to improve self-efficacy by using self-efficacy sources as mentioned above, the study also used self-control techniques. To develop stimuli control over eating in the school, a policy banning high-fat and high-sugar snack foods was implemented. In addition, kindergartens to fifth grade students were offered the healthy breakfast snack program such as a glass of 1% milk, fruit, and rice cake. Results showed that there were significant increases in healthy eating behavior between baseline and follow-up.

German, Kirschenbaum, & Rich (2007: 111-121) examined the effect of self-monitoring on weight change. The sample was 228 obese children with the mean age of 13.2 and their parents from low-income minority families. The intervention lasted 6 months. In addition to the nutritional education sessions and a 12-week structured physical therapy/exercise program implemented as an intervention, the participants were provided self-monitoring booklets and were encouraged to record all food consumed during each week and to count the calories and fat grams in these foods. The number of steps taken per day and exercises done were also monitored. A similar procedure for self-monitoring was used with the parents for the first month of the intervention. Both children and parents also signed a behavioral contract committing to self-monitor at least 50% of time. Results demonstrated that children who self-monitored on most days lost most weight over 6 months of the intervention compared with less-consistent self-monitors. In addition, children whose parents self-monitored were more likely to self-monitor and lose weight.

Riggs, Sakuma & Pentz (2007: 287-310) evaluated two school-based pilot studies aiming to change children's self-control, emotional regulation, decision making, social competence, and actual behaviors related to food intake and physical activity as risk factors for obesity. The study design was single-group pre-test/pro-test. Seven lessons were

implemented to the participants who were fifth-grade school children in a large southwestern United States city. An example of a lesson was integrating a Control Signals Poster (CSP) into healthy dietary choices. The CSP is a poster modeled like a traffic signal that has red which meant “Stop-Calm Down”, yellow which meant “Slow Down-Think”, and green lights which meant “Go-Try My Plan”. At the red light, children were instructed to stop, take a long, deep breath, and calm down if necessary. Then, at the yellow light, the children identified a potential food, decided whether they thought the food was healthy, and made a plan by considering possible alternative foods if they determined the food to be unhealthy. Finally, at the green light, children ate the food if healthy. Results demonstrated that the participants increased their actual healthy eating and physical activity, self-control scores related to healthy eating and exercise, eating decision-making skills, and physical activity decision-making skills (especially TV viewing) and self-control from pre-test to posttest.

As suggested from the literature, it can be generally summarized that self-control has been used as one of the intervention principle to promote healthy eating and physical activity across settings, such as schools and primary care. Self-control techniques commonly used in the interventions were stimulus control, reinforcement, self-monitoring, and behavioral contract, where stimulus control was the most used technique. Self-reinforcement was usually combined with self-monitoring, with self-monitoring booklets/forms regarding diet and exercise were weekly provided. Overall, the diet and physical activity interventions employing self-control were more likely to be effective.

Derivation of the present study and contribution to the previous literature

The literature regarding self-control reviewed above provides the following rationales for this study. *First*, there is no study examining the associations between self-control of obesity-related Type 2 diabetes prevention behaviors and their objective outcome, body mass index. Thus, this study will examine the associations between self-control related to healthy eating and physical activity and its outcome to provide additional prospective data about these associations. The results will also provide the predictability of the PBC in actual behavior change, as self-control is identified in the theory (this is one of the study objectives as mentioned in Chapter 1). *Second*, no research has used peer discussion of self-

monitoring and mutual support as a technique to increase self-control in children sample. Thus, this technique will be used in the intervention principles of the present study.

Principles and concepts of implementation intention

The principles and concepts regarding implementation intention reviewed in this section are; 1) background of implementation intention based on TPB limitations; 2) definition and format of implementation intention; 3) mechanisms and components of implementation intention, as presented below.

Background of implementation intention based on TPB limitations

Utility of the TPB

The TPB has been widely used to explain and predict health-related behaviors including diet and exercise. According to the TPB (Ajzen. 1991, 2002), the likelihood of someone engaging in a particular behavior can be predicted by their intention to perform that behavior or behavioral intention, which is concerned as the most immediate and important predictor of behavior. Intention, in turn, is predicted by 3 independent variables namely attitude, subjective norm, and perceived behavioral control (PBC). A number of studies support the predictions of the TPB. For example, Godin and Kok (1996) reviewed 18 studies on exercise, reporting that intention and PBC together explained approximately 36% of the variance in exercise behavior. Intention was a significant determinant of behavior in all studies whereas PBC was a significant determinant in about half of the studies. Moreover, attitude, subjective norm and PBC together explained about 42% of the variance in intention to exercise. Hagger, Chatzisarantis, & Biddle's (2002) meta-analysis of 72 studies applying the TPB in the domain of exercise confirmed this pattern of findings and reported substantial correlations between each of the key components. In relation to diet, the TPB generally explains for 31%-77% of the variance in intention to eat and 9%-46% of the variance in healthy eating behavior (Backman, Haddad, Lee, Johnston, & Hodgkin, 2002; Baker, Little, & Brownell, 2003; Bogers, Brug, Assema, & Dagnelie, 2004; Conner, Norman, & Bell, 2002; Nejad, Wertheim, & Greenwood, 2004). Consistent with this, an average of 28% of the variance in behavior has also been reported in a mata-analysis of 422 studies (Sheeran & Silverman. 2003: 2154).

The results from the study 1 (Patcharee Duangchan. 2007) applying the TPB to determine the factors that may predict engagement with physical activity and healthy eating

behavior and obesity in fourth grade schoolchildren, aged 9-11 years, in four demonstration schools, Bangkok, found that attitude, subjective norm and PBC of physical activity significantly predicted intention to perform physical activity, explaining 70.2% of the variance. For healthy eating behavior, the TPB explained 69.1% of variance in intention where subjective norm and PBC were significant predictors.

Limitations of the TPB and background to implementation intention

Despite the success of the TPB, there have been some concerns about the theory. First, the TPB does not address the processes by which intentions are translated into action (Sheeran & Silverman. 2003). It is suggested that a number of difficulties possibly prevent translating one's intention into action. For example, people may forget their intention because they have other things to be concerned with (Webb & Sheeran. 2007). Second, it is questioned whether intention predicts behavior change. Although it is evidenced that intention account on average for 28% of the variance in behavior, the success in performing the intended behavior is not guaranteed. Orbell & Sheeran (1998) found that only 43% of woman who intended to attend for cervical screening actually did so during the following year. Consistent with this, Sheeran (2002) reviewing studies on health behaviors including exercise, condom use, and cancer screening, found that the median proportion of participants with positive intentions who did not perform the behavior was 47%, showing that there could be a gap between people's intention and actual behavior. Furthermore, weak intention-behavior relation is evidenced in some studies. For example, Patcharee Duangchan (2007) demonstrated that intention and PBC together accounted for 22.3% and 23.4% of the variance in physical activity and healthy eating behavior respectively where, intention did not significantly predict such behaviors. As shown in the literature, it is more likely that the strength of intention-behavior relation varies with the type of specified behavior, and additional variables, such as past behavior and habits, may turns out to be a better predictor than intention (Gollwitzer. 1999; Rhodes, Macdonald, & McKay. 2006). For example, Rhodes et al. examined predictors of leisure-time physical activity intention and behavior in 364 9-11-year-old children in Canada based on the TPB. Longitudinal model employing autoregressive coefficients of the TPB and physical activity across 3-month time intervals demonstrated that prior physical activity (time 1) had a higher standardized effect (.33, $p < .05$) on physical activity (time 2) than intention (standardized effect = .18, $p < .05$). What is needed from these concerns is a concept or theory that will

strengthen the intention-behavior relations and show how intentions can be translated into effective action. To overcome these concerns, implementation intention is proposed.

Implementation intention has been shown to enhance the prediction of behavior provided by the TPB, reduce the impact of habit on future behavior (Sheeran & Orbell. 2000), enhance people's ability to self-regulate their behavior (Webb & Sheeran. 2003), and strengthen the intention-behavior relationship (Latimer et al. 2006; Milne et al. 2002; Prestwich et al. 2003). In addition, as suggested by meta-analyses, implementation intention is effective in promoting goal achievement with a medium to large effect size (d = 0.65) across a wide range of health behaviors, across a range of samples and measures of behaviors (Webb & Sheeran. 2003: 280; Sheeran, Aubrey, & Kellett. 2007: 854).

Definition and format of implementation intention

Implementation intention has been conceptualized by Gollwitzer (1993, 1999). As stated by Gollwitzer (1999: 494). "Implementation intentions are subordinate to goal intentions and specify the when, where, and how of responses leading to goal attainment. They have the structure of '*When situation x arises, I will perform response y'* and thus link anticipated opportunities with goal-directed responses. It is not a person's self that is linked to a desired end state (as with goal intentions); rather, the person commits himself/herself to respond to a certain situation in a specific manner. Implementation intentions serve the purpose of promoting the attainment of the goal specified in the goal intention".

According to Gollwitzer (1993, 1999), implementation intention are distinguished from goal intention, which is concerned in the TPB. It is proposed that there are 2 phases of performing a behavior The *first*, is a deliberative or *motivational phase* during which the person decides to act, or to theoretically explain, the person forms an intention to perform a behavior on a basis of his/her attitude, subjective norm, and PBC as the form 'I intend to do X'. For example, "I intend to exercise for 30 minutes three times per week". The *second* is an implemental or *volitional phase* during which the person plans to perform the behavior at a particular time and in a particular place as the form 'I intend to do X at time Y and in Place Z' or '*If situation X are encountered, then I will perform goal-directed behavior Y*'. For example, "I intend to exercise for 30 minutes at the gym on Tuesday afternoon after work" (Latimer et al. 2006; Sheeran & Silverman. 2003; Webb & Sheeran. 2007). Implementation intention affects the volitional phase of performing a behavior whereas the TPB focuses on the motivational phase.

It is suggested that, to form an implementation intention, the person must first identify a response or behavior, and second, anticipate a suitable situation or opportunity to initiate that response. For example, with regards to the above example, the person may specify “exercise for 30 minutes” and specify a suitable opportunity as “at the gym on Tuesday afternoon after work” in order to enact the goal intention to exercise (Sheeran, Webb, & Gollwitzer).

How implementation intention promotes goal attainment is presented below.

Mechanisms and components of implementation intention

The process underlying the effects of implementation intentions is not considered to lie within the individual. It is not suggested that implementation intention alters one’s motivation. Rather, “the underlying theory is that by forming implementation intentions, people pass on the control of goal-directed activities from the self to the environment. The intended behavior is subjected to external control through the environmental cues specified in one’s implementation intention. In other words, when these cues (occasions or opportunities) or means are encountered, they are expected to prompt the intended behavior” (Gollwitzer. 1993: 153). Implementation intention ensures that one’s intention to perform a behavior is specific regarding the timing and location of its performance, and also ensures that one’s intention to perform the behavior is not forgotten. It is evidenced that, by forming implementation intention, the intended behavior can be initiated more immediately, more efficiently, with less effort, and in a relatively automatic fashion (Gollwitzer. 1999; Sheeran & Orbell. 2000; Webb & Sheeran. 2007).

As mentioned above that the implementation intentions have the structure of ‘*When situation x arises, I will perform response y’* or ‘*If situation X are encountered, then I will perform goal-directed behavior Y*’, there are 2 components, the *if*-component and the *then*-component of the plan. Previous research suggested that implementation intentions are effective because of 2 processes; 1) they heighten the accessibility of the specified situational cues (the *if*-component); and 2) they strengthen the associations between cues (the *if*-component) and responses (the *then*-component) (Gollwitzer. 1999; Sheeran & orbell. 2000; Webb & Sheeran. 2007).

Heighten accessibility of the specified situational cues

Implementation intentions heighten the accessibility of the specified situational cues by specifying a suitable opportunity to act (e.g. “at the gym on Tuesday afternoon after work” as shown in the above example). This heightened accessibility enhances information processing related to the specified cue, more particularly, it becomes easy to detect and attend to the specified opportunity when one encounters it later. In other words, implementation intentions increased the accessibility of environmental cues that a person had anticipated in his/her plans. Further, the heightened accessibility possibly means that the specified situational cues attract and focus attention although the person is occupied by other concerns, and this idea has been supported by Gollwitzer et al. (Sheeran, Milne, Webb & Gollwitzer. 2005; cited Gollwitzer et al. 2002).

Strengthened associations between cues and responses

According to Gollwitzer (1993; 1999), forming implementation intentions means that as soon as the specified cue is encountered, the intended behavior will be initiated automatically. Automaticity of implementation intentions have 3 aspects; immediacy, efficiency, and lack of awareness (Sheeran et al. 2005).

How immediate implementation intention effects are, is supported by several studies employing speed of responding as the dependent variable. In sum, it can be generally concluded that people who form implementation intention are more likely to immediately seize the opportunity to act as planned, in other words, action or response initiated by implementation intentions is faster than that initiated by goal intentions. Regarding efficiency, it means that implementation intentions do not require much cognitive resource. Previous research supported that effects of implementation intention on task performance did not reduce or affect performance on a secondary task (Sheeran et al. 2005). The following topic provides more detail about the efficiency of implementation intention.

Implementation intention *vs* self-control (Webb & Sheeran. 2003)

Efficiency of implementation intention is usually explained in terms of the cognitive demands that it makes. Previous literature demonstrated that the ability to self-regulate one’s behavior is limited. According to the self-control strength model, exerting self-control on an initial task reduces performance on a subsequent task that also requires self-

control. Moreover, it appears that cognitive, emotional, and physical acts of self-control all use the same limited resource. If this limited resource is diminished, the person can not longer effectively regulate his/her behavior. Thus, preventing such diminishing would be beneficial. Implementation intentions have been proved to enhance people's ability to self-regulate their behavior and conserve self-regulatory capacity. Webb & Sheeran (2003) conducted two experiments to test whether forming implementation intentions could prevent ego-depletion, defined as temporary depletion of self-regulation capacity by an initial act of self-control, and/or offset the effects of ego-depletion. Participants were undergraduate psychology students tested individually in a single session for both experiments. Result of experiment 1 found that participants who form implementation intentions during an initial ego-depleting task subsequently showed greater persistence on an unsolvable puzzles task compared to participants who did not form implementation intentions, demonstrating that the formation of implementation intentions can prevent ego-depletion. Results of experiment 2 showed that among participants who had been ego-depleted during an initial task, forming implementation intentions improved subsequent performance on a Stroop task to the level exhibited by non-depleted controls, indicating that implementation intentions provides a self-regulatory strategy for the person who is already ego-depleted.

Consistent with this, a recent study (Martijn, Albert, Sheeran, Peters, Mikolajczak, & de Vries. 2008) demonstrated that implementation intentions conserve self-regulatory strength. Three experiments were conducted to test whether implementation intentions lead to tenacious goal striving following blockage of an initial attempt to reach the goal. For all experiments, participants were undergraduate students. Experiment 1 found that implementation intentions resulted in more attempts to realize one's goal. In experiment 2, it is found that when participants formed an implementation intention, their repeated attempt was acted out as intensely as their first, blocked attempt. Finally, experiment 3 showed that implementation intentions allow participants to seize an alternative route to goal attainment even though the alternative route required more effort compared to the route in the initial attempt. In sum, these three experiments suggest that people who form implementation intentions appear to reach their goal even if they encounter an unexpected barrier. It is evidenced, from these results, that forming implementation intention conserves self-regulatory capacity for future goal striving.

Effectiveness of intervention programs based on implementation intention

As suggested by the literature, the effects of the implementation intention were independent from the effects of the previous behavior, demographic variables, and variables from the TPB; attitudes, subjective norms, PBC, and intention. In addition, unlike behavioral intention, the implementation intentions were effective for both short and long time intervals (Sheeran & Silverman. 2003). Consistent with this, Ziegelmann, Luszczynska, Lippke, & Schwarzer (2007) compared the predictive power of goal intentions and implementation intentions. The sample was 368 persons participating in orthopedic rehabilitation. Goal intentions to perform physical activities were assessed with three items: “I intend to exercise as part of my daily routine,” “I intend to exercise as part of my daily locomotion (e.g., cycling),” and “I intend to exercise as part of my leisure time.” Implementation intentions were measured with the three items: “I have already planned precisely when to exercise,” “I have already planned precisely where to exercise,” and “I have already planned precisely how to continue exercising even when I feel limited by poor health.” Answers were scored on a 4-point scale with *not at all true*, *not true*, *a little true,* and *absolutely true*. Physical activity was assessed after rehabilitation (T1) 6 months later (T2) and 12 months later (T3). Results demonstrated that goal intentions and implementation intentions predicted exercise during rehabilitation. However, goal intentions did not predict exercise at later points in time, whereas implementation intentions continued to be associated with exercise 12 months later.

More generally, implementation intentions have been applied to a variety of health behaviors where the timing and location for performing the behavior is uncertain or where the specific behavior to be performed is unclear, including, for example, medication adherence or eating a healthy diet (Luszczynska, Sobczyk, & Abraham. 2007; Sheeran & orbell. 2000).

The effectiveness of implementation intention interventions applied to diet and exercise, is now presented.

Effectiveness of implementation intention intervention on diet

Effectiveness of implementation intention on diet was supported by the following studies. Verplanken and Faes (1999) examined the efficacy of implementation intentions in promoting a healthy diet in 100 students. The participants in the implementation intention condition were asked to make a plan to eat healthily on one particular day in the next five

days (i.e., plan exactly what they would eat and drink during the specified day). Participants in the control condition did not form this plan. All of the participants were asked to keep a diary for five days in which they recorded everything they ate and drank. Results indicated that participants who formed implementation intentions ate significantly more healthily than did participants in the control condition.

Armitage (2004) examined the efficacy of implementation intentions in promoting a low-fat diet among 264 company employees. Participants in the implementation intention group received the following instruction *"We want you to plan to eat a low-fat diet during the next month. You are free to choose how you will do this, but we want you to formulate your plans in as much detail as possible. Pay particular attention to the situations in which you will implement these plans."* The food frequency measure was used to compute three indices of dietary intake: Total fat intake, saturated fat intake, and fat intake as a proportion of total energy intake. Results, by within-participant analyses, indicated that participants who formed implementation intentions showed significant reductions in fat intake at follow-up compared to baseline according to all three indices. On the other hand, no change over the one-month period was found among participants who had not formed implementation intentions, Moreover, between-participants analyses indicated that although there were no differences between the groups at baseline, the diet of participants in the implementation intention group was significantly lower in fat (according to all three indices) than was the diet of control group. These findings suggested that forming implementation intention can be effective in promoting a healthy diet among representative samples.

Consistent with previous studies, de Nooijer et al. (2006) examined the effects of implementation intention on fruit intakes and whether those effects were dependent on positive goal intentions at baseline. The sample was 535 Dutch adults who were randomly assigned to either receive implementation intention instructions or not. Two questionnaires were completed with a 1.5-week time interval. Participants in the implementation intention condition were asked to form implementation intentions to eat an extra serving of fruit per day during one week, with the following instruction: *"We would like to ask you to try to eat an extra portion of fruit per day during the next week (a portion of fruit consists of for example one apple, two tangerines, or a bowl of strawberries, etc.). Try to plan this as precisely as possible. Below you can fill in when, where, and what you plan to eat."* Three items followed to encourage making implementation intentions: when (e.g. before breakfast, during breakfast, between breakfast and lunch, during lunch, between lunch and dinner, during dinner, after dinner, or other time), where (e.g. at the table where you eat, in or around the

house, while going from destination A to B, in a worksite restaurant or cafeteria, at the workplace, in front of television, or other place), and what (e.g. apple or other fruit juice; tangerines, oranges, grapefruits, lemons; or other citrus fruits; apples, pears, bananas, or other fruit, including preserved fruits; applesauce). In addition, participants were asked to write down how they planned to remind themselves of their plans. Results showed that the participants in the implementation intention group reported a high frequency of eating an extra serving of fruit per day. The implementation intention effect on frequency of extra fruit did not depend on goal intention at baseline.

Moreover, effects of implementation intentions on behavioral outcomes, such as weight, are also published. For example, Luszczynska et al. (2007), examined whether Implementation Intention Prompt (IIP) enhance weight reduction among overweight and obese woman. The sample was fifty-five overweight or obese woman; aged from 18 to 76 years, BMI from 25.28 to 48.33, enrolled in a commercial weight reduction program. The study design was randomized controlled trial where each participant was randomly assigned to either an IIP or control condition. The control condition consisted of weekly 1-hr group meetings for 7–12 participants focusing on nutrition and physical activity, behavioral weight control strategies (i.e., self-monitoring,), and social support by group members. Regarding the IIP condition, the participants were invited to make a plan about their nutrition for the following week. For example, the participants were invited to write detailed plans regarding six food categories (sweets, fat food, vegetables, fruits, meat, and whole grain products) in the IIP form. The form included a prompt for each food category of the following form: *"This is my plan about sweets consumption for the next 7 days. During the next week, I plan to eat . . . (please, write down what type and amount of sweets you plan to eat) at . . . (write down the time) in/at . . . (describe the situation/place where you plan to eat this food)."* In addition to making a plan about nutrition, the IIP participants were asked to make coping plans regarding risky or tempting situations. Example of making coping plans is as follows: *"Many situations may tempt you to eat something that you had not meant to. Make a plan about how you would react to these risky situations and fill in the form."* The form provided the following three prompts: *"I have my own plan that will help me to maintain my healthy diet. If I am hungry, then instead of eating an unhealthy snack I plan to . . .(write down what you plan to do). If someone offers me my favorite unhealthy food then in order not to eat it I plan . . . (write down what you plan to do). If I meet with my friends or family over dinner, then in order to eat healthy food I plan . . . (write down what you plan to do)."* Data were collected twice, with a time gap of 2 months. The outcome was participants' change in weight and BMI from

pre-intervention to follow-up. Results showed that, on average, the participants in IIP condition lost 4.2 kg (95% confidence interval = 3.19, 5.07), whereas control participants lost 2.1 kg (95% confidence interval = 1.11, 3.09). The change in frequency of planning is a key mechanism explaining greater weight reduction and BMI generated by implementation intention formation.

In addition to promoting healthy eating behavior, implementation intentions were also effective in reducing unhealthy food consumption. Research conducted by Sheeran and Milne (Sheeran et al. 2005 cited Sheeran & Milne. 2002) supported this benefit of implementation intention. Instead of asking participants to plan what healthy food they would eat, participants were asked to reduce their consumption of an unhealthy snack food by planning to eat the unhealthy food only on particular occasions. Findings indicated that forming implementation intention significantly reduced self-reported snack food consumption over a one-week period.

Effectiveness of implementation intention intervention on physical activity

Effectiveness of implementation intention intervention on physical activity was also supported. For example, Milne et al. (2002) randomized 248 student participants to three conditions: a no-intervention control group, an intervention based on Protection Motivation Theory (PMT), and a combination of the PMT intervention and implementation intentions. Participants in the implementation intention condition were instructed to complete the following statement: *"During the next week I will partake in at least 20 minutes of vigorous exercise on _____ (day or days) at _____ (time of day) at or in_____ (place)".* Efficacy of those three conditions on exercise was compared. The results showed that participants who had received the PMT intervention and had formed an implementation intention exercised significantly more often compared to both the PMT only and control groups—even though intention scores among this group were the same as the PMT-only condition. When the exercise data were analyzed in terms of the percentage of participants who exercised at least once, it is found that only 38% of the control group and 35% of the PMT-only group exercised at least once, whereas fully 91% of participants who formed implementation intention did so.

Prestwich, Lawton, and Conner (2003a) conducted a similar study but with two important refinements. *First*, their study involved a full 2 (motivational intervention: decision balance sheet vs. control) x 2 (implementation intentions: formed vs. not formed) design.

Second, Prestwich et al. employed an objective measure of fitness (average heart rate while jogging over a fixed distance) as well as two self-reports of exercise behavior (frequency and duration). Results from the behavioral follow-up taken two weeks from the baseline indicated that participants who had both completed the decision balance sheet and formed an implementation intention showed significantly greater change in frequency of exercise, duration of exercise, and fitness level compared to controls.

Effects of implementation intentions on behavioral outcomes, such as weight, are also published. Luszczynska et al. (2007), examined whether Implementation Intention Prompt (IIP) enhance weight reduction among overweight and obese woman. The sample was fifty-five overweight or obese woman; aged from 18 to 76 years, BMI from 25.28 to 48.33, enrolled in a commercial weight reduction program. The study design was randomized controlled trial where each participant was randomly assigned to either an IIP or control condition. The control condition consisted of weekly 1-hr group meetings for 7–12 participants focusing on nutrition and physical activity, behavioral weight control strategies (i.e., self-monitoring,), and social support by group members. Regarding the IIP condition, the participants were invited to make a plan about their physical activity for the following week. For example, the participants were invited to write detailed plans regarding exercise in the IIP form as follows: *"Please write down when and where you plan to exercise, and exercises you plan to perform: During the next week, I plan to exercise…times per week, for …minutes per session. I plan to exercise between…and…hours. I plan to do such exercises as…(please write down what exercises you plan to do), at…(write down where; e.g. in which gym, at home, etc.)".* In addition to making a plan about physical activity, the IIP participants were asked to make coping plans regarding risky or tempting situations. Example of making coping plans is as follows: *"Many situations may place you at risk for quitting exercise. Make your plan about how you would deal with these situations. If I am tempted to do something else instead of my exercise, I plan to…(write down, how you plan to deal with temptations."* Data were collected twice, with a time gap of 2 months. The outcome was participants' change in weight and BMI from pre-intervention to follow-up. Results showed that, on average, the participants in IIP condition lost 4.2 kg (95% confidence interval = 3.19, 5.07), whereas control participants lost 2.1 kg (95% confidence interval = 1.11, 3.09). The change in frequency of planning is a key mechanism explaining greater weight reduction and BMI generated by implementation intention formation.

As presented in the previous literature, it can be generally concluded that a number of studies have used implementation intentions to promote healthy eating behavior and physical activity. However, little research examined the effects of implementation intentions on behavioral outcomes, such as weight and BMI. Those studies were mostly conducted in adult samples who were commonly randomized to either implementation intention or control group. Performance of behaviors was measured at a later time-point. In sum, results suggest that implementation intentions were effective in enhancing the likelihood of healthy eating behavior and physical activity.

Derivation of the present study and contribution to the previous literature

The literature regarding implementation intentions reviewed above provides the following rationales for this study. *First*, it has been suggested that implementation intentions may contribute to habit formation and most health behaviors are assumed to be at least partly determined by habits. In addition, health related behavior including exercise regularly and healthy eating generally need an extra effort because there are immediate costs and only long-term rewards. Thus, implementation intention may provide beneficial effects. *Second*, no previous studies have employed implementation intention combined with self-control and self-efficacy in developing interventions to promote healthy eating and physical activity. *Third*, previous studies have employed undergraduate or adult samples. The present study will extend the scope of the implementation intention construct by applying implementation intentions to a sample of children, and combining them with self-control and self-efficacy in developing the intervention.

The present study will, therefore, make an important theoretical contribution to the literature if it can be demonstrated that behavioral intervention programs employing implementation intentions, self-control and self-efficacy increase the likelihood of achieving goals, physical outcomes that can be achieved by performing healthy eating behavior and physical activity.

CHAPTER 3

METHODOLOGY

The aim of this study was to examine the effectiveness of the SSII-Healthy Eating Intervention and Physical Activity Intervention Programs in developing self-efficacy, self-control, healthy eating behavior, physical activity, and thereby combating obesity-related Type 2 diabetes. The methodology for conducting the study is presented as follows.

1. Population and sample
2. Study design
3. Study instrument
   3.1 Measures
   3.2 Intervention programs
4. Study procedure
5. Data analysis

Population and sample

The population of this study was fourth to fifth grade obese schoolchildren in elementary schools in Bangkok. The study sample was selected from two elementary schools, Bangkok, which have similar socioeconomic status: Sawadeewittaya School and Watditsahongsaram School. Two schools were used in this study, instead of one school, to obtain independent samples and minimize the effects of possible contamination which may be occur when only one school is used. It was felt that children on the different programs were likely to discuss what they were learning and doing and influence each other in this way. Hence separate schools give better control.

The inclusion criteria were as follows, children:

1. Aged between 9-11 years;
2. Defined as obese by a BMI-for-age $\geq$ 85th percentile (CDC. 2005);
3. Assent to participate in the study and their parent or guardians consent to their participation in the study;
4. Have not experienced in participating any intervention programs related to obesity;
5. Have low or inappropriate existing levels of healthy eating behavior and physical activity.

If students have a BMI-for-age $\geq$ 85th percentile, their family was contacted by telephone/letter and an information packet was also sent to them telling them about the study and asking for their participation. Interested participants were invited to a specific session to give more detail about the importance of the interventions for their health. Students participating in the specific session were also interviewed to provide background information on healthy eating behavior and physical activity in the past week, demographic data of students and their parents, and participate in a physical examination. The aim of the physical examination was to provide additional motivation for participation. The participants who met the inclusion criteria were invited to participate in the study.

According to a review about study sample size in weight loss interventions (Wilfley et al. 2007), the targeted sample of this study was 20 students from each of the two elementary schools thereby providing a pooled sample of forty students. Compared with other published interventions, a group size of 20 was around the mean size and remains manageable for the researcher. In addition, this group size met the required number based on the previously reported intervention changes in body weight and BMI percentile among children. With a 2-sided, .05 significant level (α = .05), with weight change as the primary variable, 18 subjects in each group would be required to detect a significant difference at 90% power. For BMI percentile, 11 subjects per group would be required to detect a significant difference with 90% (Nemet, Barkan, Epstein, Friedland, Kowen, & Eliakim. 2005: e443). As far as data analysis was concerned, the correlational data would be on the total sample of 40 participants and this number meets the criteria specified by Kline (2002: 30) with a minimum of 4 participants per variable. If necessary some variables could be combined to ensure that the analyses were valid.

Study design

Design of Intervention

The aims of the interventions were enhancing self-efficacy and self-control related to healthy eating behavior and physical activity and thereby improving the healthy eating and physical activity behaviors of both the overall group and the individual participants. As two interventions were being implemented, questions arose about which intervention was likely to be more effective and if the order in which they were implemented has an effect. One way of addressing this was to use an independent sample, matched-pairs comparison with the interventions counter-balanced (Coolican. 1999; 83). This could be conceptualized as

two-group crossover design (Montgomery. 2001: 150). There would be one group in each of two elementary schools. Each school would have the interventions implemented in a different order. A coin toss randomizes the schools to the first or second group. This is demonstrated in Figure 5.

School 1	School 2
SSII-Healthy Eating Intervention Program (A, Time 1)	SSII-Physical Activity Intervention (B, time 2)
SSII-Physical Activity Intervention (B, Time 1)	SSII-Healthy Eating Intervention Program (A, Time 2)

FIGURE 5 Implementation of 2-group crossover design

This has the advantage of providing independent samples. The samples were matched for BMI, sex, and socioeconomic background, thus providing a matched-pairs design. By implementing the ABBA with the two groups, the order effects of the interventions could be measured as well as the effects of the combined interventions.

However, in research when group data is pooled to evaluate the impact of interventions, it may not adequately reflect the behavior change of the individual participants. The group average of the behaviors may be changed, but the behavior change of an individual may not be consistent with the group (Kazdin. 2001: 88-89). Thus, as data about individual behaviors may be important as a measure of intervention effects, the research design would continuously assess the impact of the intervention on both the entire group and the individual participants. In this study, the effectiveness of the SSII-Healthy Eating Intervention and Physical Activity Intervention Programs were examined. In addition, the impact of the individual and combined intervention programs was also compared.

Overall Study Design

1. Baseline measures.

Baseline measures were conducted before the start of the intervention in both groups. Data collected at the baseline provides information about the existing levels of the dependent variables before the intervention begins. This serves as the basis for comparing with the future levels of the dependent variables when the intervention is implemented. The

dependent variables measured in the baseline were healthy eating self-efficacy, physical activity self-efficacy, healthy eating self-control, physical activity self-control, knowledge on obesity-related Type 2 diabetes, healthy eating behavior, physical activity, and BMI. As suggested in the previous literature (Ashley. 2008; Conner & Spark. 2005; Sarafino. 2007), readiness to change and also emotional factors are implicated in behavior change and need to be addressed in interventions. Thus, a measure incorporating readiness to change behavior and feelings about it was also measured at the baseline.

2. Interventions

There were two interventions in this study. The first was the SSII-Healthy Eating Intervention program, and the second was the SSII-Physical Activity Intervention Program. These two interventions were developed using self-efficacy, self-control, and implementation intention approaches. As the desired outcome of the study is the adoption of healthy eating behavior and physical activity by the participants, it was considered unethical to ask participants to cease physical activity or healthy eating behavior after the first intervention. This meant that there could not be a wash out period between the two interventions; hence the need for two samples with matched pairs in each. Two independent samples also allow the assessment of any effects related to the order in which the interventions were implemented. The two samples should be matched pairs to allow direct comparisons and minimize/control the effects of possible confounding factors and thereby provide the study with strong internal validity. The samples were matched for BMI, sex, and socioeconomic background.

3. Measures at the end of intervention 1

Measures at the end of intervention 1 were conducted within 1 week after the completion of SSII-Healthy Eating Intervention program for School A, and SSII-Physical Activity Intervention Program for School B. Data on the levels of the same dependent variables as measured at the baseline were collected. This allows measurement of the effects of the individual intervention programs by comparing participant and group scores at both times. In addition, as a different intervention was implemented in each matched-pair group, the intervention, which was likely to be more effective would be identified.

4. Measures at the end of the combined intervention.

This end point measure was conducted within 1 week after the last lesson of the SSII-Physical Activity Intervention in School A, and the SSII-Healthy Eating Intervention in School B. Data on the levels of the same dependent variables as measured at the baseline were collected. Any boredom factor caused by the students repeating the measures would

be minimal as there has been several weeks between the assessments. This provides information to assess the effects of combined intervention programs and also any effects related of the order of presentation of an individual intervention.

5. Monitoring Measures

As mentioned above, this study would assess the impact of the interventions on both the entire group and the individual participants. Thus, during the implementation of the interventions, there were monitoring measures where data on healthy eating behavior and physical activity of each participant were continuously assessed using diaries, and weight was measured and recorded weekly. This has the advantage of providing the details of behavior change of an individual and thereby provides data for investigating if the behavior change of an individual was consistent with that of the entire group. The diaries were developed to be fun, to motivate the child, and be easy to complete. The participants were taught how to record the diaries at the beginning of baseline stage, and also asked to give their diaries to the researcher weekly at the beginning of each lesson. However, parental participation could be an important variable in determining outcome for the child so it was recorded.

The overall study design was presented in Figure 6.

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Phase			A1							B2						
Group 1	Baseline measure of SSII-Healthy Eating Intervention		Implementation of SSII-Healthy Eating Intervention Program						End measure of SSII-Healthy eating Intervention	Implementation of SSII-Physical Activity Intervention Program						End measure of combined interventions
			B1							A2						
Phase	Baseline measure of SSII-Physical Activity Intervention		Implementation of SSII-Physical Activity Intervention Program						End measure of SSII-Physical Activity Intervention	Implementation of SSII-Healthy Eating Intervention Program						End measure of combined interventions
Group 2	- Self-efficacy - Self-control - Knowledge - Healthy eating behavior - Physical activity - Affective beliefs and readiness to change behavior - Weight - Height		- Healthy eating behavior - Physical activity - Weight						- Self-efficacy - Self-control - Knowledge - Healthy eating behavior - Physical activity - Weight - Height	- Healthy eating behavior - Physical activity - Weight						- Self-efficacy - Self-control - Knowledge - Healthy eating behavior - Physical activity - Affective beliefs and readiness to progress - Weight - Height
Measures																

FIGURE 6 The overall study design

Study instrument

There were two types of the instruments in this study. The first was the study measures and the second was the study interventions. These were presented as follows.

Study measures

Measure for demographic data

A demographic data questionnaire was developed to collect information about sex, class, history of illness, experience of eating vitamins/supplementary food, breast feeding, paternal diabetes, maternal diabetes, diabetes history of paternal family, diabetes history of maternal family, father's occupation, mother's occupation, family income, father's education, mother's education, father's BMI, and mother's BMI.

Measures of psychosocial variables

The psychosocial variables assessed were knowledge about obesity and Type 2 diabetes, healthy eating self-efficacy, physical activity self-efficacy, healthy eating self-control, physical activity self-control, and emotion and readiness to change, which were described as follows.

1. *Knowledge about obesity-related Type 2 diabetes.* Knowledge is defined as students' capabilities to recognize information about risk factors, symptoms, prevention and treatment, and health consequences of obesity and Type 2 diabetes. To assess their knowledge, the participants were asked to respond to a true-false type test containing questions corresponding to the knowledge definition. Each item was scored 1 for the right answer, and scored 0 for the wrong answer. Scores were summated for the overall knowledge, with higher scores indicating greater knowledge of obesity and Type 2 diabetes. An example of a knowledge item was as follows.

- Family history of Type 2 diabetes is the major risk factor for Type 2 diabetes in children and adolescents?
  - ☐ True
  - ☐ False

The correct items were randomized to prevent response set.

2. *Healthy eating self-efficacy.* Healthy eating self-efficacy is defined as students' beliefs about their capabilities to perform specific behaviors corresponding to the definition of healthy eating behavior in any given set of circumstances. To assess the

healthy eating self-efficacy, the participants were asked to rate how confident/sure they are that they could eat fruit and vegetables, avoid fast food, fatty food and snacks, and avoid sugary foods and sugar-sweetened soft drinks. This follows established procedure in the research literature (Parcel, Edmundson, Perry, Feldman, O'Hara-Tompkins, Nader, et al. 1995: 26; Sallis, Pinski, Grossman, Patterson, & Nader. 1988: 285-6). Reponses were made on a 5-point Likert-type scale from 'very sure I could not do it' (score = 1) to 'sure I could do it' (score = 5). An example of healthy eating self-efficacy item was as follow.

- How sure are you that you can eat fruits instead of ice cream for dessert?
  a. Very sure I **could not** do it
  b. A little sure I **could not** do it
  c. Uncertain
  d. A little sure I **could do** it
  e. Very sure I **could do** it

3. *Physical activity self-efficacy.* Physical activity self-efficacy is defined as students' beliefs about their capabilities to perform specific behaviors corresponding to the definition of physical activity in any given set of circumstances. To assess the healthy eating self-efficacy, the participants were asked to rate how confident/sure there are that they could exercise daily for at least 30 minutes, be physically active in any free time to the extent that it causes sweating, and avoid inactivity such as TV viewing. This follows established procedure in the research literature (Parcel et al. 1995: 26; Sallis et al. 1988: 285-6). Reponses were made on a 5-point Likert-type scale from 'very sure I could not do it' (score = 1) to 'sure I could do it' (score = 5). An example of a physical activity self-efficacy item was as follow.

- How sure are you that you can play outside instead of watching TV after school?
  a. Very sure I **could not** do it
  b. A little sure I **could not** do it
  c. Uncertain
  d. A little sure I **could do** it
  e. Very sure I **could do** it

4. *Healthy eating self-control.* Healthy eating self-control is defined as students' beliefs about their control over the specific behaviors corresponding to the definition of healthy eating behavior, and their ability to change their unhealthy eating behavior to

healthy eating behavior. The participants were asked to rate 1) how much they believe that they can control themselves to eat fruit and vegetables, avoid fast food, fatty food and snacks, and avoid sugary foods and sugar-sweetened soft drinks, and 2) how much each of specific eating behaviors reflects their current behavior. This follows established procedure in the research literature (Ajzen. 2002; Tangney et al. 2004; Brandon, Oescher, & Loftin. 1990). Responses were made on a 5-point Likert-type scale ranging from 'strongly disagree' (score = 1) to 'strongly agree' (score = 5). An example of healthy eating self-control item was as follow.

- The decision to eat fruit more is beyond my control
  a. Strongly disagree
  b. Disagree
  c. Uncertain
  d. Agree
  e. Strongly agree
- I always eat potato chips
  a. Strongly disagree
  b. Disagree
  c. Uncertain
  d. Agree
  e. Strongly agree

5. *Physical activity self-control.* Physical activity self-control is defined as students' beliefs about their control over the specific behaviors corresponding to the definition of physical activity, and their ability to change their physical inactivity to physical activity. The participants were asked to rate 1) how much they believe that they can control themselves to exercise daily for at least 30 minutes, physically active in any free time which causes sweating, and avoid inactivity such as TV viewing, and 2) how much each of specific physical activity reflects their current behavior. This follows established procedure in the research literature (Ajzen. 2002; Tangney et al. 2004; Brandon et al. 1990). Responses were made on a 5-point Likert-type scale ranging from 'strongly disagree' (score = 1) to 'strongly agree' (score = 5). An example of physical activity self-control item was as follow.

- The decision to exercise daily for at least 30 minutes is beyond my control
  a. Strongly disagree
  b. Disagree
  c. Uncertain
  d. Agree
  e. Strongly agree
- I always play outside after school
  a. Strongly disagree
  b. Disagree
  c. Uncertain
  d. Agree
  e. Strongly agree

Measures of behaviors

The behaviors assessed were healthy eating behavior and physical activity, which were described as follows.

6. *Healthy eating behavior*. The healthy eating behavior is defined as students' eating-related actions which are detailed as follows: 1) eat fruit and vegetables; 2) eat whole grain/cereal products; 3) avoid fast foods, fatty foods, and snacks, 4) avoid sugary foods and sugar-sweetened drinks; 5) eat well-balanced diet according to the 5 food groups. To assess healthy eating behavior, an 11-item questionnaire was used covering all food groups as defined. The items were specially designed for Study 1 following the guidelines provided by Ajzen (2002) and Francis et al. (2004), piloted, and used with schoolchildren aged 9-11 years. Each food was rated on the frequency it was eaten, (everyday = 1; sometimes = 2, never = 3). The participants were asked, "Over the past week, how often did you eat.....?" Some items were reverse scored. To compute an overall measure of healthy eating behavior, each score of the 11 food groups was summated, with higher scores indicating greater healthy eating behavior.

7. Physical activity. The physical activity is defined as any individuals' activities which are detailed as follows: 1) daily exercises for at least 30 minutes; 2) physically active in any free time to the extent that it causes sweating; 3) avoid inactivity such as TV viewing; 4) expend energy more than intake energy. To assess physical activity, an 8-item

questionnaire covering the three groups of activities was used. The items were specially designed for Study 1 following the guidelines provided by Ajzen (2002) and Francis et al. (2004), piloted, and used with schoolchildren aged 9-11 years. Frequency of occurrence was rated on a scale of 0 (never) to 7 (everyday). E.g., "Over the past week, how many days per week did you.....?" An additional 16 sporting activities were also added in the questionnaire. E.g., "Over the past week, did you……?". To respond, participants ticked the activities they did. Scores were summated to give an overall measure of physical activity.

8. Affective beliefs and readiness to change behavior. The participants were asked to reflect on their affective beliefs, such as happiness and enjoyment about healthy eating behavior, physical activity, and body weight. Questions regarding their motivation to participate in the intervention or readiness to change their behaviors were also included. Items used in this measure were based on the elicitation study with the schoolchildren aged 9-11 years as part of Study 1 and the recommendation from previous literature (Ashley. 2008; Conner & Spark. 2005; Daley, Copeland, Wright, & Wales. 2005). Examples of items were as follow.

- Why do you participate in this program?
  - ☐ I myself would like to participate in
  - ☐ My parents would like me to participate in it
  - ☐ I would like to know more about healthy eating and physical activity
  - ☐ I would like to lose weight
  - ☐ I would like to eat healthily and be physically active
- How happy are you with your weight and body shape?
  - a. Very happy
  - b. Happy
  - c. Uncertain
  - d. Unhappy
  - e. Very unhappy
- How do you think participating in the program will make you feel?
  - a. Very sure that I will be **happy and enjoy it**
  - b. A little sure that I will be **happy and enjoy it**
  - c. Uncertain
  - d. A little sure that I will be **unhappy and will not enjoy it**

e. Very sure that I will be **unhappy and will not enjoy it**

- How difficult or easy will it be to eat healthily? (Circle the number to let me know how you feel)

Difficult : 1 : 2 : 3 : 4 : 5 : Easy

- How pleasant or unpleasant will it be to eat healthily? (Circle the number to let me know how you feel)

Unpleasant : 1 : 2 : 3 : 4 : 5 : Pleasant

- How horrible or delicious will it be to eat healthily? (Circle the number to let me know how you feel)

Horrible : 1 : 2 : 3 : 4 : 5 : Delicious

- How do you feel about physical activity?

Boring : 1 : 2 : 3 : 4 : 5 : Stimulating

Unpleasant : 1 : 2 : 3 : 4 : 5 : Pleasant

Difficulty : 1 : 2 : 3 : 4 : 5 : Easy

Unenjoyable : 1 : 2 : 3 : 4 : 5 : Enjoyable

Measures of anthropometric variables

The anthropometric variable was BMI.

BMI. BMI was calculated based on measured weight (kilograms) and height (meters) using the following formula: BMI = weight divided by height squared. BMI percentile for age and sex was derived using the Center for Disease Control growth charts (CDC. 2006). The participant's weight was also recorded weekly at the beginning of each lesson. The recorded weight was then graphed for individual monitoring as recommended in the literature (Craighead et al. 1976: 406).

Quality testing of the study measures

Quality testing of the study measures was as follows.

1. To obtain content validity, the psychosocial questionnaires were scrutinized by three experts. Two of the experts were psychologists and the third was a behavioral scientist. The experts all confirmed that the items used were consistent with the variable definitions.

2. Once content validity was established, a pilot test was undertaken with 32 schoolchildren from the same population to ensure clarity and ease of comprehension and

also determine the reliability of the instrument. The results indicated that the reliability of some items was unacceptable and slight changes in wordings and addition of some items were made. The revised questionnaires showed acceptable internal reliability which are shown in Table 6.

3. The knowledge measure was analyzed for the difficulty index to ensure that it is age appropriate. This involves scrutinizing the responses received and removing or modifying items that are too difficult and ensuring that there are not too many easy items so that the measure is a good discriminator of children's knowledge. The difficulty index of the knowledge measure was between 0.23 – 0.71.

All study measures used in this study were displayed in Appendix A

TABLE 6 Descriptive statistics of the psychosocial variables (N = 41)

Variable	Number of items	Range	Cronbachs' alpha
Healthy eating self-efficacy	11	11 to 55	.90
Healthy eating self-control	14	14 to 70	.81
Physical activity self-efficacy	8	8 to 40	.82
Physical activity self-control	8	8 to 40	.80

Study interventions

There were two intervention programs in this study, the SSII-Healthy Eating Intervention, and the SSII-Physical Activity Intervention Program. The components and development of each program were presented below.

1. The SSII-Healthy Eating Intervention Program

Overall model

This intervention was created using the self-efficacy, self-control, and implementation intention principles, and informed by a review of the literature. The intervention was then scrutinized by experts. Formative research on the intervention was also conducted with students from the same population. Overall, the major focus of the intervention was the development of self-efficacy and self-control related to healthy eating,

and thereby to enhance healthy eating behavior. The intervention consists of six weekly, 90-minute activity lessons in food skills and knowledge. The lessons incorporated traditional learning styles (lecture) and practical experiences, and use interactive and cooperative learning techniques such as games and cooking. Parents were invited to participate in the lessons and encouraged to collaborate with their children at home to increase healthy eating behavior. Class materials were sent to the parents if they cannot participate in the lessons. Based on the literature, the overall model of the SSII-Healthy Eating Intervention Program was presented in Figure 7.

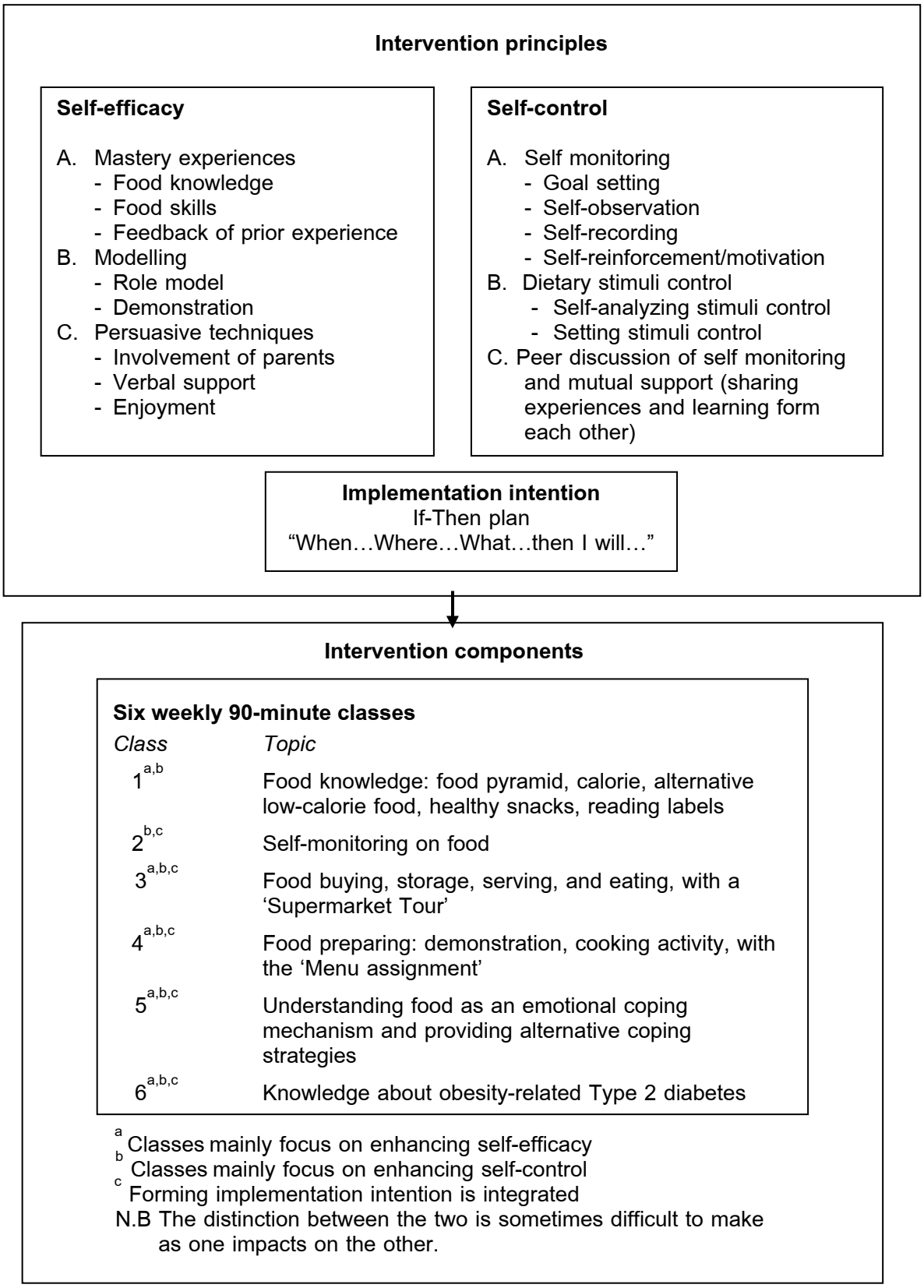

FIGURE 7 The overall model of the SSII-Healthy Eating Intervention Program

From the overall model of the SSII-Healthy Eating Intervention Program displayed above, a detail of the development process has been presented as follows.

Process 1: Concepts and techniques for behavior modification

The SSII-Healthy Eating Intervention aimed at enhancing the psychosocial and behavioral variables to help students develop healthy eating behavior, minimizing risk of Type 2 diabetes. The healthy eating behavior would consist of: 1) eating fruit and vegetables; 2) eating whole grain/cereal products; 3) avoiding fast foods, fatty foods, and snacks, 4) avoiding sugary foods and sugar-sweetened drinks; and 5) eating a well-balanced diet according to the 5 food groups. Instructors provided knowledge and skills related to healthy eating behavior. However, the instructors were unable to be with a student all the time, they need to be able to behave in their daily life and in a variety of environments by themselves to achieve healthy eating behavior to minimize the risk of Type 2 diabetes and achieve reduction in their BMI.

Keeping in perspective the above mentioned rationale and appropriateness, developing the individual‘s internal control was used as a behavioral modification technique in this program. For developing internal control, the concepts of decreasing external influences together with changing cognitive process were used (Prateep Chingnee.1997: 161). For decreasing external influences, self-control and implementation intention technique were applied, whereas, self-efficacy from the Social Learning Theory was applied to change the cognitive process.

The details of the concepts and techniques used for developing the Eat-SSII program could be categorized into 2 types. First, it was the concept directly concerned with the development of 4 dependent variables that were knowledge about obesity and Type 2 diabetes, healthy eating self-control, healthy eating self-efficacy and healthy eating behavior. The second were the concepts indirectly concerned with the development of the dependent variables of the program. These were as follows.

Concepts directly concerned with the development of the dependent variables of the intervention program

1) **Concept about obesity and Type2 diabetes.** These activities included lectures, question-answers sessions, presenting the case study, playing games and small group discussion to enable students to recognize and understand the meaning, the linkage

between obesity and Type 2 diabetes, risk factors, health outcomes, prevention and importance of preventing Type 2.

The 1st Concept was used for modification of dependent variables in the cognitive domain that was the knowledge about obesity and Type 2 diabetes.

2) Concept of self-efficacy building (Bandura. 1977, 1997; Allen. 2004). It aimed at developing students' perceived self-efficacy in terms of healthy eating behavior to reduce risk of Type 2 diabetes. It was composed of the 3 following supportive sources:

2.1 *Mastery experience,* which helped students to gain direct experience from skills training, related with healthy eating behavior, and then developing the belief in their competence. The activities were composed of lectures, question-answers sessions, playing games, rehearsal, role performing, individually and in groups, exercise practice, small group discussion, thinking practice in the individual and group level as well as using the previous experience of students to provide feedback.

2.2 *Modeling* was used through the activities composed of, firstly, presentation of a successful role model to students such as showing the student who was successful in losing weight each week by healthy eating self-control or the one who was able to behave in accordance with the behavioral assignment. These methods could convince students that if they really made attempts without feeling discouraged, they shall eventually achieve it. Second, role model demonstrations for healthy food preparation stimulated learning new behaviors or skills for students from the demonstrators. Third, learning from peers as role models, which was reinforced when they behaved positively, activated students to behave positively or curb their negative responses. Finally, parents were also role models in healthy eating behavior.

2.3 *Verbal persuasion* involved both direct and indirect encouragement in order to make students believe in their ability. The activities consisted of incorporating family members into the intervention, suggestion, exhortation, providing verbal encouragement on progress, phone reminding and talking during a week day.

The 2nd Concept was used for modification of the dependent variable in the cognitive domain that was healthy eating self-efficacy.

3) Self-control technique (Kazdin. 2001) was used to develop healthy eating self-control through antecedent control and self-presented consequence as the follows:

3.1 The antecedent control technique used in this intervention program was *stimulus control.* For the behaviors that were under the control of stimuli, the activity used was eliminating stimuli for unhealthy eating behavior which led to the risk of Type 2 diabetes such as storing unhealthy food out of sight, and buying only low calorie food and healthy snacks. For the behaviors that are not controlled by particular stimuli, there were activities building the specific stimulus over eating to develop healthy eating behavior in order to reduce the risk of Type 2 diabetes such as eating only at a dinning table, offering low calorie food for lunch and snacks, and keeping it in a noticeable place and so on.

3.2 *Self-presented consequence* which was divided into four stages was designed as behavioral goal setting, self-observation and self-recording, assessment, and self-reinforcement.

The 3rd Concept used for modification of the dependent variable in the cognitive domain was healthy eating self-control and the dependent variable in behavior domain was healthy eating behavior.

4) Concept of implementation intention (Gollwitzer. 1993) aimed at increasing healthy eating behavior among students. The activity asked the student to plan his/her eating behavior as precisely as possible in terms of what, when, and where to eat in order to strengthen the relationship between cues and responses as well as the relationship between intention to perform behavior and behavior; leading to immediacy, efficiency, less effort, and autonomic nature of the intended behavior, which were the underlying mechanisms of this concept.

The 4th Concept was used for modification of the dependent variable in the behavior domain that was healthy eating behavior.

5) Concept of awareness. Awareness was a crucial contributor for development of self-control (Sompoch Aeamsuphasit. 2006). To develop awareness, the activities composed of providing feedback, self-weighing and self-recording in every week, and recording the eating diary.

The 5th Concept was incorporated into the 6 classes of activity performing process of the Eat-SSII Program.

Concepts indirectly concerned with the development of the dependent variables of the intervention program, but which were used for driving the activity performing process

6) Concept of the group process (Department of Health. 2001) was composed of 5 processes enlisted below:

6.1 Goal setting for learning

6.2 Activity or providing the learning experiences. These experiences should be the initial experiences enabling students to clearly understand by themselves. This occurred when the students took action or attempted to learn something by themselves. The principle of this process was shown below;

- Students learned and performed activities by themselves. Those activities would support the physical involvement, ego or emotional involvement, social involvement and intellectual involvement in order to altogether develop every aspect of a student's knowledge.

- Students were divided into small groups for experiences, exchanges in learning, team working or playing games. According to these activities, students would develop working and living skill as well as good interpersonal relationships.

6.3 Analysis. This process was that students took part in experience analysis, learning, and exchanging opinions about what they have experienced and felt during group working. These activities led to the development of thinking and intelligence. Also, the truth about what the students had learnt was evident as they discovered what they intended to learn by themselves.

6.4 Summarization and concept application. After students clearly understood the accurate concept, the instructor must provide students with the opportunity to discuss so they can summarize what they have learned in order to give the students the opportunities to think and apply these learnt concepts in different places such as home, other public places, or other environments in addition to classroom, as well as to use those concepts in solving the possible problems that might occur in the future.

6.5 Assessment. This process aimed at investigating whether the activities done in the class met the specified objective. Assessment could help the instructor to perceive the development of students, students' understanding of the content, the effectiveness of the learning method, the level of skills that need to be further developed, and also assist the instructor to evaluate how well his/her activity succeeded. The

assessment of group achievement; including the group's work performance, solidarity, and collaboration of group members, might be one of these processes. Another method for this process was the assessment of individual's achievement such as asking students to evaluate his/herself and each group member, and sharing advice and comments together with other group members.

The 6th Concept was incorporated into the 6 classes of activity performing process for the Eat-SSII Program.

7) Concepts of using games in learning (Udtaporn Chindamanee. 2005). Icebreaking game and games for enhancing the learning experience were the types of games used in the program.

The 7th Concept was incorporated into the 6 classes of activity performing process of the Eat-SSII Program.

Process 2: The development of activity framework

From the concepts and techniques which were used in modification of the psychosocial and behavioral variables being the dependent variables of the Eat-SSII program as mentioned above, the activity framework was developed as a guide for creating activities in detail. The relationship between activities, variables to be modified, applied concepts and techniques, and methods of performing the activities could be summarized as shown in Table 7.

TABLE 7 The relationship between activities, the dependent variables to be modified, the applied concepts/techniques and methods of performing activities of program Eat-SSII.

Class	Content/Activities	Variables wanted to be modified	Applied concepts/Techniques	Methods of performing activities
1	Food knowledge: food pyramid, calorie, alternative low-calorie food, healthy snack, label reading	1. Healthy eating self- efficacy	1.1 Mastery experience in healthy eating behavior	- lectures - Question answer sessions - Playing a games - Rehearsal and real performing - Small group discussion - Thinking practice at both individual and group level - providing feedback
			1.2 Verbal persuasion	- Exhortation - Suggestions
2	Self-monitoring on food	1. Healthy eating self-control 2. Healthy eating behavior	Self-presented consequence	- Practicing 4 steps of self-monitoring in classroom. - Assignment of self-monitoring in eating behavior as previously practiced - Internal reinforcement
			Implementation intention	- Assignment of planning one's eating behavior
		3. Healthy eating self- efficacy	Mastery experience in healthy eating behavior	- Evaluation of self-monitoring assignment and providing feedback

TABLE 7 (Cont.)

Class	Content/Activities	Variables to be modified	Applied concepts/Techniques	Methods of performing activities
3	Food buying, storage, serving, and eating, with the 'Supermarket Tour'	1. Healthy eating self-control 2. Healthy eating behavior	Stimulus control	- Eliminating stimuli for unhealthy eating behavior - Building the specific stimulus exerting over healthy eating behavior
			Self-presented consequence	- Assignment of self-monitoring in eating behavior - Internal reinforcement
			Implementation intention	- Assignment of planning one's eating behavior
		3. Healthy eating self – efficacy	3.1 Mastery experience in healthy eating behavior	- Rehearsal and real performing in food purchasing - Work assignment and small group discussion - Providing feedback
			3.2 Verbal persuasion	- Suggestion - Providing encouragement of progress
4	Food preparing: demonstration, cooking activity, with the 'Menu assignment'	1. Healthy eating self – efficacy .	1.1 Mastery experience in healthy eating behavior	- Rehearsal and cooking activity. - Menu assignment - Providing feedback
			1.2 Modeling	- Role model demonstration for food preparation - Peer role model - Asking parents as role model in healthy eating behavior
			1.3 Verbal persuasion	- Involvement of family members. - Suggestion - Providing encouragement of progress

TABLE 7 (Cont.)

Class	Content/Activities	Variables to be modified	Applied concepts/Techniques	Methods of performing activities
4 (Cont')		2. Healthy eating self-control 3. Healthy eating behavior	Self-presented consequence	- Assignment of self-monitoring in eating behavior - Internal reinforcement
			Implementation intention	- Assignment of planning one's eating behavior
5	Understanding food as an emotional coping mechanism and providing alternative coping strategies	1. Healthy eating self-control 2. Healthy eating self – efficacy	Facing with problem and coping skills.	- Suggestion - Small Group Discussion - Skill Practice - Providing feedback
		3. Healthy eating behavior	Self-presented consequence	- Assignment of self-monitoring in eating behavior - Internal reinforcement
			Implementation intention	- Assignment of planning one's eating behavior
6	Knowledge about obesity-related Type 2 diabetes	1. Knowledge about obesity-related Type 2 diabetes	Concept about obesity-related Type 2 diabetes	- lecturing - Questioning - Playing the games - Small group discussion
		2. Healthy self – efficacy	2.1 Mastery experience in healthy eating behavior	- Providing feedback
			2.2 Verbal persuasion	- Suggestion - Providing encouragement of progress
		3. Healthy eating self-control 4. Healthy eating behavior	Self-presented consequence	- Assignment of self-monitoring in eating behavior - Internal reinforcement
			Implementation intention	- Assignment of planning one's eating behavior

Process 3: Activity development

With regards to the activity framework, the details of each class were developed, which were presented below.

Class 1: *Food knowledge: food pyramid, calorie, alternative low-calorie food, healthy snack, label reading*

1. Facilitator asks the participants to return the eating diary. The returned diary allows the participants to get one point which they can collect and exchange for a reward at the end of the intervention. Their eating diaries are then examined and any problems and ways of overcoming them are discussed.

2. The participants are weighed, given a weight graph, taught how to plot their weight, and asked to plot their weight on their own weight graph. The desired weight and weight loss goal of each participant is set.

3. Basic information is provided on the food pyramid, the importance of well-balanced diet according to the food pyramid, what food calories are, how to calculate food calories and how to read food labels. As suggested by the literature, food restriction is not recommended for altering eating behavior. Instead it is more effective for the long term to encourage the replacement of unhealthy food with healthy alternatives. Thus, information about alternative low-calorie foods and healthy snacks is also given to the participants. This provides guidance for the participants on what to eat instead of their usual food to decrease their caloric intake.

4. Learning exercises on the information previously given are then conducted using games, group discussions and group work. The participants are divided into groups. Each group is assigned different foods which have different calorific values. The groups are asked which one of the assigned foods are low calorie, how many calories do the foods have, and what nutrients in the foods according to food pyramid. Answers are then given and discussed. The winning group is rewarded.

5. The participants are asked to self-analyze their dietary stimuli in order to explore whether their unhealthy eating behaviors are under the control of any stimuli. For example, the participants are asked to identify events that control his/her snack eating. If it is likely that their snack eating are under the control of many stimuli such as watching TV, talking with friends on telephone, and being alone, facilitator will be helping them to eliminate the control that these stimuli exert over snack eating. On the other hand, if snack eating is not

controlled by particular stimuli, the facilitator will be helping the participants to perform healthy eating behavior under a new set of stimuli, to develop stimulus control, such as offering them low-calorie and healthy snacks instead of sweet or high-calorie snacks daily.

6. The facilitator concludes the lesson and any question are answered. The participants and their parents are encouraged to express their opinions and share their experiences. Finally, the participants are given new forms for their eating diary, and asked to return them at the beginning of the next lesson.

Class 2: *Self-monitoring on food*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal. However, they are told that the rewards will not be food.

2. The facilitator asks the participants to return their eating diary. The returned diary allows the participants to get another point which they can collect and exchange for a reward at the end of the intervention.

3. The eating diaries are then reviewed. Progress and difficulties in eating low-calorie foods and healthy snacks which is the previous week's assignment are evaluated and discussed. Feedback of prior experience and verbal support are also given.

4. The participants are instructed how to control and plan their eating behavior in order to achieve their weight loss goal. The principles, importance, and processes of self-monitoring and implementation intention are then presented. Briefly, the participants are instructed about the following;

4.1 How to form implementation intention to eat three food categories (fruit and vegetable; fast foods, fatty foods and snacks; sugary foods and sweetened drinks) during the next week. For example regarding fruit, *'during the next week, I plan to eat*…(please, write down what type and amount of fruit you plan to eat; e.g. one apple, two tangerines, or a bowl of strawberries, etc.) *at…* (write down the time; e.g. before breakfast, during breakfast, between breakfast and lunch, during lunch, between lunch and dinner, during dinner, after dinner, or other time) *in/at*…(describe the situation/place where you plan to eat this fruit; e.g. at the table where you eat, in or around the house, while going from destination A to B, in a worksite restaurant or cafeteria, at the workplace, in front of television, or other place).*"*

4.2 How to observe their eating behaviors (noticing *what, when, and where* they are planning to eat and what they actually do),

4.3 How to record the observed behaviors,

4.4 How to assess/compare the observed behaviors with their plans/behavioral goal,

4.5 How to reinforce and reward themselves if they meet their weekly goal. Participants are instructed to assess whether they have met their weekly goal and to record this by ticking the appropriate statement in their diary. The statements provide different levels of positive feedback depending on how successful they have been in the attainment of their eating behavioral goal, for example, if they have eaten fruit as planned everyday. For example participants who have met their goals receive the message, "I have done very well this week and shown that I can control what I eat. I hope to continue this next week." For participants who have not been successful or only partially successful, the statements reflect this but provide them with encouragement for the following week.

5. Exercises on self-monitoring and a self-monitoring form are given to ensure understanding. Any questions are answered.

6. The participants are assigned to plan and self-monitor their eating behaviors for the coming week using the processes they have been instructed in.

7. The facilitator concludes the lesson and any question are answered. Finally, the participants are given new forms for their eating diary, and asked to return it at the beginning of the next lesson.

Class 3: *Food buying, storage, serving, and eating, with the 'Supermarket Tour'*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.

2. Facilitator asks the participants to return the eating diary. The returned diary allows the participants to get another point which they can collect and exchange for a reward at the end of the intervention.

3. The eating diaries are then reviewed. Progress and difficulties in self-monitoring which is the previous week's assignment are evaluated and discussed. Feedback of prior experience and verbal support are also given.

4. The participants then are told about food buying, storage, serving, and eating as presented below.

4.1 Food buying. The literature suggested that if there are no high-caloric foods in the house, people cannot eat them. Thus, the suggestion is made to participants' parents to alter their food buying habits by buying only low-caloric foods and healthy snacks, preparing a food list before shopping, going out to shop when full instead of when hungry, and not buying extra quantities of food as recommended in the literature.

4.2 Food storage. The participants' parents are told to assess their current food storage practices and try to store their food so that it can not be easily seen or reached by their children, particularly high calorie or 'unhealthy' food given as occasional treats.

4.3 Food serving and eating. The participants' parents are instructed to serve smaller portions of food, place their food on smaller dishes, put small quantities of food on each spoonful, eat slowly, stop eating when feel full, and not eat while they are watching TV as recommended in the literature.

5. Exercise on food buying by the 'Supermarket Tour'. The participants are divided into groups, given the same amount of money, and assigned to buy low-caloric foods and healthy snacks within the limited time. Foods bought are assessed and discussed.

6. The participants are then assigned to increase or maintain their level of eating behavioral goal and self-monitor their eating behaviors for the coming week using the processes they have been instructed in.

7. The facilitator concludes the lesson and any question are answered. Finally, the participants are given new forms for their eating diary for recording, and asked to return it at the beginning of the next lesson.

Class 4: *Food preparing: demonstration, cooking activity, with the 'Menu assignment'*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.

2. The facilitator asks the participants to return their eating diary. The returned diary allows the participants to get another point which they can collect and exchange for a reward at the end of the intervention.

3. The eating diaries are then reviewed. Progress and difficulties in the previous week's assignment are evaluated and discussed. Feedback of prior experience and verbal support are also given.

4. The participants are still assigned to increase or maintain the level of eating behavioral goal and self-monitor their eating behaviors for the coming week.

5. The participants and their parents are instructed to plan and cook a menu that includes low-caloric raw materials. A role model demonstrates how to prepare the food and the participants then follow step by step. A booklet containing other low-caloric menus and instruction are given and the participants then are asked to choose their favorite menu to prepare at home. The selected menu that was cooked will be shared with the group as well as their experience of preparing the food. In this way they will learn from each other.

6. The facilitator concludes the lesson and any question are answered. Finally, the participants are given new forms for their eating diary, and asked to return it at the beginning of the next lesson.

Class 5: *Understanding food as an emotional coping mechanism and providing alternative coping strategies*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.

2. The facilitator asks the participants to return the eating diary. The returned diary allows the participants to get another point which they can collect and exchange for a reward at the end of the intervention.

3. The eating diaries are then reviewed. Progress and difficulties in the food self-monitoring are evaluated and discussed. Feedback of prior experience and verbal support are also given.

4. The ‘Menu assignment’ of each participant from the previous week is presented. Group discussion, experience exchange, and feedback from a dietician are then implemented.

5. The issue of emotional eating as a coping strategy is then presented. The participants are asked what they usually do when they are anxious, depressed, lonely, angry, bored, and tired. The answers given are discussed. The participants’ eating diaries are also reviewed to explore the situations or feelings they typically report before eating to see if any patterns are evident.

6. A number of alternatives for handling those feelings which may lead to eating are given, for example, planning some activities to do, developing long-term hobbies to

handle boredom, and exercise as a distraction when upset as recommended in the literature.

7. The lessons presented from class 1-4 are reviewed.

8. The participants are still assigned to increase or maintain their level of eating behavioral goal and to self-monitor their eating behaviors for the coming week.

9. The facilitator concludes the lesson and any question are answered. Finally, the participants are given new forms for their eating diary, and asked to return them at the beginning of the next lesson.

Class 6: *Knowledge about obesity and its related complication (Type 2 diabetes)*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.

2. Facilitator asks the participants to return the eating diary. The returned diary allows the participants to get a reward.

3. The eating diaries are then reviewed. Progress and difficulties in the food self-monitoring, preparing and eating healthy menus are evaluated and discussed. Feedback of prior experience and verbal support are also given.

4. The participants are given information about risk factors, symptoms, prevention and treatment, health consequences of obesity and Type 2 diabetes, and the importance of healthy eating to prevent diseases using audiovisual presentation and role play/story telling.

5. The facilitator summarizes the information presented.

6. The BMI-for-age chart is given to the participant. Then, the participants are taught what BMI is, how important BMI is, how to calculate BMI, and how to interpret their BMI from the BMI-for-age chart. This is deliberately placed at the end of the intervention when hopefully the participants will have lost some weight and their BMI will be closer to the normal range.

7. A learning exercise on BMI calculating and game play focusing on what they have learnt about obesity and Type 2 diabetes.

8. The participants are asked to maintain their food self-monitor, eating and preparing low-calorie foods. Finally, they are given new forms for their eating diary, and asked to return it at the next meeting.

9. Facilitator concludes the SSII-Healthy Eating intervention and any questions are answered. Frank discussion from the participants and their parents is welcome.

Process 4: Transformation of activity classes into lesson plan

Each class of activities in the SSII-Healthy Eating Intervention was then transformed into the lesson plan format; which was consisted of activity, objective, activity procedure, time, instruction media/equipment, target aimed to develop, and assessment. An example of lesson plan for the Class 1 was shown in Table 8.

TABLE 8 Lesson plan of the class 1: food knowledge

Activity	Activity objective	Procedure	Time	Media/Equipment/ Instructor	Target aimed to develop	Assessment
1) Relation building activity…Know me, know you, know us.	1) To build intimacy between members and instructor 2) To build amiable situation among members in group.	1) Instructor self-introduces and his/her working team 2) Ask members to tell his/her own nick name by holding hand in circle shape. After that Instructor assigns one of them to start self- introduction and then ask all members to applause according to pattern 12312312121 simultaneously. Then, ask the beginner to applause 2 times and following with telling his/her nick name i.e. 12312312121 pub pub Win 3) After all members applause according to above pattern, ask members on the left hand side (or even right hand side) to applause 2 times and then following with telling his/her nick name 4) Do like this until covering all names 5)) Instructor ask members to draw a conclusion together about what they has learned from this activity (Example of o*pinion which instructor raise up form summary of students i.e*. member can make friends including instructor in order to build intimacy and amiable situation and prepare for next activity)	15 min.	-	-	1) 100% of members participate in the activity 2) By random asking, the randomized members can remember name of another members accurately at least 3 members 3) By making observation, 100% of members are enjoyable and share good relation

TABLE 8 (Cont.)

Activity	Activity objective	Procedure	Time	Media/Equipment/ Instructor	Target aimed to develop	Assessment
2) Walk rally on basic knowledge about nutrition	1) To inform students about the objectives of activity.	1) Instructor presents the objective of activity that we will learn about nutrition in order to enable student to make healthy food choice which thereby help in minimizing risk of type 2 diabetes. The activity is composed of 4 stations as below; - The five groups food - Calculating food calorie - Nutrition flag/food pyramid and alternative foods - food label reading The students are also informed that there will be an assistant instructor in each station. Then, all students are divided into 4 groups and are asked to name his/her group. 2) Instructor carries on explaining that there will be 5 minutes for each station and when time is up, music will be played. After that, students in each group walk to the next station by holding waist of in front of person in alignment.	5 min.	-	-	1) Instructor have informed students about the objective of this activity
2.1 The five group food station	1) To make student to understand /review the five group food and well-balanced diet.	1) Instructor of the station asks what the name of this group is. Ask all students to speak up loudly for 3 times simultaneously	15 min.	1) Academic poster of five groups food 2) assigned sheet of the five group food	Create the mastery experience in healthy food choice	1) Students accurately complete the assigned sheet of the five group food 2) All students participate in doing in all processes of activity

TABLE 8 (Cont.)

Activity	Objective	Procedure	Time	Media/Equipment/ Instructor	Target aimed to develop	Assessment
2.1 The five group food station (Continue)	2) To enable students to Analyze what nutrient in the food menu according to the five group food	2) Ask student to review knowledge about essential nutrition of the five group food by requesting all students to brainstorm and fill information in the assigned sheet of the five group food. Then, ask students to join hand in presenting and explaining their assignment 3) Instructor provide feedback on the result of assigned work and briefly summarize knowledge about the five group food one more time				
2.2 Calculating food calorie	1) To enable students to obtain skill in calculating food calorie from daily food	1) Instructor of the station asks what the name of this group is. Ask all students to speak up loudly for 3 times simultaneously 2) Instructor distributes table of food calorie containing calorie of each types of food, fruits, beverage, snack and dessert to students in group, and then explains the meaning of word ”Calories” or “Kilocalories”. 3) Instructor provides basic information to students that 1,600 Kilocalories per day is required as standard calorie for schoolchildren. However, for schoolchildren who are overweight or obese, the amount of 1,200 Kilocalories per day is considered to be sufficient. After that, assignment on calculating food calorie is provided to students	15 min.	1) Assigned sheet of Calculating food calorie 2) Table of food calorie	1) Create the mastery experience in healthy food choice 2) Encourage and exhort students to eat healthily	1) All members in group take part in doing group activity in all processes. 2) All students can calculate food calorie from the assigned food accurately 3) Instructor has encouraged and exhorted students to eat healthily

TABLE 8 (Cont.)

Activity	Objective	Procedure	Time	Media/Equipment/ Instructor	Target aimed to develop	Assessment
		4) Instructor provides feedback on assigned sheet about calculating food calorie and asks students to control calorie gained from food consumption. Also, instructor encourages students that all of them can do as the one can do well today.				
2.3 Nutrition flag/food pyramid and alternative foods	1) To enable student to understand proportion and quality of food that should eat in 1 day according to nutrition flag 2) To make student understand about alternative foods 3)) To enable student to develop skills in choosing alternative healthy foods.	1) Instructor of the station asks what the name of this group is. Ask all students to speak up loudly for 3 times simultaneously 2) Instructor distributes the nutrition flag Jigsaw picture in group to join hand in completing. After complement, ask them to share ideas and find out the meaning toward their Jigsaw picture. 3) Instructor provides feedback on the meaning of Jigsaw picture which students share ideas and summarizes again by using poster as a tool *(Sample of summary* i.e. the nutrition flag is in upside-down triangle shape referring to group of food which should consume in 1 day from the most to least. At the top of flag refers to group of food which emphasizes on eating at the most. ..(To be continue)	15 min.	1) Jigsaw picture of nutrition flag 2) The nutrition flag poster size. 3) The variety types of color picture/ /food model	Create the mastery experience in healthy food choice	1) Students in group can make nutrition flag jigsaw correctly. 2) All group members take part in sharing ideas about meaning of picture toward nutrition flag. 3) All group members take part in doing activity about grouping alternative foods. 4) All groups of students can group color picture/food model correctly.

TABLE 8 (Cont.)

Activity	Objective	Procedure	Time	Media/Equipment/ Instructor	Target aimed to develop	Assessment
		and decreasing gradually until bottom edge of flag refers to group of food that which emphasizes on eating at the least. Human's body needs each group of food in different quantity. The nutrition flag will be guideline in telling us about the proportion of each group of food which we should eat daily.) 4) Instructor shows the students the color picture/ food model of each group which illustrates on the nutrition flag and then asks them to brainstorm each other to group the color picture/ food model i.e. rice, noodle, noodle with curry. They should be grouped together and so on. 5) Instructor provides feedback about alternative foods which students join hand in grouping and summarizes knowledge about the nutrition flag and alternative foods briefly again.				
2.4 Food label reading station	1) To enable members to understand nutritious information which is identified on packaging of dessert and box of each beverage.	1) Instructor of the station asks what the name of this group is. Ask all students to speak up loudly for 3 times simultaneously. 2) Instructor distributes samples of food, dessert and beverages to students in group. ..(To be continue)	15 min.	Samples of food, dessert and drinks	Create the mastery experience in healthy food choice	1) Students in group choose food and snack which contain low energy, good for body, low sugar and salt. 2) All group members participate in brainstorming and choosing food.

TABLE 8 (Cont.)

Activity	Objective	Procedure	Time	Media/Equipment/ Instructor	Target aimed to develop	Assessment
	2) To enable members to choose to eat food, dessert or even snack which contain low energy through reading nutritious information.	3) Instructor asks students which types of food, dessert and beverage they choose to eat and why they choose those things. 4) Ask members to brainstorm, discuss and present food, dessert and beverage which are chosen by group to instructor at station. 5) After finishing the presentation, instructor provides feedback about choosing food as the following: - How much do energy you gain from food, dessert and beverages? - How do you know that how much energy you have gained from food, desert and beverage? - What is the main nutrition in each type of food? Is it essential to your body? - Are there sugar, salt and oil in each type of food, desert and beverage? How much? 6) Ask members to summarize principle in choosing food, dessert and beverages according to nutritious way and help to minimize risk of Type 2 diabetes. How to read nutrition label and information which should read by instructors help in fulfilling into insufficient issues.				3) Students in each group take part in summarizing principle in food and snack consumption including to how to read nutrition label.

TABLE 8 (Cont.)

Activity	Objective	Procedure	Time	Media/Equipment/ Instructor	Target	Assessment
3. Make a conclusion about activity	1) To enable students to get the mapping concept regarding to what they have learnt form these activities.	1) Instructor summarizes all activities at 4 stations as the following; - The five group food station - Calculating food calorie station - Nutrition Flag and alternative foods station - food label reading station Enable students to learn about nutrition principles and also enable them to choose to eat food that help in minimizing the risk of Type 2 diabetes accurately. Moreover, ask students to adopt what they have learnt from the activities to apply with their daily life.	10 min.	-	-	1) Instructor summarizes the mapping concept of activities to students.

2. The SSII-Physical Activity Intervention Program

Overall model

This intervention was created using self-efficacy, self-control, and implementation intention principles, and informed by a review of the literature. The intervention was then scrutinized by experts. Formative research on the intervention was also conducted with students from the same population. Overall, the major focus of the intervention was the development of self-efficacy and self-control related to physical activity, and thereby to enhance physical activity. The intervention consists of six weekly, 90-minute activity lessons in exercise and physical activity skills and knowledge. The lessons incorporated traditional learning styles (lecture) and practical experiences, and use interactive and cooperative learning techniques such as games. Parents were invited to participate in the lessons and encouraged to collaborate with their children at home to increase the child's physical activity. Class materials were sent to the parents if they cannot participate in the lessons. Based on the literature, the overall model of the SSII-Physical Activity Intervention Program was presented in Figure 8.

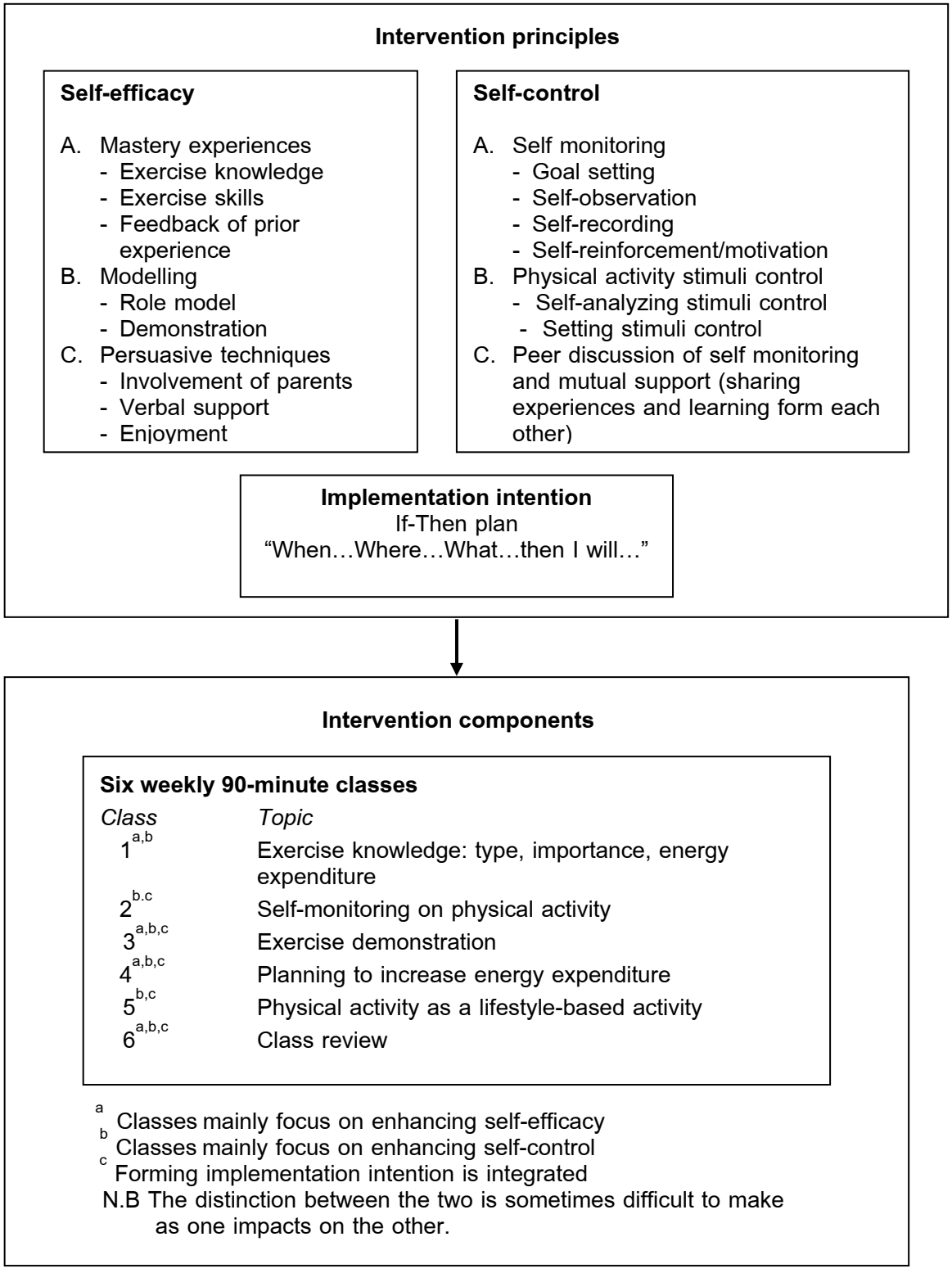

FIGURE 8 The overall model of the SSII-Physical Activity Intervention Program

From the overall model of the SSII-Physical Activity Intervention Program displayed above, details of the development process have been presented as follows.

Regarding **Process 1**: concepts and techniques for behavior modification and **Process 2**: the development of activity framework, as they were similar to the SSII-Healthy Eating Intervention which was previously described in detail, they were not presented here for the SSII-Physical Activity Intervention Program. However, the details in Thai were showed in Appendix B.

Process 3: Activity development

Details of activity in each class were presented below.

Class 1: *Physical activity knowledge: type, importance, energy expenditure*

1. The participants are weighed, given a weight graph, taught how to plot their weight, and asked to plot their weight on their own weight graph. The desired weight and weight loss goal of each participant is set.

2. The participants are given the activity diary, taught how to record, and asked to record daily for the coming week. They are also informed that returning the diary allows them to get one point which they can collect and exchange for a reward at the end of the intervention.

3. Basic information is provided on what physical activity is, types and the importance of physical activity, what energy expenditure is, and how to calculate energy expenditure for each activity. A booklet containing information about daily activity and the energy expenditure of each activity is given to the participants. This provides guidance for the participants on what to do to increase their energy expenditure.

4. Learning exercises on knowledge previously given to them are then conducted using games, group discussion and group work. The participants are divided into groups who will compete against each other. Each group is assigned different types of activities. The groups are asked which one of the assigned activities have high energy expenditure, and how many calories does the activity expend, and what the type of activity is according to information they have learnt. Answers are then given and discussed. The winning group is rewarded.

5. The participants are asked to self-analyze their physical activity stimuli in order to explore whether their behaviors are under the control of any stimuli. If it is likely that their

behaviors are under the control of particular stimuli, the facilitator will help them to eliminate the control that these stimuli exert over their behavior. On the other hand, if behaviors are not controlled by particular stimuli, the facilitator will help the participants to perform physical activity under a new set of stimuli, to develop stimulus control, such as offering them exercise equipment or encouraging them to be more physically active everyday to increase their energy expenditure, for example, playing outside after school rather than watching TV.

6. The facilitator concludes the lesson and any questions are answered. The participants and their parents are encouraged to express their opinions and share their experiences. Finally, the participants are given new forms for their physical activity diary, and asked to return them at the beginning of the next lesson.

Class 2: *Self-monitoring on physical activity*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.

2. The facilitator asks the participants to return their physical activity diary. The returned diary allows the participants to get another point which they can collect and exchange for a reward at the end of the intervention.

3. The physical activity diaries are then reviewed. Progress and difficulties in being more physically active are evaluated and discussed. Feedback of prior experience and verbal support are also given.

4. The participants are instructed how to control and plan their physical activity in order to achieve their weight loss goal. The principles, importance, and processes of self-monitoring and implementation intention are then presented. Briefly, the participants are instructed about the following;

4.1 How to plan to be physically active (or to reduce physical inactivity). For example, *during the next week I plan to exercise…times per week, for …minutes per session. I plan to exercise between…and…hours. I plan to do such exercises as…(please write down what exercises you plan to do), at…(write down where; e.g. in which gym, at home, etc.).*

4.2 How to observe their physical activity (noticing *what, where, and when* they are planning to do and what they actually do),

4.3 How to record their actual physical activity,

4.4 How to assess/compare their actual behaviors with their plans or behavioral goals,

4.5 How to reinforce/reward themselves if they meet their weekly goal.

Participants are instructed to assess whether they have met their weekly goal and to record this by ticking the appropriate statement in their diary. The statements provide different levels of positive feedback depending on how successful they have been in the attainment of their physical activity goals, for example, *they can exercise at playing badminton 3 times per week, for 30 minutes per session, between 5.00-5.30 pm, at home* as planned. Participants who have met their goals receive the message, "I have done very well this week and shown that I can control what I do. I hope to continue this next week." For participants who have not been successful or only partially successful, the statements reflect this but provide them with encouragement for the following week.

5. Learning exercises on self-monitoring and self-monitoring forms are given to ensure understanding. Any questions are answered.

6. The participants are assigned to plan and self-monitor their physical activity for the coming week using the processes they have been instructed in.

7. The facilitator concludes the lesson and any question are answered. Finally, the participants are given new forms for their physical activity diary, and asked to return them at the beginning of the next lesson.

Class 3: *Exercise demonstration*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.

2. Facilitator asks the participants to return the physical activity diary. The returned diary allows the participants to get another point which they can collect and exchange for a reward at the end of the intervention.

3. The physical activity diaries are then reviewed. Progress and difficulties in the previous week’s assignment are evaluated and discussed. Feedback of prior experience and verbal support are also given.

4. The participants are still assigned to increase or maintain their level of physical activity goal and self-monitor their physical activity for the coming week using four processes they have been instructed in.

5. The participants are taught exercise skills, which are age appropriate and fun. Exercise equipment such as balls or weights, if necessary, can be lent to the participants. A role model demonstrates how to warm up, exercise, and cool down after exercise, and the participants then follow step by step. An exercise manual containing the instruction and pictures are given to the participants and they are encouraged to exercise with their parents daily at least 30 minutes.

6. The facilitator concludes the lesson and any questions are answered. Finally, the participants are given new forms for their physical activity diary, and asked to return them at the beginning of the next lesson.

Class 4: *Family's planning to increase energy expenditure*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.

2. Class exercises for 30 minutes led by a member of the group, supported by the sports scientist.

3. The facilitator asks the participants to return their physical activity diary. The returned diary allows the participants to get another point which they can collect and exchange for a reward at the end of the intervention.

4. The physical activity diaries are then reviewed. Progress and difficulties in the previous week's assignment, self-monitoring and daily exercise, are evaluated and discussed. Feedback on prior experience and verbal support are also given.

5. The participants are still assigned to increase or maintain their level of physical activity goal and self-monitor their physical activity for the coming week.

6. The importance of parents in relation to obesity prevention is suggested by the literature (Craighead et al. 1976; Epstein, Paluch, Roemmich, & Beecher. 2007). Thus, the parents are asked to help and plan activities for their children to increase physical activity and energy expenditure, for example, assign housework or other duties in the children's free time, arrange the exercise so that it becomes part of the family's daily program, and create a supportive home environment for promoting physical activity.

7. The participants are encouraged to exercise daily at least 30 minutes.

8. The facilitator concludes the lesson and any question are answered. Finally, the participants are given new forms for their physical activity diary, and asked to return them at the beginning of the next lesson.

Class 5: *Physical activity as a lifestyle-based activity*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.
2. Class exercises for 30 minutes by a member of the group, supported by the sports scientist.
3. The facilitator asks the participants to return their physical activity diary. The returned diary allows the participants to get another point which they can collect and exchange for a reward at the end of the intervention.
4. The physical activity diaries are then reviewed. Progress and difficulties in the previous week's assignment are evaluated and discussed. Feedback of prior experience and verbal support are also given.
5. The participants are still assigned to increase or maintain their level of physical activity goal and self-monitor their physical activity for the coming week.
6. The participants are encouraged to exercise daily at least 30 minutes.
7. As permanent alteration in physical activity is a goal for this intervention, the participants are suggested to focus on encouraging lifestyle-based activity rather than structured sports only. Physical activity diaries of the participants are reviewed to explore their lifestyle and situation. The physical activities that fit into one's lifestyle and situation are then recommended by the sport scientist.
8. The facilitator concludes the lesson and any question are answered. Finally, the participants are given new forms for their physical activity diary, and asked to return them at the beginning of the next lesson.

Class 6: *Class review*

1. The participants are weighed and assigned to plot their weight on their own weight graph. They are also rewarded if they meet their weekly weight goal.
2. Class exercise for 30 minutes by a member of the group, supported by the sports scientist.
3. An innovative style of exercise that is fun and age appropriate will be presented by a sports scientist.
4. The facilitator asks the participants to return their physical activity diary. The returned diary allows the participants to get a reward.

5. The physical activity diaries are then reviewed. Progress and difficulties in the previous week's assignment are evaluated and discussed. Feedback on prior experience and verbal support are also given.

6. The information given in classes 1-5 is reviewed.

7. The participants are asked to maintain their activity self-monitoring, exercise at least 30 minutes daily. Finally, they are given new forms for their physical activity diary, and asked to return them at the next meeting.

8. The facilitator concludes the SSII-Physical Activity Intervention and any questions are answered. Frank discussion from the participants and their parents is welcome.

Example of activity class, as the form of lesson plan in Thai, was shown in Appendix B.

Study procedure

Preparation stage

1. Develop study instruments.

2. Send letters to the sample schools, Sawadeewittaya School and Watditsahongsaram School, from the Faculty of Graduate study, Srinakharinwirot University asking for permission to undertake the study. Then, contact a teacher who is a cooperator or research assistant in each school to inform them about the objectives and procedure of the study.

3. Ask for ethical approval of the study from the Behavioral Science Research Institute Ethics Committee, Srinakharinwirot University.

Screening of participation stage

The screening stage consisted of 3 sections as presented below.

Section one: recruit and contact. Research assistant in each school recruited students who have a BMI-for-age $\geq$ 85th percentile. The students' families were contacted by telephone/letter and information packets were also sent to them telling them about the study and asking for their participation in one of the sessions that provide them with further information about the study. They were informed that no decision about participation in the study was made until attendance at this session. This was to ensure that all participants were clearly informed about the study.

Section two: information giving session. Interested participants were invited to an information giving session which provided a physical examination including blood pressure, physical fitness, and body flexion. Students participating in the session were also interviewed to provide background information on healthy eating behavior and physical activity in the past week, and demographic data of the students and their parents. Details about the importance of the interventions for their health were discussed. The participants were told that the purpose of the interventions was to help them to change eating habits and physical activity and thereby to loose/control weight and prevent them from further chronic diseases such as Type 2 diabetes, hyperlipidemia, and high blood pressure. They were also informed that the interventions would continue for four months, with 12 weekly 90 minute classes. Finally, any questions regarding the study were answered.

Section three: recruiting final participants and obtaining their consent. The participations who met the inclusion criteria were invited into the study. Consent forms were sent to parents for completion to indicate their agreement/commitment for their child to participate in the intervention programs. Parents were also encouraged to participate but this was informal and they were not part of the research program.

The current socio-economic status, BMI, and sex of the consenting participants were compared to ensure that both groups were match-paired and comparable.

Baseline stage

Baseline stage lasts a week before the start of the first intervention. At the beginning of the baseline, the participants were taught how to complete their eating diary and physical activity diary for continued monitoring of their eating behavior and physical activity. They were also asked to record the diaries for a week and return to the researcher at the beginning of the first intervention. The diary forms were then provided for future recording. To measure psychosocial variables and behaviors, the participants were asked to complete the self-report questionnaires on healthy eating self-efficacy, physical activity self-efficacy, healthy eating self-control, physical activity self-control, knowledge on obesity and Type 2 diabetes, affective beliefs and readiness to change, healthy eating behavior, and physical activity, and return to the researcher when they finish. Any inquiries about the questionnaires were responded to by trained research assistants. For anthropometric variables, weights and heights were measured for calculating BMIs.

Intervention procedure

The participants were randomized by school to School A or School B, which had the interventions implemented in a different order as the procedure presented below.

Procedure for School A

1. Implementation of the SSII-Healthy Eating Intervention Program

Week	Topic
1	Food knowledge: food pyramid, calorie, alternative low-calorie food, healthy snack, label reading
2	Self-monitoring on food
3	Food buying, storage, serving, and eating, with the 'Supermarket Tour'
4	Food preparing: demonstration, cooking activity, with the 'Menu assignment'
5	Understanding food as an emotional coping mechanism and providing alternative coping strategies
6	Knowledge about obesity-related Type 2 diabetes

2. End point measures of the SSII-Healthy Eating Intervention Program

Assessments were conducted within a week after the 6th class of the Healthy Eating Intervention Program. The participants were asked to complete the self-report questionnaires on healthy eating self-efficacy, healthy eating self-control, knowledge on obesity and Type 2 diabetes, and eating behavior. The eating behavior diaries were also examined for the assessment of their eating behavior. Weights and heights were also measured for calculating BMIs.

3. Implementation of the SSII-Physical Activity Intervention Program

Week	Topic
1	Exercise knowledge: type, importance, energy expenditure
2	Self-monitoring on physical activity
3	Exercise demonstration
4	Planning to increase energy expenditure
5	Physical activity as a lifestyle-based activity with walk rally
6	Class review

Procedure for School B

1. Implementation of the SSII-Physical Activity Intervention Program

Week	Topic
1	Exercise knowledge: type, importance, energy expenditure
2	Self-monitoring on physical activity
3	Exercise demonstration
4	Planning to increase energy expenditure
5	Physical activity as a lifestyle-based activity with walk rally
6	Class review

2. End point measures of the SSII-Physical Activity Intervention Program

Assessments were conducted within a week after the 6th class of the Physical Activity Intervention Program. The participants were asked to complete the self-report questionnaires on physical activity self-efficacy, physical activity self-control, knowledge on obesity and Type 2 diabetes and physical activity. The physical activity diaries were examined for the assessment of physical activity. Weights and heights were also measured for calculating BMIs.

3. Implementation of the SSII-Healthy Eating Intervention Program

Week	Topic
1	Food knowledge: food pyramid, calorie, alternative low-calorie food, healthy snack, label reading
2	Self-monitoring on food
3	Food buying, storage, serving, and eating, with the ‘Supermarket Tour’
4	Food preparing: demonstration, cooking activity, with the ‘Menu assignment’
5	Understanding food as an emotional coping mechanism and providing alternative coping strategies
6	Knowledge about obesity-related Type 2 diabetes

End point measures of the combined SSII-Healthy Eating and Physical Activity Interventions

Assessments were conducted within a week after the last class of the second intervention for both study groups. To measure psychosocial variables and behaviors, the participants were asked to complete the self-report questionnaires on healthy eating self-efficacy, physical activity self-efficacy, healthy eating self-control, physical activity self-control, knowledge on obesity and Type 2 diabetes, healthy eating behavior, and physical activity, and return to the researcher when they finish. The eating and physical activity diaries were also examined. For anthropometric variables, weights and heights were measured for calculating BMIs.

The overall study procedure was presented in Figure 9.

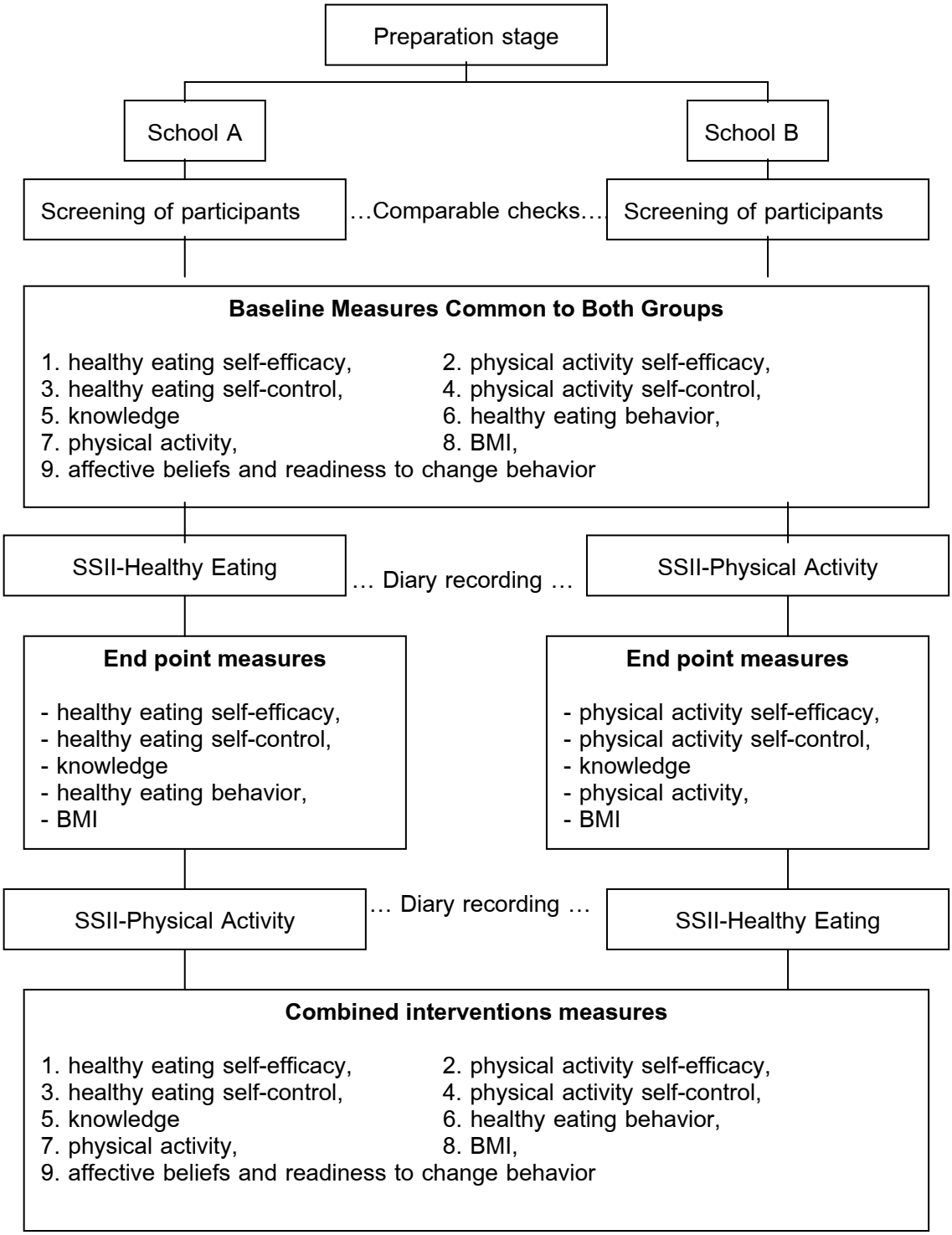

FIGURE 9 The overall study procedure

Data Analysis

Data analysis was performed using SPSS for Windows. The statistical tests to be undertaken were presented below:

1. Descriptive statistics (frequency, percentage, means, standard deviations, minimum, maximum, alpha coefficient) for the sample and each variable,

2. One-way repeated measures ANOVA for testing whether psychosocial, behaviors and anthropometric variables changes occur overtime within intervention group (hypothesis 1 - 3),

3. One-way multivariate analysis of covariance (MANCOVA) for testing whether there were differences in psychosocial, behaviors, and anthropometric variables between the two Schools (hypothesis 4).

4. The multiple regression between the variables was calculated and inspected to see whether the relationships predicted by the PBC hold (hypothesis 5).

An alpha level of .05 will be used for all statistical tests.

CHAPTER 4

RESULTS

This study was generated to develop behavioral intervention programs to reduce the risk factors of obesity-related Type 2 diabetes in schoolchildren. The programs aimed to enhance self-efficacy and self-control in relation to healthy eating behavior and physical activity, which are both components of the perceived behavioral control (PBC), and thereby improve both. The objectives of this study are presented below:

1. To examine the effectiveness of the individual Self-control, Self-efficacy, and Implementation Intention (SSII) Healthy Eating Intervention Program and SSII-Physical Activity Intervention Program in developing self-efficacy, self-control, healthy eating behavior, physical activity and thereby combating obesity-related Type 2 diabetes.

2. To examine the effectiveness of the SSII-Healthy Eating Intervention and Physical Activity intervention programs at the end of intervention implementation in terms of ordering effects and combined effects.

3. To provide a test of the PBC in predicting actual behavior change in relation to healthy eating behavior and physical activity.

This chapter presents all the findings obtained according to the research hypothesis, and the flow of information has been sequentially presented as follows:

Part 1: Demographic of the sample; including sex, classroom, history of illness, experience of eating vitamins/supplementary food, breast feeding, paternal diabetes, maternal diabetes, diabetes history of paternal family, diabetes history of maternal family, father's occupation, mother's occupation, family income, father's education, mother's education, father's BMI, and mother's BMI.

Part 2: Characteristics of the study variables; including knowledge about obesity and Type 2 diabetes, healthy eating self-efficacy, physical activity self-efficacy, healthy eating self-control, physical activity self-control, healthy eating behavior, physical activity, affective beliefs and readiness to change behavior, healthy eating behavior, physical activity, and BMI.

Part 3: The results in accordance with the research hypotheses:

1. After the SSII-Healthy Eating Intervention Program; Knowledge, self-efficacy, self-control, and healthy eating behavior of the sample would increase, but BMI of the sample would decrease.

2. After the SSII-Physical Activity Intervention Program; Knowledge, self-efficacy, self-control and physical activity of the sample would increase, but BMI of the sample would decrease.

3. The combined effects of the SSII-Healthy Eating and Physical Activity Intervention Program on behaviors would be greater than that of the individual programs.

4. School A, where the SSII-Healthy Eating Intervention was implemented first , would have a lower BMI than School B, where SSII-Physical Activity Intervention was implemented first..

5. The reductions in BMI, and increases in healthy eating behavior and physical activity would be accompanied by increases in self-efficacy and self-control if the PBC is good at predicting actual behavior change.

Part 1: Demographic of the sample

In total, 30 children, from each of the two schools selected for the research, who met the inclusion criteria and undertook the physical examination at the final stage of recruitment were given the consent forms asking for commitment from their parents to participate in the study. Although 20 students from each school were the targeted group in this study, an addition of 10 eligible students was selected to account for the expected dropout and incomplete class attendance. The 26 written informed consents from the School A and 24 from the School B were obtained from parents of the participating students. These represented 86.7% and 80.0% of children who were eligible to take part from School A and B, respectively. The reason for the higher response rate in School A may be that children attending this school received more encouragement to participate from the school administrator and staff as the school aimed to win the governmental ‘Health Promotion School Award’ in this year.

Further 5 boys from the School A and 3 boys and 1 girl from the School B were excluded from the analysis due to their having an insufficient number of class attendances during the intervention phases and dropouts, thereby providing 21 participants from the School A and 20 from the School B for final analysis, with a pooled sample of 41 students. Missing data were due to school absence, children leaving the school (1 boy in School A and 1 girl in School B), school extracurricular activities such as sport and a music tournament, and taking extra tutorial class on the intervention day.

Table 9 summarizes the baseline characteristics and socio-economic status for the students of each group. No significant differences were found between the groups before the intervention, excluding student's BMI as significant difference in this variable was exhibited across schools (t = 2.42, p = .02). Overall, boys and girls were 10.5 ± 0.5 years of age; with boys being overrepresented (75%) in the study sample. Most students were studying in Grade 4 (53.7%), had no current health problems (75.6%) and experience of eating vitamins (75.6%), and had been breast-fed for 4 months or more (41.5%). Regarding family history of diabetes, less than 10% of parents reported diabetes as their current health problem. However, 26.8% and 29.3% of diabetes history was reported by paternal family and maternal family, respectively. For socio-economic status, 41.4% of students' fathers worked as laborers, whereas being a housewife was representative of the maternal occupation. More than half of parents revealed a family income of 20,000 baht/month or less. In addition, around 80% of fathers and mothers reported low education. Mean age of parents was around 40 years and it is apparent that most parents were obese with a mean BMI of 25.64 ± 4.17 for fathers and 26.40 ± 5.11 for mothers.

TABLE 9 Baseline characteristics of the intervention groups

Characteristics	School A (N=21)		School B (N=20)		Total (N=41)	
	n	%	n	%	n	%
Sex						
Girl	3	14.3	7	35.0	10	24.4
Boy	18	85.7	13	65.0	31	74.6
Class						
Grade 4	10	47.6	12	60.0	22	53.7
Grade 5	11	52.4	8	40.0	19	46.3
Current health problems						
No	15	71.4	16	80.0	31	75.6
Yes	6	28.6	4	20.0	10	24.4
Experience of eating vitamins or supplementary food						
No	14	66.7	17	85.0	31	75.6
Yes	2	9.5	3	15.0	5	12.2

TABLE 9 (Cont.)

Characteristics	School A (N=21)		School B (N=20)		Total (N=41)	
	n	%	n	%	n	%
Duration of breast feeding						
Never breast-fed	3	14.3	5	25.0	8	19.5
Breast-fed 1-3 months	10	47.6	6	30.0	16	39.0
Breast-fed $\geq$ 4 months	8	30.1	9	45.0	17	41.5
Paternal diabetes						
Yes	2	9.5	2	10.0	4	9.8
No	13	61.9	13	65.0	26	63.4
Don't know	6	28.6	5	25.0	11	26.8
Maternal diabetes						
Yes	1	4.8	2	10.0	3	7.3
No	8	38.1	9	45.0	17	41.5
Don't know	12	57.1	9	45.0	21	51.2
Diabetes history of paternal family						
Yes	8	38.1	3	15.0	11	26.8
No	6	28.6	9	45.0	15	36.6
Don't know	7	33.3	8	40.0	15	36.6
Diabetes history of maternal family						
Yes	6	28.6	6	30.0	12	29.3
No	6	28.6	9	45.0	15	36.6
Don't know	9	42.8	5	25.0	14	34.1
Father's occupation						
Government officer	2	9.5	-	-	2	4.9
State enterprise/private officer	3	14.3	6	30.0	9	22.0
Personal business	4	19.0	8	40.0	12	29.3
No occupation	1	4.8	-	-	1	2.4
Laborer	11	52.3	6	30.0	17	41.4

TABLE 9 (Cont.)

Characteristics	School A (N=21)		School B (N=20)		Total (N=41)	
	n	%	n	%	n	%
Mother's occupation						
State enterprise/private officer	1	4.8	2	5.0	3	7.3
Personal business	6	28.6	7	35.0	13	31.7
Housewife	8	38.0	7	35.0	15	36.6
Laborer	6	28.6	4	20.0	10	24.4
Family income (Bahts)						
Less than 20,000	14	66.7	14	70.0	28	68.3
20,000 – 30,000	6	28.6	5	25.0	11	26.8
30,001 – 40,000	-	-	-	-	-	-
40,001 – 50,000	1	4.8	-	-	1	2.4
50,001 – 60,000	-	-	1	5.0	1	2.4
Father's education						
Lower than bachelor's degree	16	76.2	16	80.0	32	78.0
Bachelor's degree	5	23.8	2	10.0	7	17.1
Master's degree	-	-	1	5.0	1	2.4
Other	-	-	1	5.0	1	2.4
Mother's education						
Lower than bachelor's degree	16	76.2	18	90.0	34	82.9
Bachelor's degree	5	23.8	2	10.0	7	17.1

TABLE 9 (Cont.)

Characteristics	School A (N=21)		School B (N=20)		Total (N=41)	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Age of students (year)	10.57	0.51	10.40	0.50	10.49	0.51
Students' height (cm)	146.67	7.74	145.75	5.95	146.22	6.85
Students' weight (kg)	59.66	11.66	54.12	6.92	56.96	9.93
Students' BMI (kg/m^2)	27.52	3.50	25.38	1.86	26.48	2.99
Age of father (year)	40.60	7.05	39.82	4.54	40.19	5.77
Age of mother (year)	38.20	6.48	38.00	4.77	38.10	5.57
Father's BMI (kg/m^2)	25.78	4.96	25.52	3.51	25.64	4.17
Mother's BMI (kg/m^2)	26.40	5.74	26.40	4.56	26.40	5.11

Part 2: Characteristics of the study variables

The variable characteristics were displayed according to types of variables, which were continuous and discrete one. Table 10 shows the characteristics of continuous dependent variables whereas the categories were exhibited in Table 11.

Change in psychosocial variables

The psychosocial dependent variables first targeted for research in this study were knowledge about obesity-related Type 2 diabetes, healthy eating self-efficacy, physical activity self-efficacy, healthy eating self-control, physical activity self-control, and affective beliefs and readiness to change behavior. With regards to the last variable, as mentioned in Chapter 3; affective beliefs including happiness and enjoyment about healthy eating behavior, physical activity, body weight as well as questions regarding students' motivation to participate in the intervention, were included. It is shown that the measure contained both rating and categorical scales. Thus, data reflecting this variable was separately displayed where affective beliefs about healthy eating behavior and affective beliefs about physical activity, which were in continuous scale, are presented in Table 10 and the rest of categorical scales are presented in Table 11.

TABLE 10 Total mean and SD of the psychosocial, behavioral and anthropometric variables by school and time of measures

Variables	School A (N=21)		School B (N=20)		Total (N=41)	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
1. Knowledge						
Baseline measure	5.81	1.29	6.45	1.95	6.12	1.67
Endpoint measure	6.76	1.34	7.25	1.52	7.00	1.43
Combined intervention measure	8.14	1.85	8.40	1.76	8.27	1.79
2. Healthy eating self-efficacy						
Baseline measure	43.00	7.75	46.65	8.92	44.78	8.44
Endpoint measure*	48.67	4.51	X	X	48.67	4.51
Combined intervention measure	47.81	5.70	45.20	6.81	46.54	6.32
3. Physical activity self-efficacy						
Baseline measure	31.38	5.67	32.90	5.09	32.12	5.38
Endpoint measure*	X	X	34.80	2.46	34.80	2.46
Combined intervention measure	36.48	3.04	36.50	3.35	36.49	3.15
4. Healthy eating self-control						
Baseline measure	52.14	7.48	56.55	5.92	54.29	7.04
Endpoint measure*	56.86	6.40	X	X	56.86	6.40
Combined intervention measure	56.62	7.34	54.90	6.77	55.78	7.04
5. Physical activity self-control						
Baseline measure	29.90	6.26	30.85	4.49	30.37	5.42
Endpoint measure*	X	X	31.95	4.32	31.95	4.32
Combined intervention measure	29.29	5.08	33.55	3.05	31.37	4.69
6. Affective beliefs about healthy eating behavior**						
Baseline measure	9.05	1.80	10.30	1.78	9.66	1.88
Combined intervention measure	9.81	1.69	11.15	1.42	10.46	1.69
7. Affective beliefs about Physical activity**						
Baseline measure	13.38	2.97	14.15	2.25	13.76	2.64
Combined intervention measure	14.95	1.60	15.55	1.00	15.24	1.35

TABLE 10 (cont.)

Variables	School A (N=21)		School B (N=20)		Total (N=41)	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
8. Intention to eat healthily**						
Baseline measure	20.57	2.86	21.50	2.89	21.02	2.88
Combined intervention measure	20.62	3.72	20.40	4.04	20.51	3.83
9. Intention to physically active**						
Baseline measure	11.48	2.40	11.35	2.16	11.41	2.26
Combined intervention measure	12.76	1.87	13.15	1.66	12.95	1.76
10. Healthy eating behavior						
Baseline measure	22.00	2.12	21.85	3.23	21.93	2.67
Endpoint measure*	23.19	1.86	X	X	23.19	1.86
Combined intervention measure	25.19	2.36	24.90	2.53	25.05	2.42
11. Physical activity						
Baseline measure	44.52	9.66	45.75	13.34	45.12	11.47
Endpoint measure*	X	X	52.25	8.54	52.25	8.54
Combined intervention measure	52.52	8.44	58.05	11.02	55.22	10.06
12. Weight (Kg)						
Baseline measure	59.66	11.66	54.12	6.92	56.96	9.93
Endpoint measure	59.06	11.37	53.80	7.63	56.49	9.97
Combined intervention measure	60.40	11.58	55.52	7.88	58.02	10.13
13. BMI (Kg/m^2)						
Baseline measure	27.52	3.50	25.38	1.86	26.48	2.99
Endpoint measure	27.02	3.53	24.92	2.38	25.99	3.17
Combined intervention measure	27.28	3.64	25.24	2.10	26.28	3.13

*The total sample based on one school as only one was measured

**End point measure was not conducted

X = That variable was not measured

Additional Theory of Planned Behavior (TPB) based variables

In order to completely explain the effects of change in self-efficacy and self-control on actual behaviour change that was one of the targeted objectives of the study, as suggested by the TPB, intention to perform healthy eating behavior and intention to perform physical activity were also measured.

As shown in Table 10, there were increases in knowledge about obesity-related Type 2 diabetes, physical activity self-efficacy, affective beliefs about healthy eating behavior, affective beliefs about physical activity, and intention to perform physical activity over times of measure. Increases in mean scores were recorded after the first intervention or endpoint measure, but reductions in those after the combined intervention measure were found in 3 variables, including healthy eating self-efficacy, healthy eating self-control, and physical activity self-control. In contrast, a small decrease in mean score of intention to perform healthy eating behavior was shown after the combined intervention measure and this pattern accounted for only the sample in School B. Based on this result with higher variance (SD=3.83 comparing with 1.76 of SD for intention to perform physical activity) at the combined intervention measure, individual data about the change in intention to perform healthy eating behaviour after the combined intervention and demographic data was analyzed to investigate influence of demographic data on the inverted finding. It is revealed that sex significantly affected the change (increase, the same, or decrease) in the intention to perform healthy eating behaviour after the combined intervention among students (χ^2=6.60, p<.05).

Change in behavioral variables

The behavioral variables in this study were healthy eating behavior and physical activity. There were increases in both behaviors over time of the study and these findings were exhibited in each of two schools.

Change in anthropometric variables

Weight and BMI were anthropometric variables in the study. Mean scores of those variables showed that there were decreases in weight and BMI after endpoint measure, whereas increases in those were displayed after the combined intervention.

Although the changes in mean scores of dependent variables were demonstrated, significant differences have not been examined yet. Multivariate analyses were performed to significantly confirm those changes and the results were presented in Part 3.

TABLE 11 Frequency and percentage of psychosocial and behavioral variables by school

Variables	School A (N=21)		School B (N=20)		Total (N=41)	
	n	%	n	%	n	%
1. Reasons for participating in this program (multiple responses)						
I myself would like to participate in	9	42.9	14	70.0	23	56.1
My parents would like me to participate in this	9	42.9	11	55.0	20	48.8
I would like to know more about healthy eating and physical activity	16	76.2	15	75.0	31	75.6
I would like to lose weight	15	71.4	10	50.0	25	61.0
I would like to eat healthily and be physically active	9	42.9	16	80.0	25	61.0
I would like a prize	5	23.8	-	-	5	12.2
Teacher would like me to participate in it	2	9.5	6	30.0	8	19.5
I don't want to be at risk of T2DM	1	4.8	-	-	1	2.4
2. Happiness with weight and body shape						
Very happy	5	23.8	8	40.0	13	31.7
Happy	-	-	2	10.0	2	4.9
Uncertain	5	23.8	1	5.0	6	14.6
Unhappy	7	33.3	8	40.0	15	36.6
Very unhappy	4	19.0	1	5.0	5	12.2
3. Feeling *before* participating in the program						
Very sure that I will be happy and enjoy it	14	66.7	12	60.0	26	63.4
A little sure that I will be happy and enjoy it	6	28.6	8	40.0	14	34.1
Uncertain	1	4.8	-	-	1	2.4
A little sure that I will be unhappy and will not enjoy it	-	-	-	-	-	-
Very sure that I will be unhappy and will not enjoy it	-	-	-	-	-	-

TABLE 11 (Cont.)

Variables	School A (N=21)		School B (N=20)		Total (N=41)	
	n	%	n	%	n	%
4. Feeling *after* participating in the program						
Very happy and pleasant	18	85.7	17	85.0	35	85.4
Happy and pleasant	2	9.5	1	5.0	3	7.3
Uncertain	1	4.8	1	5.0	2	4.8
Unhappy and unpleasant	-	-	-	-	-	-
Very unhappy and unpleasant	-	-	1	5.0	1	2.4
5. Having breakfast *before* participating in the program						
Not having breakfast	1	5.0	-	-	1	2.5
Sometimes	8	40.0	12	60.0	20	50.0
Everyday	11	55.0	8	40.0	19	47.5
6. Having breakfast *after* participating in the program						
Not having breakfast	-	-	1	5.0	1	2.4
Sometimes	6	28.6	10	50.0	16	39.0
Everyday	15	71.4	9	45.0	24	58.5

As presented in Table 11, most students participated in the intervention program because they would like to know more about healthy eating and physical activity (75.6%), would like to lose weight (61%), and would like to eat healthily and be physically active (61%). In addition, around a half of students joined the intervention program by themselves. Regarding their weight and body shape satisfaction, most students revealed that they were unhappy (36.6%). However, almost one third of the students felt happy with their body shape. Before participating in the program, most students were very sure that they would be happy and would enjoy it (63.4%). That expected feeling was supported as a majority (85%) reported that they were very happy and enjoyable after the intervention. Question about having breakfast before and after the program was also added in the measure as this behavior was very important for schoolchildren. After the intervention, there was an

increased number of students reporting that they had breakfast everyday (58.5% comparing with 47.5% at the baseline).

Part 3: The results in accordance with research objectives

3.1 The results corresponding to objective 1

The objective 1 was to examine the effectiveness of the individual Self-control, Self-efficacy, and Implementation Intention (SSII) Healthy Eating Intervention Program and SSII-Physical Activity Intervention Program in developing self-efficacy, self-control, healthy eating behavior, and thereby combating obesity-related Type 2 diabetes. Research hypotheses to evaluate this objective were hypothesis 1 and 2. The hypothesis 1 was that *after the SSII-Healthy Eating Intervention Program; knowledge, self-efficacy, self-control, and healthy eating behavior of the sample will increase but BMI will decrease*. Hypothesis 2 was that *after the SSII-Physical Activity Intervention Program; knowledge, self-efficacy, self-control and physical activity of the sample will increase but BMI will decrease*.

A One-way Repeated Measures ANOVA was conducted to compare the mean scores at baseline (T1) with that at endpoint measure (T2) and combined intervention measure (T3) for each of the dependent variables. As first implemented with the individual SSII-Healthy Eating Intervention Program, only the sample in the School A was included for analysis to examine the hypothesis 1. Similarly, only the sample in the School B was included for examining the hypothesis 2 as the individual SSII-Physical Activity Intervention Program was first implemented in this School.

Before conducting the One-way Repeated Measures ANOVA, assumptions for Repeated Measures ANOVA were examined as detailed below:

1. *Independence of observations*. Two schools were used in this study instead of one school to obtain independent sample and minimize the effects of possible contamination which may be occur when only one school is used. These schools were then randomized by coin toss to select the A or B group, which different order of two combined interventions was implemented. Then, the students who met the inclusion criteria from each of two schools, which a number of students was more than the targeted sample, were randomly invited to participate in this study by sending their parents consent forms to indicate their commitment. Final students who participated in each school came from different classes (Grade 4 and grade 5) and different rooms (Room 4/1, room 4/2, room 4/3, room 5/1, room 5/2, and room 5/3). Thus, it appears that the assumption of independence of observation was satisfied.

2. *Normality*. In this study, a number of 20 students in School A and 21 students in School B were the chosen sample. Skewness and kurtosis, along with Shapiro-Wilk, were assessed to obtain evidences of normality (Stevens, 1992: 253). It was found that most variables showed normal distribution. In addition, as suggested from the literature (Nemet, Barkan, Epstein, Friedland, Kowen, & Eliakim. 2005: e445; Tabachnick & Fidelll. 2007: 251; Cliff, Wilson, Okely, Mickle, & Steele. 2007: 265), robustness to nonnormality were shown with at least n = 10 per group. Thus, it appears that the assumption of normality was met.

3. *Homogeneity of variances and covariances*. For repeated measure ANOVA, which there were 2 levels of a within-subjects factor in this case, this assumption referred to the sphericity assumption. Mauchly's test was used to evaluate the sphericity. If there was violation of sphericity ($p < .05$), the Greenhouse-Geisser that was adjusted for violation of the assumption would be used (Tabachnick & Fidel. 2007: 329).

The results of two hypotheses according to the objective 1 were detailed as follows.

Hypothesis 1: *After the SSII-Healthy Eating Intervention Program; knowledge, healthy eating self-efficacy, healthy eating self-control, and healthy eating behavior of the sample will increase but BMI will decrease.*

Table 12 presents the result of One-way repeated Measures ANOVA for knowledge, healthy eating self-efficacy, healthy eating self-control, healthy eating behavior, and BMI over times of measure in the School A. Mauchly's test indicated that the sphericity assumptions were met ($p>.05$) for those variables. The ANOVA results demonstrated that, in School A, there were significant differences in all variables between three times of measurement: baseline (T1), endpoint measure (T2), combined intervention measure (T3). It was found that knowledge showed the highest partial Eta-Squared (.59); followed by healthy eating behavior (.47), and healthy eating self-efficacy (.37), respectively, suggesting that relation between the repeated-measure factor and knowledge was strongest among dependent variables. Bonferroni comparisons revealed that, after the SSII-Healthy Eating Intervention Program (T2 versus T1); knowledge, healthy eating self-efficacy, healthy eating self-control, and healthy eating behavior significantly increased from the baseline but BMI significantly decreased (Table 13). The rest of pairwise comparisons were not mentioned here as they were beyond the concern of the hypothesis. Thus, the hypothesis 1 was supported.

TABLE 12 The result of One-way repeated Measures ANOVA for knowledge, healthy eating self-efficacy, healthy eating self-control, healthy eating behavior, and BMI over times of measure (T) in the School A (N=21)

Source of variation	SS	df	MS	F	Sig.	Partial η^2
Knowledge about obesity-related						
Type 2 diabetes						
Time (T)	57.81	2	28.91	28.30	.00*	.59
Residual	40.86	40	1.02			
Healthy eating self-efficacy						
Time (T)	391.84	2	195.92	7.11	.00*	.37
Residual	1101.49	40	27.54			
Healthy eating self-control						
Time (T)	296.22	2	148.11	3.30	.04*	.14
Residual	1797.11	40	44.93			
Healthy eating behavior						
Time (T)	109.17	2	54.59	17.40	.00*	.47
Residual	125.49	40	3.14			
BMI						
Time (T)	2.63	2	1.31	6.81	.00*	.25
Residual	7.51	40	0.193			

*$p < .05$

TABLE 13 Pairwise comparisons of mean scores for knowledge, healthy eating self-efficacy, healthy eating self-control, healthy eating behavior, and BMI across times of measure (T) in the School A (N=21)

Variables	Time of measure	Mean scores	Pairwise comparison	Mean differences	Sig.
Knowledge	T1	5.81	T2 – T1	.95	.00*
	T2	6.76	T3 – T1	2.33	.00*
	T3	8.14	T3 – T2	1.38	.00*
Healthy eating self-efficacy	T1	43.00	T2 – T1	5.67	.02*
	T2	48.67	T3 – T1	4.81	.01*
	T3	47.81	T3 – T2	-.86	1.00
Healthy eating self-control	T1	52.14	T2 – T1	4.71	.03*
	T2	56.86	T3 – T1	4.47	.27
	T3	56.62	T3 – T2	-.24	1.00
Eating behavior	T1	22.00	T2 – T1	1.19	.04*
	T2	23.19	T3 – T1	3.19	.00*
	T3	25.19	T3 – T2	2.00	.01*
BMI	T1	27.52	T2 – T1	-.50	.00*
	T2	27.02	T3 – T1	-.24	.45
	T3	27.28	T3 – T2	.26	.09

*p < .05

The result of One-way repeated Measures ANOVA for knowledge, physical activity self-efficacy, physical activity self-control, physical activity, and BMI over times of measure (T) in the School B was presented in Table 14 and pairwise comparisons were presented in Table 15.

TABLE 14 The result of analysis of variance for knowledge about obesity-related Type 2 diabetes, physical activity self-efficacy, physical activity self-control, physical activity, and BMI over times of measure (T) in the School B (N=20)

Source of variation	SS	df	MS	F	Sig.	Partial η^2
Knowledge about obesity-related						
Type 2 diabetes						
Time (T)	38.43	1.35	28.53	17.02	.00*	.47
Residual	42.90	25.60	1.68			
Physical activity self-efficacy						
Time (T)	129.73	2	64.87	6.38	.00*	.25
Residual	386.27	38	10.16			
Physical activity self-control						
Time (T)	73.73	1.32	55.68	3.90	.04*	.17
Residual	358.93	25.16	14.26			
Total						
Physical activity						
Time (T)	1514.53	2	757.27	11.99	.00*	.39
Residual	2400.13	38	63.16			
BMI						
Time (T)	2.25	1.49	1.51	2.36	.12	.11
Residual	18.11	28.33	0.64			

*p < .05

TABLE 15 Pairwise comparisons of mean scores for knowledge, physical activity self-efficacy, physical activity self-control, physical activity, and BMI across times of measure (T) in the School B (N=20)

Variables	Time of measure	Mean scores	Pairwise comparison	Mean differences	Sig.
Knowledge	T1	6.45	T2 – T1	.80	.20
	T2	7.25	T3 – T1	1.95	.00*
	T3	8.40	T3 – T2	1.15	.00*
Physical activity self-efficacy	T1	32.90	T2 – T1	1.90	.22
	T2	34.80	T3 – T1	3.60	.01*
	T3	36.50	T3 – T2	1.70	.22
Physical activity self-control	T1	30.85	T2 – T1	1.10	.15
	T2	31.95	T3 – T1	2.70	.02*
	T3	33.55	T3 – T2	1.60	.56
Physical activity	T1	45.75	T2 – T1	6.50	.03*
	T2	52.25	T3 – T1	12.30	.00*
	T3	58.05	T3 – T2	5.80	.13
BMI	T1	25.38	T2 – T1	-.46	.04*
	T2	24.92	T3 – T1	-.14	1.00
	T3	25.24	T3 – T2	.32	.76

*p < .05

Hypothesis 2: *After the SSII-Physical Activity Intervention Program; knowledge, physical activity self-efficacy, physical activity self-control and physical activity of the sample will increase but BMI will decrease*.

Table 14 shows the result of One-way repeated Measures ANOVA for knowledge, physical activity self-efficacy, physical activity self-control, physical activity, and BMI over times of measure in the School B. Mauchly's test indicated that the sphericity assumptions for knowledge, physical activity self-control, and BMI were violated (p<.05). Thus, for those three variables, the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity. The results demonstrated that, in School B, there were significant differences in knowledge, physical activity self-efficacy, physical activity self-control, and physical activity between three times of measurement: baseline (T1), endpoint measure

(T2), combined intervention measure (T3), whereas BMI were not significantly different. It was found that, among variables demonstrating significant differences between times, knowledge showed the highest partial Eta-Squared (.47); followed by physical activity (.39), and physical activity self-efficacy (.25), respectively. This suggested that, similar to the School A, relation between the repeated-measure factor and knowledge was stronger than that of other dependent variables. However, Bonferroni comparisons showed that, after the SSII-physical activity Intervention Program (T2 versus T1); only mean score of physical activity significantly increased from baseline (Table 15). Surprisingly, the pairwise comparisons of BMI were not consistent with the ANOVA results, showing that there was significantly decrease in BMI after the SSII-physical activity Intervention Program (T2 versus T1). The rest of pairwise comparisons were not mentioned here as they were beyond the concern of this hypothesis. Thus, the hypothesis 2 was partially supported.

3.2 The results corresponding to objective 2

Objective 2 was to examine the effectiveness of the SSII-Healthy Eating Intervention and Physical Activity intervention programs at the end of intervention implementation in terms of ordering effects and combined effects. Research hypotheses in agree with this objective were hypothesis 3 and 4. The hypothesis 3 was that *the combined effects of the SSII-Healthy Eating and Physical Activity Intervention Program on behaviour will be greater than that of the individual programs*. The hypothesis 4 was that *the School A, which was first selected for implementing the SSII-Healthy Eating intervention, will provide less BMI than the School B, who was first implemented with SSII-Physical Activity intervention.*

The results of two hypotheses were detailed as follows.

Hypothesis 3: *The combined effects of the SSII-Healthy Eating and Physical Activity Intervention Programs on behaviour will be greater than that of the individual programs*.

By conducting the One-way Repeated Measures ANOVA to compare the mean scores at baseline (before the individual program: T1) with that at endpoint measure (after the individual program: T2) and combined intervention measure (after the combined intervention: T3) for each of the dependent variables, the combined effects of two individual intervention programs were also examined. Thus, for this hypothesis, the pairwise comparisons shown in Table 13 and Table 15 were implicated.

The combined effect on the School A

The SSII-Healthy Eating Intervention was first implemented in School A, and followed by the SSII-Physical Activity Intervention. Thus, combined intervention measure was performed after implementation of the later intervention. Combined effects on each dependent variable were described below.

Knowledge about obesity-related Type 2 diabetes: As shown in Table 13, Bonferroni comparisons revealed that all three means were significantly different from each other. Mean knowledge was significantly higher after the individual SSII-Healthy Eating Intervention Program (Mean=6.76) than before the individual program (Mean=5.81). The mean knowledge score after the combined intervention (Mean=8.14) was significantly higher than that after the individual program, and also significantly higher than the mean score at baseline. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 10.

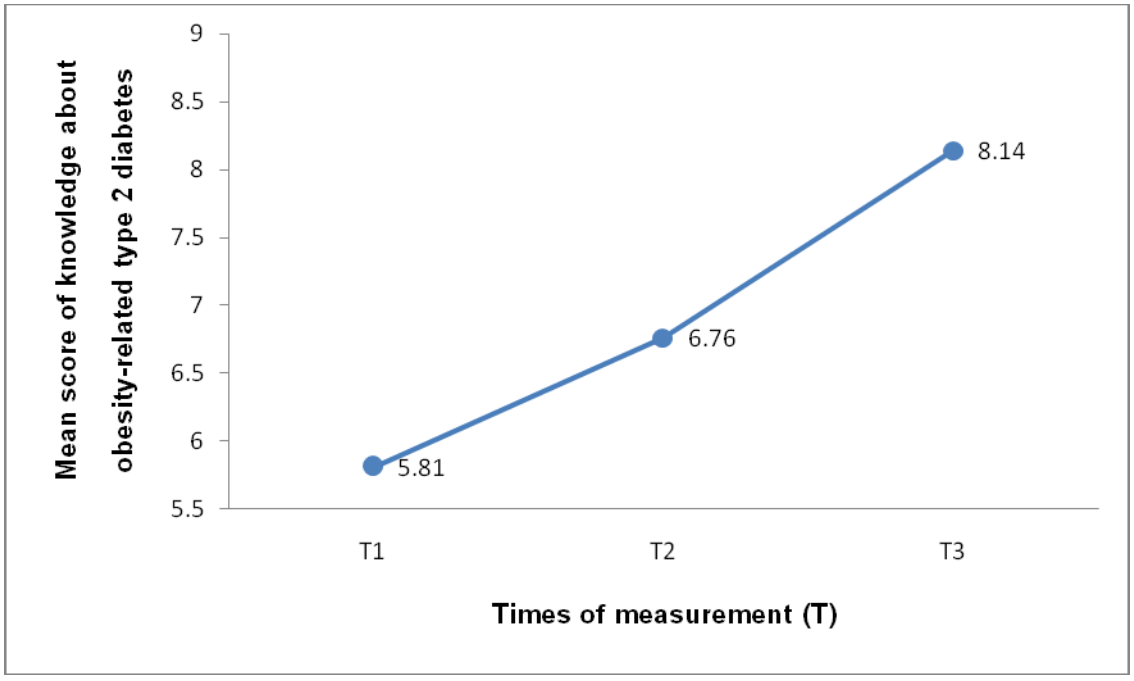

FIGURE 10 Differences in mean score of knowledge about obesity-related type 2 diabetes between three times of measurement in the School A

Healthy eating self-efficacy: Bonferroni comparisons shown in Table 13 demonstrated that mean score of healthy eating self-efficacy was significantly higher after the individual SSII-Healthy Eating Intervention Program (Mean=48.67) than before the individual program (Mean=43.00). The mean score after the combined intervention (Mean=47.81) was also significantly higher than that before the individual program, but small decrease in mean score was found after the combined intervention. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 11.

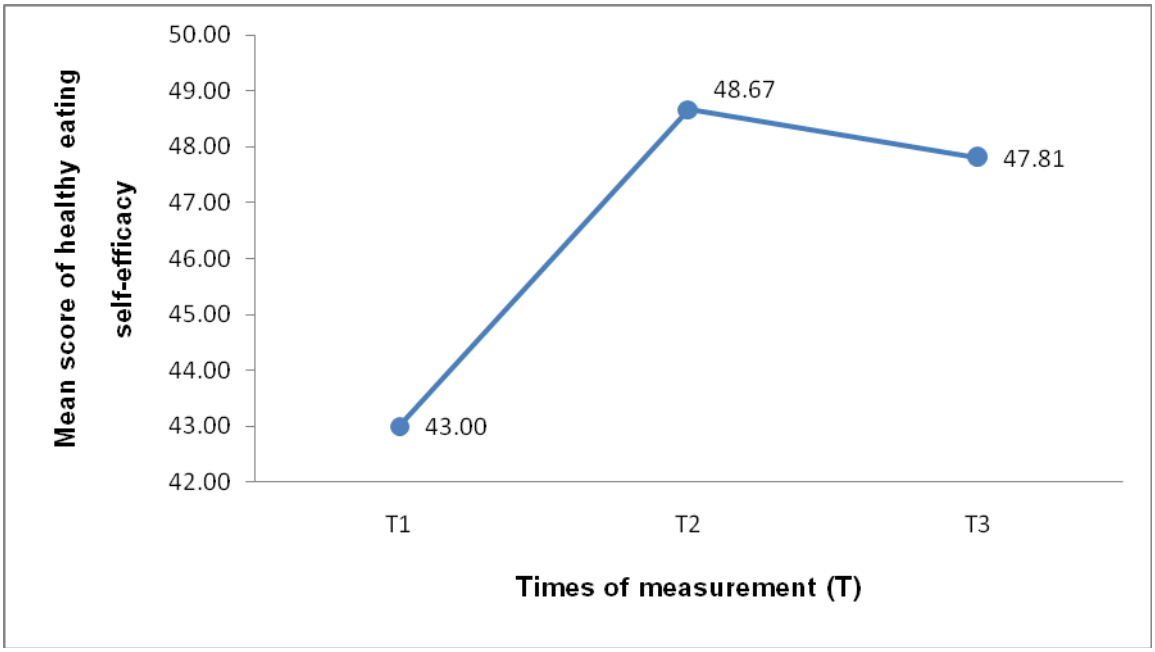

FIGURE 11 Differences in mean score of healthy eating self-efficacy between three times of measurement in the School A

Healthy eating self-control: Bonferroni comparisons shown in Table 13 revealed that mean score of healthy eating self-control was significantly higher after the individual SSII-Healthy Eating Intervention Program (Mean=56.86) than before the individual program (Mean=52.14). The mean score after the combined intervention (Mean=56.62) was not significantly different from that at baseline and after the individual program. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 12.

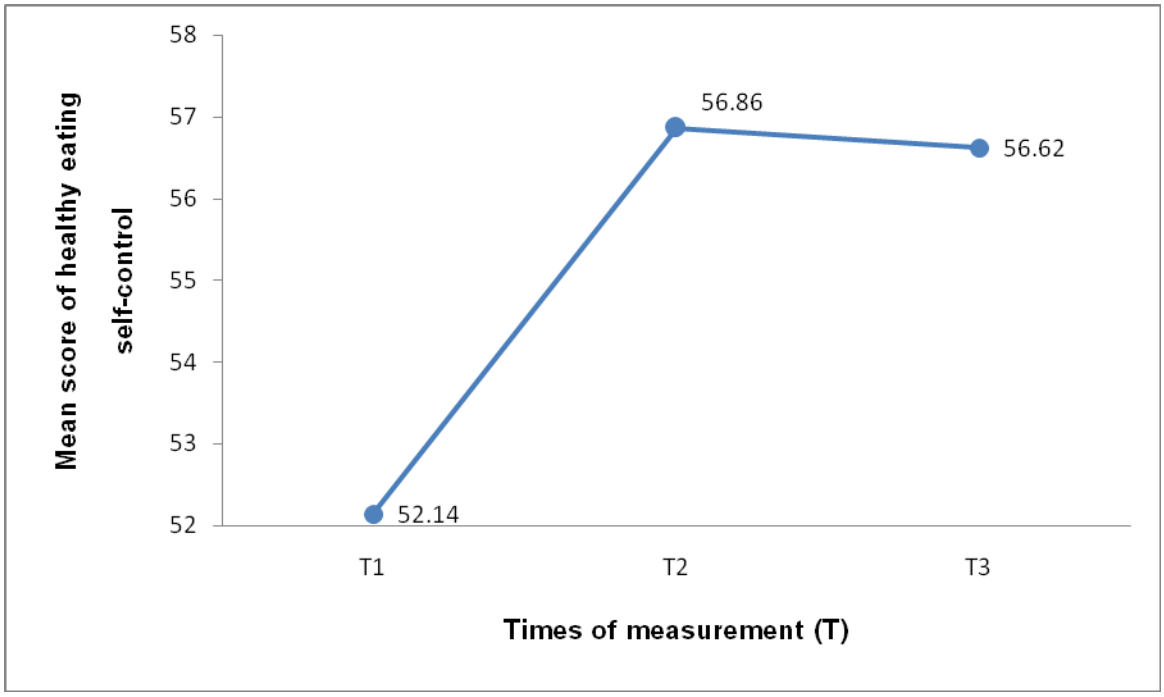

FIGURE 12 Differences in mean score of healthy eating self-control between three times of measurement in the School A

Healthy eating behavior: As shown in Table 13, Bonferroni comparisons showed that all three means were significantly different from each other. Mean behavior was significantly higher after the individual SSII-Healthy Eating Intervention Program (Mean=23.19) than before the individual program (Mean=22.00). The mean score after the combined intervention (Mean=25.19) was significantly higher than that before and after the individual program. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 13.

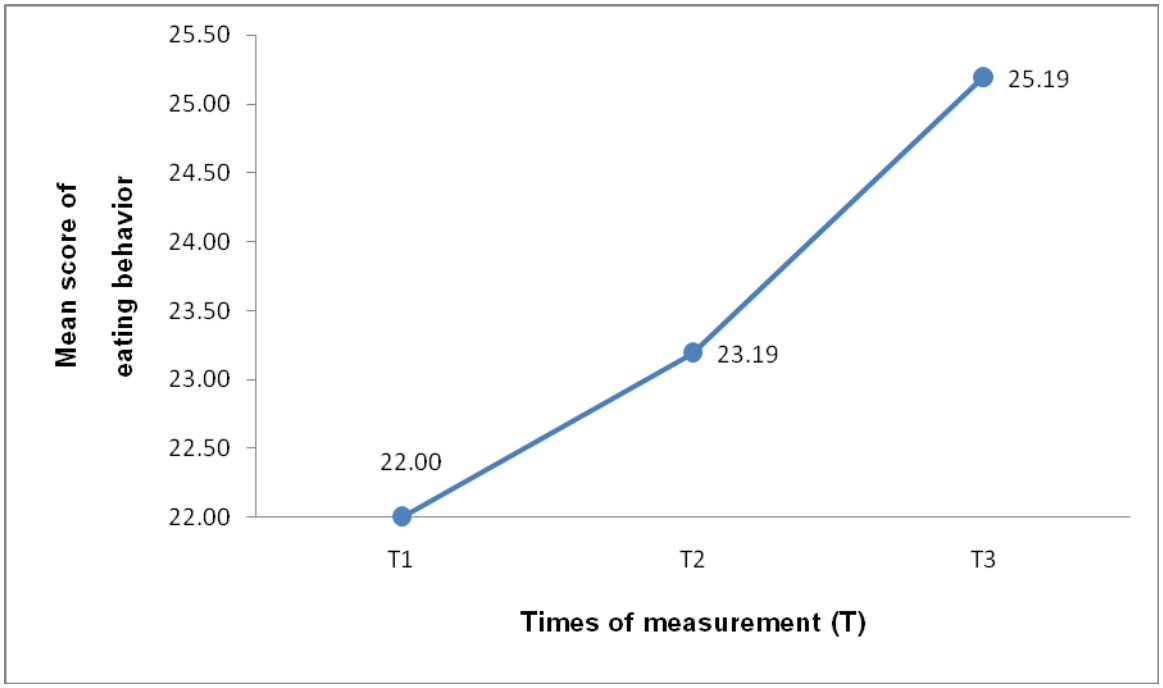

FIGURE 13 Differences in mean score of healthy eating behavior between three times of measurement in the School A

BMI: From Bonferroni comparisons shown in Table 13, it was found that mean BMI was significantly lower after the individual SSII-Healthy Eating Intervention Program (Mean=27.02) than before the individual program (Mean=27.52). The mean BMI after the combined intervention (Mean=27.28) was not significantly different from that before and after the individual program. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 14.

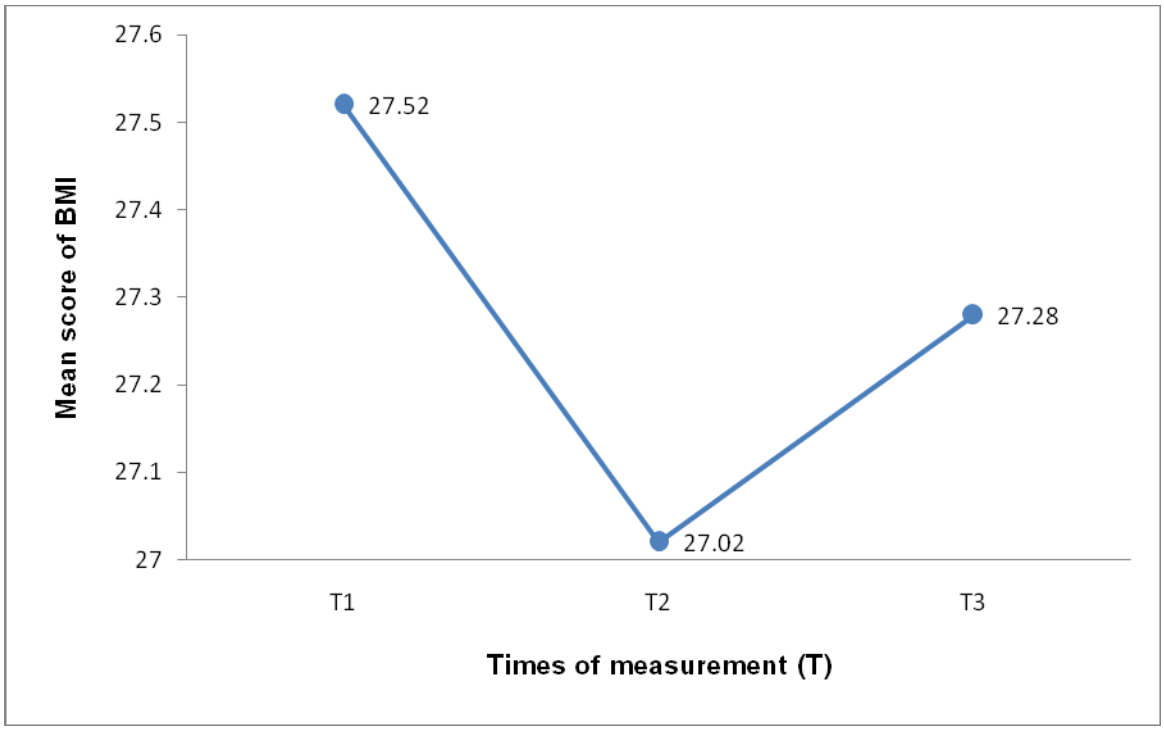

FIGURE 14 Differences in mean score of BMI between three times of measurement in the School A

In conclusion, as suggested by the above results, the combined effects of the SSII-Healthy Eating and Physical Activity Intervention Programs on two dependent variables, including knowledge about obesity-related Type 2 diabetes and healthy eating behavior, were greater than that of the individual SSII-Healthy Eating Intervention. Thus, hypothesis 3, saying that *the combined effects of the SSII-Healthy Eating and Physical Activity Intervention Programs on behaviour will be greater than that of the individual programs*, was partially supported in the School A.

The combined effect on the School B

The School B was first implemented with the SSII-Physical Activity Intervention, and followed by the SSII-Healthy Eating Intervention Program. Thus, combined intervention measure was performed after implementation of the SSII-Healthy Eating Intervention. Combined effects on each dependent variable were presented below.

Knowledge about obesity-related Type 2 diabetes: As shown in Table 15, Bonferroni comparisons revealed that there was no significant increase in mean knowledge after the individual SSII-Physical Activity Intervention Program (Mean=7.25), comparing with before the individual program (Mean=6.45). The mean knowledge score after the combined intervention (Mean=8.40) was significantly higher than that after the individual program, and

also significantly higher than the mean score at baseline. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 15.

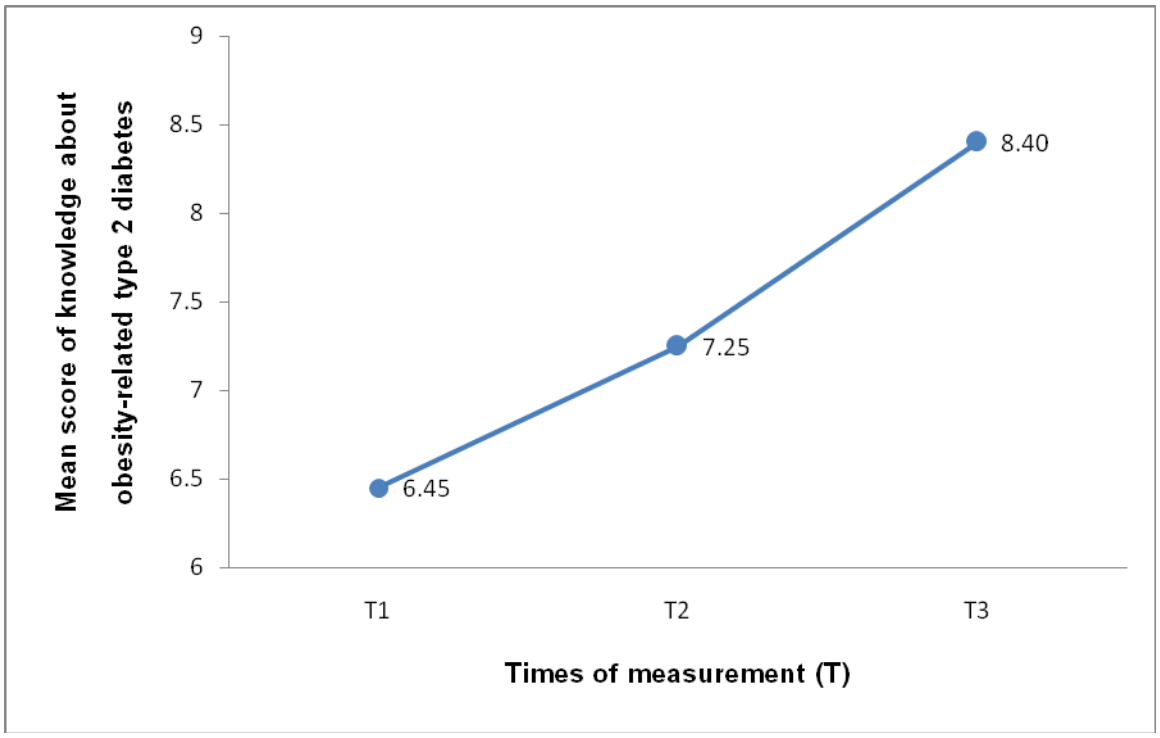

FIGURE 15 Differences in mean score of knowledge about obesity-related type 2 diabetes between three times of measurement in the School B

Physical activity self-efficacy: Bonferroni comparisons shown in Table 15 demonstrated that mean score of physical activity self-efficacy after the individual SSII-Physical Activity Intervention Program (Mean=34.80) was not significantly different from the mean score before the individual program (Mean=32.90). However, mean score after the combined intervention (Mean=36.50) was significantly higher than it was before the individual program. There was no significant difference in mean score between after the individual intervention and after the combined intervention program. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 16.

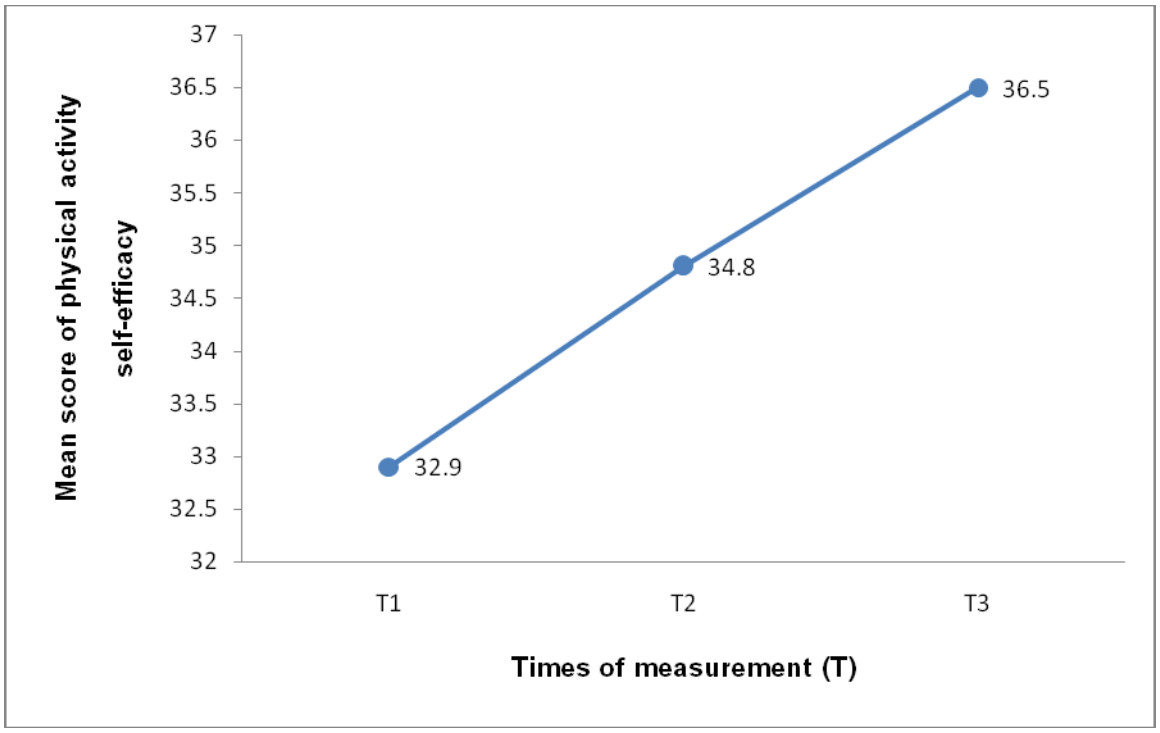

FIGURE 16 Differences in mean score of physical activity self-efficacy between three times of measurement in the School B

Physical activity self-control: Bonferroni comparisons shown in Table 15 demonstrated that mean score of physical activity self-control after the individual SSII-Physical Activity Intervention Program (Mean=31.95) was not significantly different from the mean score before the individual program (Mean=30.85). However, mean score after the combined intervention (Mean=33.55) was significantly higher than it was before the individual program. There was no significant difference in mean score between after the individual intervention and after the combined intervention program. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 17.

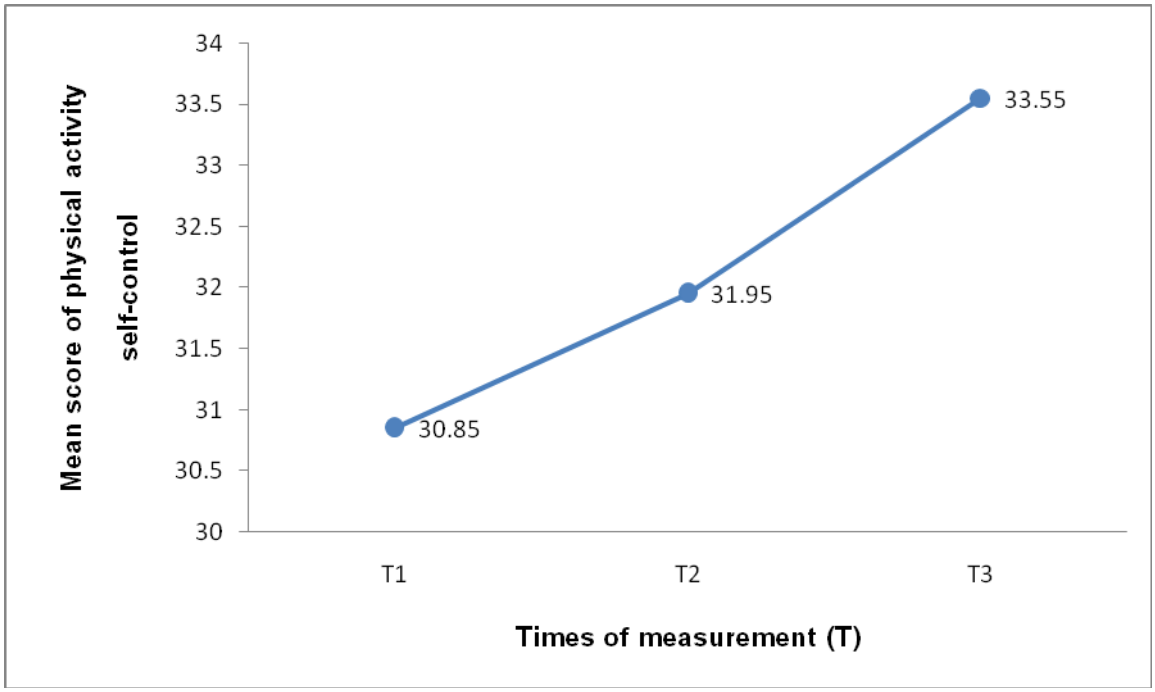

FIGURE 17 Differences in mean score of physical activity self-control between three times of measurement in the School B

Physical activity: Bonferroni comparisons in Table 15 revealed that mean score of physical activity after the individual SSII-Physical Activity Intervention Program (Mean=52.25) was not significantly different from the mean score before the individual program (Mean=45.75). However, mean score after the combined intervention (Mean=58.05) was significantly higher than that before the individual program. There was no significant difference in mean score between end point measure and combined intervention measure. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 18.

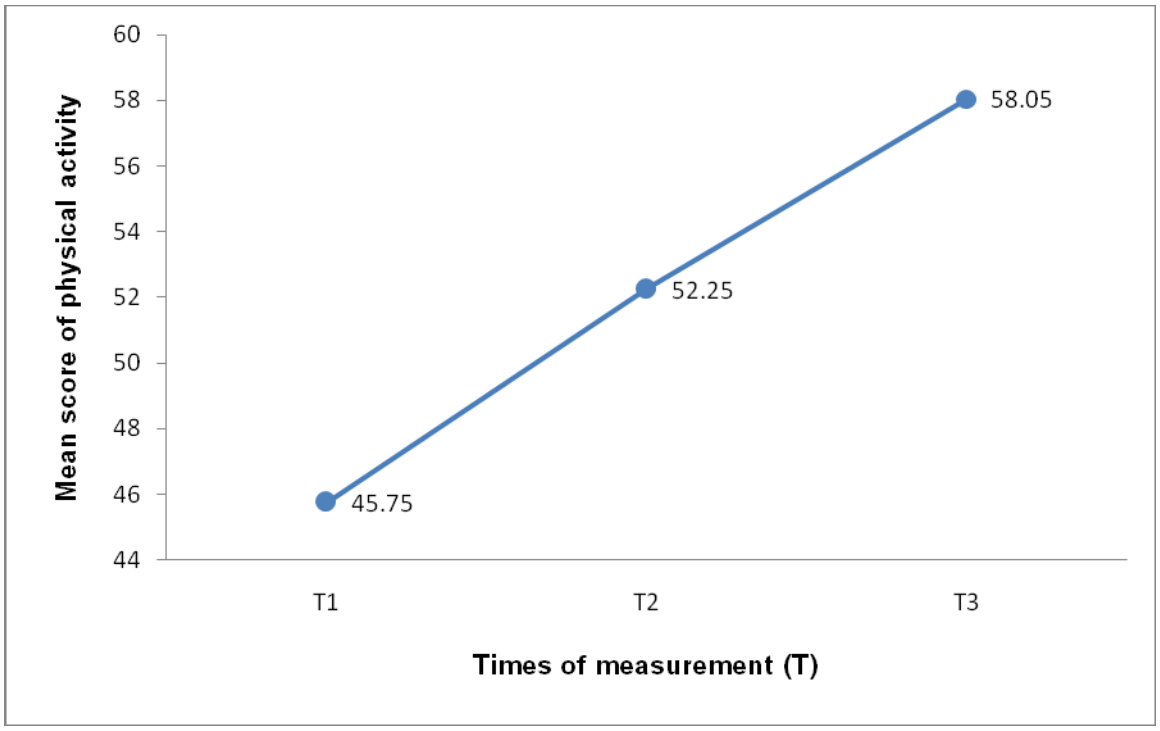

FIGURE 18 Differences in mean score of physical activity between three times of measurement in the School B

BMI: Bonferroni comparisons shown in Table 15 demonstrated that mean BMI was significantly lower after the individual SSII-Physical Activity Intervention Program (Mean=24.92) than before the individual program (Mean=25.38). The mean BMI after the combined intervention (Mean=25.24) was higher than that after the individual program, but still lower than the mean score at baseline. However, There was no significant different in mean BMI between endpoint measure and combined intervention measure. The pattern of differences could be seen clearly in the plot of the three means shown in Figure 19.

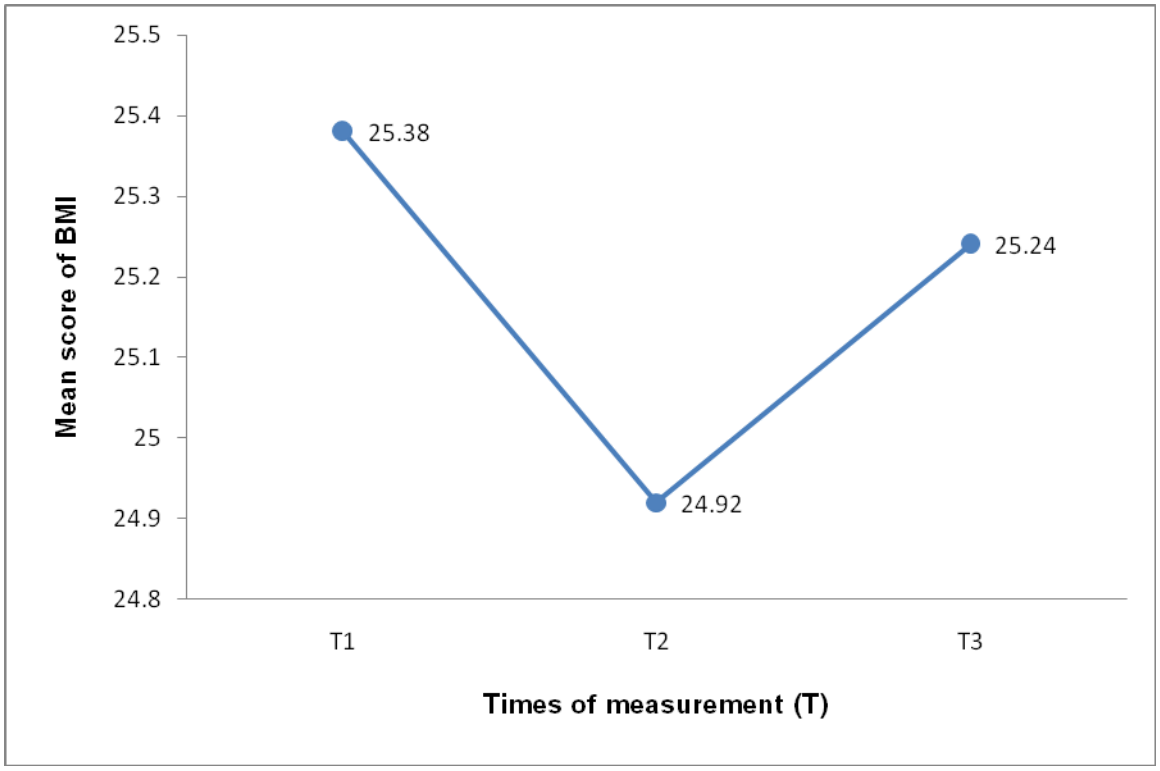

FIGURE 19 Differences in mean score of BMI between three times of measurement in the School B

In conclusion, as suggested by the above results, the combined effects of the SSII- Physical Activity and Healthy Eating Intervention Programs on just knowledge about obesity-related Type 2 diabetes were greater than that of the individual SSII-Physical Activity Intervention. Thus, hypothesis 3, saying that *the combined effects of the SSII-Healthy Eating and Physical Activity Intervention Programs on behaviour will be greater than that of the individual programs*, was hardly supported in the School B.

The hypothesis 4: *the School A, where the SSII-Healthy Eating intervention program was first implemented, will provide less BMI than the School B, where the SSII-Physical Activity intervention was firs implemented.*

A one-way multivariate analysis of covariance (MANCOVA) was performed on eight dependent variables; including knowledge about obesity-related Type 2 diabetes, healthy eating self-efficacy, healthy eating self-control, healthy eating behavior, physical activity self-efficacy, physical activity self-control, physical activity, and BMI. Adjustment was made for three covariates: knowledge, physical activity self-efficacy, and BMI. Independent variable

was school (School A and School B), where the different order of the combined intervention programs was implemented.

The results of MANCOVA on dependent variables were presented in Table 16. It was found, with the use of Wilk's criterion, the combined dependent variables were significantly related to all covariates, suggesting that pretest scores of knowledge, physical activity self-efficacy, and BMI were adequately reliable for being covariates in this analysis. The MANCOVA result showed that there were significant differences in dependent variables associated with school after adjustment for differences in knowledge, physical activity self-efficacy, and BMI prior to the intervention (F = 2.426, p = .038). Table 17 displays the results of univariate analysis. It was demonstrated that, after the combined intervention program, there were differences in healthy eating self-efficacy and physical activity self-control between the School A and the School B. This suggested that the School A, where the SSII-Healthy Eating intervention was first implemented, provided higher healthy eating self-efficacy and less physical activity self-control than the School B, where the SSII-Physical Activity intervention was first implemented (Healthy eating self-efficacy: mean=47.81 for School A vs 45.20 for School B; physical activity self-control: mean=29.29 for School A vs 33.55 for School B).

It appears that the combined SSII-Healthy Eating Intervention and Physical Activity intervention programs was more effective in producing increased healthy eating self-efficacy, but less effective in improving physical activity self-control than the combined SSII-Physical Activity Intervention and Healthy Eating Intervention programs. Thus, the hypothesis 4 was not supported.

TABLE 16 Results of MANCOVA of dependent variables, with pretest of knowledge, physical activity self-efficacy, and BMI as the covariates

Source of variation	Wilk's Lambda	F	Sig
Covariates			
Knowledge	.566	2.783	.020*
Physical activity self-efficacy	.401	5.424	.000*
BMI	.059	58.054	.000*
Main effect			
School	.599	2.426	.038*

p < .05

TABLE 17 Differences in dependent variables between School A and School B, after adjustment for covariates

Variables		SS	df	MS	F	Sig
knowledge	Contrast	.496	1	.496	.229	.635
	Error	78.195	36	2.172		
Healthy eating behavior	Contrast	.438	1	.438	.079	.780
	Error	198.654	36	5.518		
Healthy eating self-efficacy	Contrast	142.208	1	142.208	5.543	.024*
	Error	923.630	36	25.656		
Healthy eating self-control	Contrast	77.503	1	77.503	1.536	.223
	Error	1816.959	36	50.471		
Physical activity	Contrast	223.967	1	223.967	2.576	.117
	Error	3129.650	36	86.935		
Physical activity self-efficacy	Contrast	1.180	1	1.180	.122	.728
	Error	347.190	36	9.644		
Physical activity self-control	Contrast	101.914	1	101.914	7.592	.009*
	Error	483.243	36	13.423		
BMI	Contrast	.299	1	.299	.420	.521
	Error	25.659	36	.713		

$p < .05$

3.3 The results corresponding to the objective 3

Objective 3 was to provide a test of the PBC in predicting actual behavior change in relation to healthy eating and physical activity. Research hypotheses to evaluate this objective was hypothesis 5, saying that *the reduction in BMI, and increases in healthy eating and physical activity will be accompanied by increases in self-efficacy and self-control if PBC is good at predicting actual behavior change.*

Descriptive statistics of the study variables

As suggested by the TPB and previous research, PBC also had indirect effect on behavior through intention. Therefore, intention to perform healthy eating behavior and intention to perform physical activity were also included in the analysis to obtain more accuracy of variance in predicting actual behaviors.

To examine predictors of actual behaviour change, change scores (T3 - T1) between the combined intervention measure (T3) and baseline measure (T1) of the TPB based variables, including healthy eating behavior, intention to perform healthy eating, healthy eating self-efficacy, healthy eating self-control, physical activity, intention to perform physical activity, physical activity self-efficacy, and physical activity self-control, were used instead of raw data. Change score of BMI was also calculated. Descriptive statistics of change scores of each variable were presented in Table 18.

TABLE 18 Descriptive statistics of change scores of the TPB variables and BMI (N=41)

Variables	Mean of change score	SD	Min	Max
Change in BMI	.19	.81	-1.80	1.81
Change in healthy eating behavior	3.12	2.66	-4.00	10.00
Change in intention to perform healthy eating	-.51	4.38	-11.00	6.00
Change in healthy eating self-efficacy	1.76	8.48	-17.00	20.00
Change in healthy eating self-control	1.49	10.33	-18.00	25.00
Change in physical activity	10.10	9.23	-7.00	35.00
Change in intention to perform physical activity	1.54	2.44	-4.00	7.00
Change in physical activity self-efficacy	4.37	5.40	-5.00	26.00
Change in physical activity self-control	1.00	5.59	-10.00	14.00

As Shown in Table 18, overall, positive mean of change score were found among variables, except intention to perform healthy eating which negative value was exhibited. Physical activity demonstrated the highest mean of change scores, followed by physical activity self-efficacy and healthy eating behavior, respectively.

Intercorrelations among the study variables are presented in Table 19 to allow comparisons with previous studies. As can be seen from Table 19, regarding variables related to eating behavior, change in healthy eating behavior was significantly correlated with just change in intention to perform healthy eating behavior ($r = -.375$, $p < .05$). In addition, change in intention to perform healthy eating behavior was significantly correlated with change in healthy eating self-efficacy ($r = .548$, $p < .01$), and change in healthy eating self-control ($r = .374$, $p < .05$). Finally, change in healthy eating self-efficacy was significantly correlated with change in healthy eating self-control ($r = .553$, $p < .01$).

Regarding variables related to physical activity, change in physical activity was significantly correlated with change in intention to perform physical activity ($r = .362$, $p < .05$) and change in physical activity self-control ($r = .399$, $p < .01$). In addition, change in intention to perform physical activity was significantly correlated with just change in physical activity self-control ($r = .541$, $p < .01$). Finally, change in physical activity self-control was significantly correlated with change in physical activity self-efficacy ($r = .312$, $p < .05$). Change in BMI was not significantly correlated with all variables ($p > .05$). However, as suggested from the correlation coefficients, the reduction in BMI tended to be accompanied by small increases in five variables; including healthy eating behavior, intention to perform healthy eating, healthy eating self-control, healthy eating self-efficacy, and physical activity self-efficacy.

TABLE 19 Intercorrelations among the Study Variables (N = 41)

Variable	1	2	3	4	5	6	7	8
TPB variables								
1. Change in Healthy eating behavior	-							
2. Change in intention to perform healthy eating	-.375*	-						
3. Change in healthy eating self-control	.033	.374*	-					
4. Change in healthy eating self-efficacy	.014	.548**	.553**	-				
5. Change in Physical activity	.151	.055	-.208	.007	-			
6. Change in intention to perform physical activity	-.045	.033	.016	.083	.362*	-		
7. Change in physical activity self-control	.079	-.043	.071	-.077	.399**	.541**	-	
8. Change in physical activity self-efficacy	.016	.079	.266	.156	.186	.262	.312*	-
Additional variables								
9. change in BMI	-.084	-.156	-.114	-.115	.081	.003	.087	-.052

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

Prediction of change in healthy eating behavior

Multiple regression analysis was used to predict change in healthy eating. The results were presented in Table 20. The analysis showed that change in healthy eating self-control, change in healthy eating self-efficacy, and change in intention to perform healthy eating together significantly predicted change in healthy eating, explaining 21.5% of variance, but only change in intention to perform healthy eating was a significant predictor. However, comparing change in self-efficacy and change in self-control, the first showed a higher effect on behavior than the second (β=.27 for change in self-efficacy, β=.09 for change in self-control). The question arises why change in self-control and self-efficacy did not significantly predict the actual behavior change. As suggested by the TPB, intention was predicted by 3 independent variables including PBC. Thus, another multiple regression analysis was also conducted to examine effect of change in healthy eating self-control and change in healthy eating self-efficacy on intention. It was found that change in self-control and self-efficacy together significantly predicted change in intention, explaining 30.7% of variance with only change in healthy eating self-efficacy being a significant predictor. The overall causal relations among study variables for the prediction of healthy eating behavior were exhibited in Figure 20 and the prediction equations could be illustrated with standardized scores as follows.

I1 = .103SC1 + .491SE1

B1 = -.556I1 + .094SC1 + .266 SE1

TABLE 20 Multiple Regression Analyses Predicting Intention and Healthy eating behavior (N = 41)

Predictors	*B*	*SE B*	β
Predicting change in Intention[a] (I1)			
Change in healthy eating self-control (SC1)	.044	.069	.103
Change in healthy eating self-efficacy (SE1)	.254	.084	.491**
Predicting change in Healthy eating[b] (B1)			
Change in intention (I1)	-.338	.106	-.556**
Change in healthy eating self-control (SC1)	.024	.045	.094
Change in healthy eating self-efficacy (SE1)	.083	.061	.266

[a] R^2 = .307, p < .01.
[b] R^2 = .215 2, p < .05.
** p < .01.

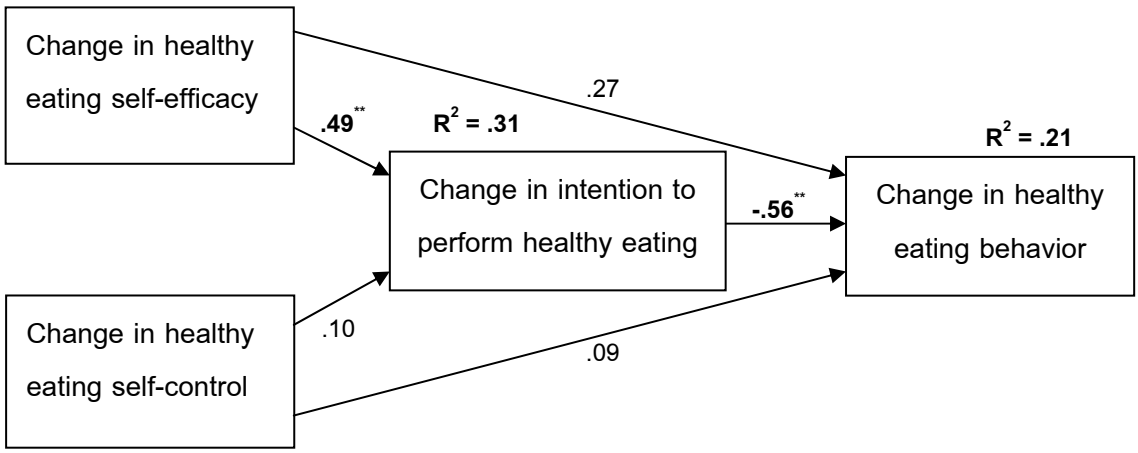

FIGURE 20 Causal relations among study variables in predicting healthy eating behavior

The prediction of change in physical activity

Results of multiple regression analysis to predict change in physical activity were displayed in Table 21. It was demonstrated that change in physical activity self-control and change in physical activity self-efficacy together significantly predicted change in physical activity, explaining 16.4% of variance, with only physical activity self-control was significant predictor. As an increase in physical activity was accompanied by increases in

physical activity self-efficacy and physical activity self-control, result of an additional regression analysis which included intention to perform physical activity was not presented here. The overall causal relations among study variables for the prediction of physical activity were displayed in Figure 21 and the prediction equation could be illustrated with standardized scores below.

B2 = .378SC2 + .068SE2

TABLE 21 Multiple Regression Analyses Predicting physical activity (N = 41)

Predictors	*B*	*SE B*	β
Predicting change in physical activity[c] (B2)			
Change in physical activity self-control (SC2)	.631	.261	.378*
Change in physical activity self-efficacy (SE2)	.118	.270	.068

[c] R^2 = .164, p < .05.
* p < .05.

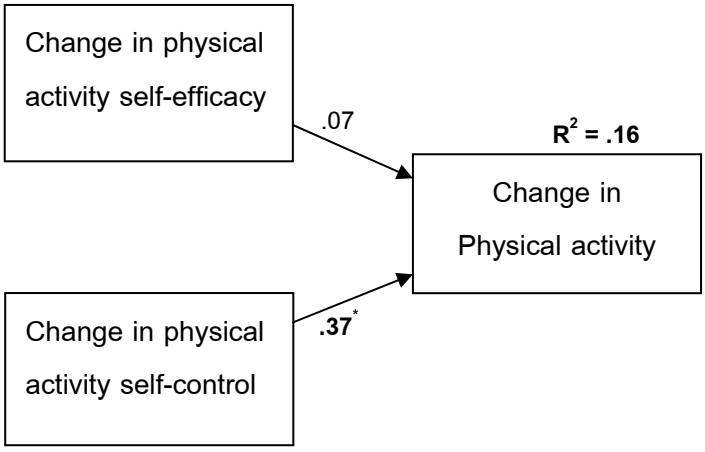

FIGURE 21 Causal relations among study variables in predicting physical activity

In conclusion, as suggested by the above results, reduction in BMI was not significantly correlated with increases in both self-efficacy and self-control. Regarding increase in healthy eating, it was not significantly predicted by increases in self-efficacy and self-control, but unexpected, it was significantly predicted by a decrease in intention. Additional analysis showed that an increase in intention to perform healthy eating was

significantly predicted by increase in healthy eating self-efficacy. Unlike the prediction of change in healthy eating behavior, increase in physical activity was significantly predicted by increases in self-efficacy and self-control. It was likely that, for healthy eating behavior, self-efficacy was a dominant predictor when compared with self-control; whereas for physical activity, self-control was a dominant predictor. Thus, the hypothesis 5, saying that *reduction in BMI and increases in healthy eating and physical activity will be accompanied by increases in self-efficacy and self-control if PBC is good at predicting actual behavior change,* was partially supported.

In sum, this study aimed to examine the effectiveness of the SSII-Healthy Eating and Physical Activity Intervention Programs which included individual effects, combined effects and ordering effects. To be easily illustrated, the overall results of program effectiveness were concluded and presented in the Table 22 below.

TABLE 22 Overall results of effectiveness of the programs

Variables	Individual Eat-SSII (T2 vs T1)	Individual Exercise-SSII (T2 vs T1)	Combined effects (T3 vs T2)	Combined effects (T3 vs T1)	Ordering effect (T3 vs T3)
School A					
- knowledge about obesity-related Type 2 diabetes	✓	-	✓	✓	X
- Healthy eating self-efficacy	✓	-	X	✓	✓
- Healthy eating self-control	✓	-	X	X	X
- Healthy eating behavior	✓	-	✓	✓	X
- BMI	✓	-	X	X	X
- Physical activity self-efficacy*	-	-	-	✓	X
- Physical activity self-control*	-	-	-	X	✓
- Physical activity*	-	-	-	✓	X
School B					
- knowledge about obesity-related Type 2 diabetes	-	X	✓	✓	X
- Physical activity self-efficacy	-	X	X	✓	X
- Physical activity self-control	-	X	X	✓	✓
- Physical activity	-	✓	X	✓	X
- BMI	-	✓	X	X	X
- Healthy eating self-efficacy*	-	-	-	X	✓
- Healthy eating self-control*	-	-	-	X	X
- Healthy eating behavior*	-	-	-	✓	X

Note. ✓ = Significant change; X = Non-significant change

* = That variable was measured only at the baseline and combined intervention in each school

\- = That variable was not measured

T1 = Baseline measures; T2 = Endpoint measures; T3 = Combined measures

Eat-SSII = The SSII-Healthy Eating Intervention Program

Exercise-SSII = The SSII-Physical Activity Intervention Program

CHAPTER 5

CONCLUSION AND DISCUSSION

This chapter presents the essence of research methodology, summary of findings, discussion, applications of findings, and limitation and recommendations, which were sequentially described as follows.

THE ESSENCE OF RESEARCH METHODOLOGY

Research objectives

The aims of this experimental research were to:

1. Examine the effectiveness of the individual Self-control, Self-efficacy, and Implementation Intention (SSII) Healthy Eating Intervention Program and SSII-Physical Activity Intervention Program in developing self-efficacy, self-control, healthy eating behavior physical activity, and thereby combating obesity-related Type 2 diabetes.
2. Examine the effectiveness of the SSII-Healthy Eating Intervention and Physical Activity intervention programs at the end of intervention implementation in terms of ordering effects and combined effects.
3. Provide a test of the PBC in predicting actual behavior change in relation to healthy eating behavior and physical activity.

Hypotheses

1. After the SSII-Healthy Eating Intervention Program; Knowledge, self-efficacy, self-control, and healthy eating of the sample would increase, but BMI of the sample would decrease.
2. After the SSII-Physical Activity Intervention Program; Knowledge, self-efficacy, self-control and physical activity of the sample would increase, but BMI of the sample would decrease.
3. The combined effects of the SSII-Healthy Eating and Physical Activity Intervention Program on behavior would be greater than that of the individual programs.
4. School A, where the SSII-Healthy Eating Intervention was first implemented, would have a lower BMI than School B, where the SSII-Physical Activity Intervention was first implemented.

5. The reductions in BMI, and increases in healthy eating and physical activity would be accompanied by increases in self-efficacy and self-control if the PBC is good at predicting actual behavior change.

Methodology

1. The study sample

The sample of this study was 41 students, aged 9-11 years, who met the inclusion criteria and consented to participate in the study; which 21 of those were studying in Sawadeewittaya School (School A), and other 20 were studying in Watditsahongsaram School (School B), Bangkok. Srinakharinwirot University, Graduate School, approved the study, and written informed consents from parents were required for students to participate. Baseline characteristics of students and their parents were compared and it was found that there were no significant differences between the schools before the intervention, except student's BMI.

2. Study instrument

There were two types of the instruments in this study. The first was the study measures and the second was the study interventions. These were presented as follows.

2.1 The study measures. These measures were established for psychosocial and behavioral variables, which included knowledge about obesity-related Type 2 diabetes, healthy eating behavior, healthy eating self-efficacy, healthy eating self-control, physical activity, physical activity self-efficacy, physical activity self-control, and affective beliefs and readiness to change behavior. The internal consistencies (Cronbach's α) of those measures were between .08-.90, indicating high interitem correlation.

2.2 The study interventions. There were two intervention programs in this study, the SSII-Healthy Eating Intervention Program, and the SSII-Physical Activity Intervention Program. Each of the two interventions were created using the self-efficacy, self-control, and implementation intention principles, and informed by a review of the literature. The interventions were then scrutinized by experts in psychology and behavioral science, and a parent representative. Formative research on the interventions was also conducted with 32 students from the same population. Overall, the SSII-Healthy Eating intervention consists of six weekly, 90-minute activity lessons in food skills and knowledge, whereas 90-minute activity lessons in exercise and physical activity skills and knowledge were components of the SSII-Physical Activity Intervention Program. The lessons incorporated traditional learning

styles (lecture) and practical experiences, and use interactive and cooperative learning techniques such as games, and cooking. Parents were invited to participate in the lessons and encouraged to collaborate with their children at home to increase healthy eating and physical activity.

3. Study procedures

There was one group in each of two schools; Sawadeewittaya school (School A) and Watditsahongsaram school (School B). Each school had the interventions implemented in a different order. A coin toss randomizes the schools to the first or second group. It was that the SSII-Healthy Eating intervention was first implemented in School A, whereas the SSII-Physical Activity Intervention Program was first implemented in the School B. The study procedures consisted of a preparation stage, screening of participation stage, baseline measures, implementation of the first intervention, endpoint measures, implementation of the second intervention, and combined intervention measures.

4. Data analysis

Data analysis was performed using SPSS for Windows. The statistical tests undertaken for hypothesis examination were: (1) descriptive statistics including frequency, percentage, means, standard deviations, minimum, maximum, alpha coefficient for the sample and each variable; (2) one-way repeated measures ANOVA for testing whether psychosocial, behavioral and anthropometric changes occur overtime within intervention group; (3) one-way multivariate analysis of covariance (MANCOVA) for testing whether there were differences in psychosocial, behavioral, and anthropometric variables between the two Schools; and (4) the multiple regression to test whether the relationships predicted by the PBC hold.

SUMMARY OF FINDINGS

Results according to research hypotheses could be summarized as follows.

1. After the individual SSII-Healthy Eating Intervention Program; mean scores of knowledge about obesity-related Type 2 diabetes, healthy eating self-efficacy, healthy eating self-control, and healthy eating behavior significantly increased from the baseline and BMI significantly decreased. Thus, ***the hypothesis 1 was supported***.

2. After the individual SSII-physical activity Intervention Program; mean score of physical activity significantly increased from the baseline whereas BMI showed a significant decrease. Regarding the other dependent variables, changes in mean scores did not reach

statistical significance, but were uniform in the expected direction. Thus, ***the hypothesis 2 was partially supported***.

3. The combined effects of the two interventions were separately summarized for different schools as follows.

3.1 In School A: the combined effects of the SSII-Healthy Eating and Physical Activity Intervention Programs on two dependent variables: (1) knowledge about obesity-related Type 2 diabetes, and (2) healthy eating behavior; were greater than that of the individual SSII-Healthy Eating Intervention. Thus, ***hypothesis 3 was partially supported in the School A.***

3.2 In School B: the combined effects of the SSII-Physical Activity and Healthy Eating Intervention Programs on just knowledge about obesity-related Type 2 diabetes were greater than that of the individual SSII-Physical Activity Intervention. Thus, ***hypothesis 3 was hardly supported in the School B***.

4. There were significant differences in dependent variables associated with school after adjustment for differences in knowledge, physical activity self-efficacy, and BMI prior to the intervention (F = 2.426, p = .038). Univariate analysis showed that after the combined intervention program, there were differences in healthy eating self-efficacy and physical activity self-control between the School A and the School B, where the School A provided higher healthy eating self-efficacy and less physical activity self-control than the School B (Healthy eating self-efficacy: mean=47.81 for School A vs 45.20 for School B; physical activity self-control: mean=29.29 for School A vs 33.55 for School B). Thus, ***the hypothesis 4 was not supported.***

5. Reduction in BMI was not significantly correlated with increases in both self-efficacy and self-control in relation to healthy eating and physical activity. Regarding an increase in healthy eating, it was not significantly predicted by increases in self-efficacy and self-control, but was significantly predicted by a decrease in intention to perform healthy eating. In turn, increase in intention to perform healthy eating was significantly predicted by increase in healthy eating self-efficacy. In contrast, increase in physical activity was significantly predicted by increases in physical activity self-efficacy and physical activity self-control, with only physical activity self-control was a significant predictor. Thus, ***the hypothesis 5 was partially supported***.

DISCUSSION

This part presents discussion of findings according to research hypotheses, which are described as follows.

Hypothesis 1: *After the SSII-Healthy Eating Intervention Program; knowledge, healthy eating self-efficacy, healthy eating self-control, and healthy eating behavior of the sample will increase but BMI will decrease.*

The results revealed that after the SSII-Healthy Eating Intervention Program; mean scores of knowledge about obesity-related Type 2 diabetes, healthy eating self-efficacy, healthy eating self-control, and healthy eating behavior significantly increased from the baseline and BMI significantly decreased, supporting the hypothesis 1. These results suggested that the individual SSII-Healthy Eating Intervention was effective in enhancing self-efficacy and self-control in relation to healthy eating, and thereby improved healthy eating resulting in the reduction in risk of obesity-related Type 2 diabetes. Discussion of the results according to this hypothesis would be presented by each dependent variable as follows.

Change in knowledge about obesity-related Type 2 diabetes

Knowledge is considered as a variable in the cognitive domain. The analysis demonstrated significant increases in knowledge about obesity-related Type 2 diabetes after the implementation of the SSII-Healthy Eating Intervention Program, which is in line with the results from previous studies (Holcomb et al. 1998: 282-8; Saksvig et al. 2005: 2392–8; Tuuri, Zanovec, Silverman, Geaghan, Solmon, Holston et al. 2009; Kullanit Sakdisupa. 2004; Sujantra Ittikusumarn. 2005). This finding indicates that after participating in the SSII-Healthy Eating Intervention Program, a student recognizes and understands information about risk factors, symptoms, prevention and treatment, and health consequences of obesity and Type 2 diabetes learned from the intervention program. Some points may play a role in explaining this finding. *Firstly*, in the SSII-Healthy Eating Intervention, there were activities aiming to enhance knowledge about obesity-related Type 2 diabetes; which included lectures, question-answers sessions, presenting a case study, playing games and small group discussion to enable students to recognize and understand the meaning, the linkage between obesity and Type 2 diabetes, risk factors, health outcomes, prevention and importance of preventing Type 2. Thus, when knowledge about obesity-related Type 2

diabetes was measured after the program, significant increase in ability to recognize and understand this information, which is the definition of knowledge about obesity-related Type 2 diabetes in this study, was exhibited. This is in accord with the revised Bloom's Taxonomy (Anderson & Krathwohl. 2001), suggesting that lectures, question-answers sessions, presenting a case study, and small group discussion is likely to enable students to remember and understand concepts which are the first and second levels of the learning objectives of Anderson and Krathwohl's Taxonomy, respectively. *Secondly,* it may be due to manipulations in the environment, the instruction media/equipment, and the instruction format used in the program. During the implementation of the program, an amiable environment was created. In addition, interesting instruction media, such as big and colorful pictures related to the content and real samples were delivered to the students. Moreover, interactive and cooperative learning techniques such as group processes and games were used to enhance students' learning experience and enable students to clearly understand what they have learnt by themselves. It is likely that these techniques make students pay attention, attempt to learn, and take part in activities, which thereby enhances their recall and understanding.

It is likely that 1) activities aiming to develop the cognitive domain and 2) the arrangement of an amiable environment and using interesting instruction media to enhance students' learning experiences may result in significant increases in knowledge after the intervention.

Change in healthy eating self-efficacy

After the SSII-Healthy Eating Intervention Program, it was found that the mean score of healthy eating self-efficacy significantly increased from the baseline. This result is consistent with the previous studies (Holcomb et al. 1998: 282-8; Saksvig et al. 2005: 2392–8; Kullanit Sakdisupa. 2004), suggesting that after participating in the SSII-Healthy Eating Intervention Program, students were more confident that they could eat fruit and vegetables, avoid fast food, fatty food and snacks, avoid sugary foods and sugar-sweetened soft drinks, and eat well-balanced of five food groups. There have been some possible explanations for this. *First*, activities in the SSII-Healthy Eating Intervention have applied the sources for developing self-efficacy suggested by the literature (Bandura. 1977; Allen. 2004); including mastery experience, modeling, and verbal persuasion. (1) Mastery

experience helped students to gain direct experience from skills training, related with healthy eating, and then developed belief in their competence. The activities were composed of lectures, question-answers sessions, playing games, rehearsal and role performing in food choice and food preparation, small group discussion, thinking practice at both individual and group level as well as using previous experience of students to provide feedback. (2) Modeling was used through the activities composing of, firstly, presentation of a successful role model to students such as showing the student who was successful in losing weight in each week or the one who was able to behave in accordance with the behavioral assignment. These methods could convince students that if they really made attempts without feeling discouraged, they shall eventually achieve it. Second, role model demonstration of healthy food preparation stimulated learning new behaviors or skills for students from the demonstrators. Third, learning from peers as role models, which was reinforced when they behaved positively, activated students to behave positively or curb the negative responses. Finally, parents were also role models in healthy eating behavior. (3) Verbal persuasion was both direct and indirect encouragement in order to make students believe in their ability. The activities consisted of incorporating family members into the intervention, suggestion, exhortation, and providing verbal encouragement on progress.

The *Second* explanation may be due to the subjective norm or social support about healthy eating behavior. Results from Study 1, investigating causal factors of obesity prevention behaviors and body mass index in fourth grade school children at demonstration schools, Bangkok, showed that subjective norm about healthy eating behavior was significantly correlated with PBC of healthy eating behavior ($r = .471$, $p < .01$). Self-efficacy is one of the two components of PBC (Ajzen. 2002; Lui, Doucette, & Farris. 2007: 153) and also considered as the same construct as PBC (Ajzen. 1991). This indicated that when a student perceives that significant others believe he/she should perform healthy eating behavior and those significant others themselves perform healthy eating, that student is likely to feel that performing healthy eating behavior is easy. The age of participants might help to explain this. In this study, the sample study was 4^{th} to 5^{th} grade schoolchildren where the influence of the social environments seems to be important. In addition, all students had consent from their parents to participate in the program. Thus, it is more likely that the students perceive that their parents want them to perform healthy eating behavior. This presumption is consistent with the reason for participating in this program, that 42.9% of students reported their parents would like them to participate in it and 9.5% reported

teacher would like them to participate in it, providing 52.4% of social support contributed to this participation.

In conclusion, increase in healthy eating self-efficacy after the SSII-Healthy Eating Intervention Program may be due to 1) activities in the program applying sources of developing self-efficacy; 2) association between subjective norm about healthy eating behavior and PBC.

Change in healthy eating self-control

After the SSII-Healthy Eating Intervention Program, it was demonstrated that mean score of healthy eating self-control significantly increased from the baseline. This result is consistent with the previous studies (Kanistha Chanchay. 2006; Riggs, Sakuma, & Pentz. 2007: 287-310), suggesting that after participating in the SSII-Healthy Eating Intervention Program, students had higher beliefs about their control over eating fruit and vegetables, avoiding fast food, fatty food and snacks, avoiding sugary foods and sugar-sweetened soft drinks, and eating well-balanced of five food groups, than before the program. There have been some possible explanations for this. *First*, it may be due to subjective norm or social support about healthy eating behavior. As mentioned above, positive association between subjective norm about healthy eating behavior and PBC could play a role for explanation of this finding, indicating that when a student perceives significant others believe he/she should perform healthy eating behavior and those significant others themselves perform healthy eating, that student would likely feel that he/she has high control over their healthy eating behavior. *Second*, it may be because of increased awareness. Awareness is considered as a crucial contributor for development of self-control. In the SSII-Healthy Eating Intervention Program, there were activities enhancing awareness in healthy eating as follows: (1) Self-monitoring in eating behaviour by performing four stages designed as behavioral goal setting, self-observation and self-recording, assessment, and self-reinforcement. It is likely that people rarely observe their own behavior in a systematic fashion. Therefore, when people are provided with the opportunity to observe their own behavior carefully, any changes may occur on the basis of their increased awareness (Morrison & Bennett. 2006: 63). (2) Self-weighing and self-recording one’s weight every week. Weighing oneself may provide information that one is overweight and thereby increase awareness to control oneself on healthy eating, until they achieve the desired weight. (3) Education in knowledge about obesity-related Type 2

diabetes. From this activity, students may perceive severity and negative circumstances of obesity, and thereby increase awareness to self-control on healthy eating.

The *third* explanation may be due to stimulus control technique used in the SSII-Healthy Eating Intervention Program. Students were asked to eliminating stimuli for unhealthy eating and develop the specific stimulus exerting influence over healthy eating behaviour, such as storing unhealthy food out of sight, buying only low caloric food and healthy snacks, and eating only at a dinning table. These techniques are proved to be effective in enhancing self-control (Kazdin. 2001; Sakvig et al. 2005; Sarafino. 2007). The *fourth* explanation may due to a positive relationship between self-efficacy and self-control. As state by Ajzen (2002), self-efficacy and controllability are subcomponent of the PBC. Thus, it is logical that both components might be highly correlated, suggesting that when a student feels that performing healthy eating behavior is easy and he/she is confident to do it, that student would likely feel that he/she has high control over the healthy eating behavior. This explanation is supported by the result of the intercorrelations among the study variables, showing that change in healthy eating self-efficacy was significantly correlated with change in healthy eating self-control ($r = .553$, $p < .01$). In this case, it could be said that any activities aiming to enhance healthy eating self-efficacy possibly enhance healthy eating self-control.

In conclusion, increase in healthy eating self-control after the SSII-Healthy Eating Intervention Program may be due to 1) association between subjective norm about healthy eating behavior and PBC; 2) increase in awareness; 3) self-control techniques used; and 4) positive correlation between healthy eating self-efficacy and healthy eating self-control.

Change in healthy eating behavior

After the SSII-Healthy Eating Intervention Program, it was found that the mean score of healthy eating behavior significantly increased from the baseline, indicating that the individual SSII-Healthy Eating Intervention is effective in improving healthy eating behavior. This result is consistent with the previous studies (Holcomb et al. 1998; Trevino et al. 1998; Teufel and Ritenbaugh. 1998; Epstein, Paluch, Kilanowski, & Raynor. 2004; Saksvig et al. 2005; Linde, Rothman, Baldwin, & Jeffery. 2006; Kullanit Sakdisupa. 2004; Sujantra Ittikusumarn. 2005; Kanistha Chanchay. 2006), applying self-efficacy and/or self-control in the behavioral intervention for combating childhood obesity or Type 2 diabetes, and revealed significant increase in eating behavior after the program. This finding may be due

to several possible explanations. *Firstly*, it may be because of increases in healthy eating self-efficacy and healthy eating self-control, which are two component of PBC in the Theory of Planned Behavior (TPB) and are also the definition of PBC in this study. As suggested by the TPB (Ajzen. 1991; Ajzen. 2002), PBC could predict behavior and this was supported by a number of research studies in relation to diet (Masalu. 2001: 435-45; Backman et al. 2002: 184-93; Conner et al. 2002: 194-201; Baker et al. 2003: 189-98; Bogers et al. 2004: 157-66; Nejad et al. 2004 : 2099-131). Consistent with this, results of Study 1 (Patcharee. 2007) found that PBC significantly predicted healthy eating behavior (β = .321, p < .01). This explanation is also in accord with a study evaluating the intervention program designed to increase self-efficacy for weight loss (Roach, Yadrict, Johnson, Boudreaux, Forsythe, & Billon .2003: 1357-1359). The sample was 73 students aged 18-23 years who were enrolled at a southern university. Results found that there was a significant relationship between change in self-efficacy and change in eating behavior for the intervention group (r = 0.388, p < .01), but not for the control group, suggesting that as self-efficacy improved, eating habits improved. In line with those, Riggs, Sakuma & Pentz (2007: 287-310) evaluated two school-based pilot studies aiming to change children's self-control, emotional regulation, decision making, social competence, and actual behaviors related to food intake. Results demonstrated that the participants increased their actual healthy eating, and self-control scores significantly related to healthy eating. The result testing the prediction of change in healthy eating behavior by change in self-efficacy and self-control based on data obtained from this study sample will be further discussed on hypothesis 5.

Secondly, This finding may be due to methods of performing activities used in the program or delivery features. The program was developed using interactive and cooperative learning techniques such as games, cooking activity, real performing in food buying as ‘Supermarket tour’. In addition, the amiable environment, age appropriateness, and fun were very much involved. These techniques probably influenced students’ attitude towards healthy eating behavior which may lead to an increase in healthy eating behavior. Results from the self-report of overall satisfaction supported this explanation, indicating that the students were very happy, appreciative, and had fun with the program, especially the cooking activity (Appendix C). Moreover, the results about feelings after participating in the program demonstrated that a majority (95.2%) of students reported that they were happy and enjoyed the program. This explanation is in accord with the previous literature (Ashley. 2008; Conner & Spark. 2005; Sarafino. 2007) suggesting the influence of affective beliefs

on health behaviors. It is acknowledge that attitudes towards health behavior comprise both instrumental and affective beliefs. Between the two components, affective beliefs were not only a significant predictor of health behavior, but also a more powerful determinant than instrumental beliefs. This is in line with a previous study (Rivis, Sheeran, & Armitage. 2009: 2985-3019) determining the predictive validity of anticipated affect and moral norms in the TPB and demonstrated that anticipated affect increased the variance explained in intention by 5%. Intention mediated the influence of anticipated affect on behavior. However, results from the Study 1 (Patcharee Duangchan. 2007) revealed that attitudes towards healthy eating behavior significantly predicted healthy eating behavior (β = .17, $p < .05$), indicating that affective beliefs may influence healthy eating behavior without any mediators. This explanation is also consistent with a meta-analytic review of obesity prevention programs for children and adolescents suggesting that interactive programs show greater intervention effects because this format helps students engage in the program content, which facilitates skill acquisition and attitudinal change (Stice et al. 2006).

Thirdly, parental influences may play a role in the explanation of this finding. It has been suggested that parents play important roles in influencing the dietary habits of teens, with peers assuming a more predominant role as adolescents increase in age (Backman et al. 2002: 191). In the SSII-Healthy Eating Intervention Program, parents were involved in activities aiming to enhance self-efficacy and self-control, for example being role models in healthy eating behavior and providing verbal encouragement. Parents may directly influence their children's eating styles with regard to the types of food consumed, how, where, and at what speed it is eaten (Munsch et al. 2007). In addition, parents may indirectly influence their children through factors such as the development of food preferences and attitude towards healthy eating behavior. *Finally,* increases in healthy eating behavior may be because of forming implementation intentions. The implementation intention has been shown to enhance the prediction of behavior provided by the TPB, reduce the impact of habit on future behavior (Sheeran & Orbell. 2000), enhance people's ability to self-regulate their behavior (Webb & sheeran. 2003), and strengthen the intention-behavior relationship (Latimer et al. 2006; Milne et al. 2002; Prestwich et al. 2003). In the SSII-Healthy Eating Intervention Program, the participants were assigned to form implementation intentions to eat healthily during next week. By forming implementation intention, the intended behavior can be initiated more immediately, more efficiently, with less effort, and in a relatively automatic fashion (Gollwitzer. 1999; Sheeran & Orbell. 2000;

Webb & Sheeran. 2007). The efficacy of implementation intention in promoting healthy eating behavior and reducing in unhealthy food consumption was supported by previous research (Verplanken & Faes. 1999; Sheeran et al. 2005 cited Sheeran & Milne. 2002; Armitage. 2004; de Nooijer et al. 2006).

In conclusion, increases in healthy eating behavior after the SSII-Healthy Eating Intervention Program may be due to 1) increases in healthy eating self-efficacy and healthy eating self-control, 2) consideration of affective beliefs in the design of intervention; 3) parental influences; and 4) forming implementation intention.

Change in BMI

After the SSII-Healthy Eating Intervention Program, it was found that mean score of BMI significantly decreased from the baseline, indicating that the individual SSII-Healthy Eating Intervention program is effective in reducing risk factor of obesity-related Type 2 diabetes in overweight and obese schoolchildren. This result is consistent with the previous studies (Saelens et al. 2002; Roach et al. 2003; Epstein et al. 2004; Nemet et al. 2005; Linde et al. 2006; German, Kirschenbaum, & Rich. 2007; Smith et al. 2009; Andrade et al. 2010; Kullanit Sakdisupa. 2004; Sujantra Ittikusumarn. 2005). Obesity is a predominant risk factor for Type 2 diabetes with the risk increasing in parallel with increases in obesity. This may be due to the relationship between high visceral fat in obese children and insulin action. It is likely that insulin-mediated glucose disposal will decrease when the visceral fat in the body is high. This may make the child more at risk for developing Type 2 obesity (Amscher. 2002: 39-40). Thus, it is implied that when body weight or BMI reduced, insulin action improved, and risk of Type 2 diabetes was reduced. Although the sample were still, by definition, obese by the end of the intervention, it was not expected by this study that they would reach a normal BMI range within such a short timeframe, as this would have required energy-restricted diet and rapid lifestyle changes that are not recommended for schoolchildren.

The success of this individual program could be explained by several factors. *First*, it may be due to changes in healthy eating behavior, which was, in turn, likely to have resulted from increases in healthy eating self-efficacy and healthy eating self-control. This is supported by Roach et al. (2003: 1357-1359) evaluating the intervention program designed to increase self-efficacy for weight loss. Results found that there was a significant relationship between change in self-efficacy and change in eating behavior for the intervention group ($r = 0.388$, $p < .01$), but not for the control group. In addition, Change in

self-efficacy was also significantly correlated with weight loss in the intervention group ($r = -0.536$, $p < .01$), but not in the control group, demonstrating that as self-efficacy improved, eating habits improved and weight loss was greater. In line with this, the results of Study 2 examining the effectiveness of behavioral intervention program to modify psychosocial, behavioral, and anthropometric dependent variables, exhibited that change in PBC related to healthy eating behavior was significantly correlated with change in BMI ($r = -.499$, $p < .05$). Change in healthy eating behavior, leading to the reduction in BMI, may be affected by forming implementation intention used in the program. This is supported by a study (Luszczynska et al. 2007) examining whether Implementation Intention Prompt (IIP) enhance weight reduction among overweight and obese woman. The sample was fifty-five overweight or obese woman; aged from 18 to 76 years, BMI from 25.28 to 48.33, enrolled in a commercial weight reduction program. The outcome was participants' change in weight and BMI from pre-intervention to follow-up. Results showed that, on average, the participants in IIP condition lost 4.2 kg (95% confidence interval = 3.19, 5.07), whereas control participants lost 2.1 kg (95% confidence interval = 1.11, 3.09). *Secondly*, it may be because of parental influences. As mentioned above, parents may play a role in influencing the healthy eating behavior by strategies such as being role models and providing verbal encouragement, which thereby lead to a reduction in BMI. In addition to this, parental obesity may be another factor used to explain parental influence on childhood obesity which was supported by previous studies, suggesting that parental obesity significantly correlated with obese children (Davison and Birch. 2002; Pornpojamarn. 2003; Patcharee Duangchan. 2007). To confirm this, the correlation between mother's BMI, father's BMI, and student's BMI after the individual SSII-Healthy Eating Intervention Program was examined. The result showed that father's BMI was significantly correlated with student's BMI ($r = .589$, $p = .02$), suggesting that paternal obesity likely influenced the success of the program on reduction in student's BMI.

Hypothesis 2: *After the SSII-Physical Activity Intervention Program; Knowledge, self-efficacy, self-control and physical activity of the sample would increase, but BMI of the sample would decrease.*

The results demonstrated that after the SSII-Physical Activity Intervention Program; the mean score of physical activity significantly increased from the baseline, whereas BMI showed a significant decrease. Changes in mean scores of the other dependent variables,

however, were uniform in the expected direction. Thus, the hypothesis 2 was partially supported. These results suggested that the individual SSII- Physical Activity Intervention was effective in improving physical activity and thereby reducing risk of obesity-related Type 2 diabetes. Discussion of the results according to this hypothesis would be presented by each dependent variable as follows.

Change in knowledge about obesity-related Type 2 diabetes

The result demonstrated no significant increase in knowledge about obesity-related Type 2 diabetes after the implementation of the SSII-Physical Activity Intervention Program, which is not consistent with the results from previous studies (Holcomb et al. 1998: 282-8; Saksvig et al. 2005: 2392–8; Tuuri et al. 2009; Kullanit Sakdisupa. 2004; Sujantra Ittikusumarn. 2005), and is not consistent with the result from School A which was first implemented with the SSII-Healthy Eating Intervention. As expected, this finding indicates that simply providing students with information about physical activity is not enough to make the students recognize and understand all information about risk factors, symptoms, prevention and treatment, and health consequences of obesity and Type 2 diabetes. An explanation for this finding may be that, unlike the SSII-Healthy Eating Intervention, the SSII-Physical Activity Intervention Program have not included activities aiming to enhance knowledge about obesity-related Type 2 diabetes; such as lecturing, questioning, small group discussion. In addition, as seen in the measure of knowledge about obesity-related Type 2 diabetes, questions about physical activity are represented only 27% in the measure. These may lead to a small increase in score after the end of the program. However, it is expected that the mean score of knowledge would significantly increase after the combined interventions which will be further discussed in the hypothesis 3.

Change in physical activity self-efficacy

After the individual SSII-Physical Activity Intervention Program, it was found that mean score of physical activity self-efficacy was not significantly higher than that at the baseline, but it increased in an expected direction. This result is not consistent with the previous studies (Holcomb et al. 1998: 282-8; Saksvig et al. 2005: 2392–8; Kullanit Sakdisupa. 2004), suggesting that after participating in the SSII- Physical Activity Intervention Program, students were as confident as they were at the baseline that they could daily exercises for at least 30 minutes, physically active in any free time to the extent that it causes sweating, and avoid inactivity such as TV viewing. In other words, the

program could only maintain physical activity self-efficacy. The explanation of this finding may be due to high physical activity self-efficacy at the baseline, with the mean score of 32.94 $\pm$ 5.09 (range = 8-40). Although theory-based activities, including mastery experience, modeling, and verbal persuasions, were included, they had little effect on students' beliefs in their competence. Another explanation may be social support. Anderson et al. (Anderson, Wojcik, Winett, & Williams. 2006: 510-520) examined the influence of social support, self-efficacy, outcome expectations, and self-regulation among participants in a church-based health promotion study, using structural equation analysis of data from 999 adults. Results showed that social support was a direct precursor to self-efficacy (β = .35, p < .001). In this study, although 55% of students reported that their parents would like them to participate in the program, social support was unknown as it was not measured in this study. It may be that their parents did not actually support them, which may thereby lead to non-significant increase in physical activity self-efficacy.

In conclusion, non-significant increase in physical activity self-efficacy after the SSII-Physical Activity Intervention Program may be due to 1) high level of physical activity self-efficacy at the baseline; 2) direct effect of social support on physical activity self-efficacy.

Change in physical activity self-control

After the individual SSII-Physical Activity Intervention Program, it was found that the mean score of physical activity self-control did not significantly increase from the baseline, but it increased in an expected direction. This result is not consistent with the previous study (Riggs et al. 2007), suggesting that, like physical activity self-efficacy, after participating in the SSII-Physical Activity Intervention Program, Students' beliefs about their control over physical activity; including daily exercises for at least 30 minutes, physically active in any free time to the extent that it causes sweating, and avoid inactivity such as TV viewing, were sustained. There have been some explanations for this finding. *First*, it is possible that there might be low level of social support about physical activity resulting in non-significant increase in physical activity self-control. The study of Anderson et al. (2006) may again play a role for this explanation. Results of their study showed that social support about physical activity also had direct effect on self-control and had indirect effect on self-control through self-efficacy (β_{total} = .54, p < .001). In addition, physical activity self-efficacy did had direct effect on self-control (β_{direct} = .18, p < .001). Thus, it is logical that as students' confidence about daily exercises for at least 30 minutes, being active in any free

time to the extent that it causes sweating, and avoiding inactivity such as TV viewing were maintained; beliefs about their control over those activities were also maintained. *Second*, it may be due to awareness. Awareness is considered as an important contributor for development of self-control. In the SSII-Physical Activity Intervention Program, there were activities enhancing awareness in physical activity including self-monitoring in physical activity and self-weighing and self-recording one's weight every week. However, this may not be enough to increase awareness as students have not perceived severity and negative circumstances of obesity. This perception is expected to arise in the class of education in knowledge about obesity-related Type 2 diabetes which was not included in this program. Thus, it is possible that students may have not enough awareness to control themselves on physical activity. *Third*, it may be because of decreased self-control of physical activity. As suggested in the literature (Webb & Sheeran. 2003), the ability to self-regulate one's behavior is limited. According to the self-control strength model, exerting self-control on an initial task reduces performance on a subsequent task that also requires self-control. Moreover, it appears that cognitive, emotional, and physical acts of self-control all use the same limited resource. If this limited resource is diminished, the person can not longer effectively regulate his/her behavior. In this study, the sample was 4^{th} to 5^{th} grade students who may have limited self-control. Thus, it is possible that physical activity self-control may increase at the beginning of the program, but it is diminished at the end of the program.

In conclusion, non-significant increase in physical activity self-control after the SSII-Physical Activity Intervention Program may be due to 1) low level of social support and non-significant increase in physical activity self-efficacy; 2) insufficient awareness; and decreased self-control.

Change in physical activity

After the SSII-Physical Activity Intervention Program, it was found that the mean score of physical activity significantly increased from the baseline, indicating that the individual SSII- Physical Activity Intervention is effective in improving physical activity. This result is consistent with the previous studies (Holcomb et al. 1998; Riggs, Epstein, Paluch, Kilanowski, & Raynor. 2004; Linde et al. 2006; Sakuma, & Pentz. 2007; Cliff, Wilson, Okely, Mickle, & Steele. 2007; Smith, Annesi, Walsh, Lennon, & Bell. 2009; kullanit Sakdisupa. 2004; Sujantra Ittikusumarn. 2005), applying self-efficacy and/or self-control in the behavioral intervention for combating childhood obesity or Type 2 diabetes, and revealed significant increase in physical activity after the program. This finding may be due to the

methods of performing activities used in the program. As the program was developed using interactive and cooperative learning techniques such as games, walk rally, rehearsal and real performing. In addition, a friendly environment, age appropriateness, and fun were very much emphasized. These techniques probably influenced students' attitude towards physical activity which may lead to an increase in physical activity. Results from the self-report of overall satisfaction supported this explanation, indicating that the students were very happy, appreciate, and had fun with the program (Appendix C). Moreover, the result about feeling after participating in the program demonstrating that a majority (90%) of students reported that they were happy and found it enjoyable after the program. This explanation is in accord with previous literature (Ashley. 2008; Conner & Spark. 2005; Sarafino. 2007) suggesting the influence of affective beliefs on health behaviors. It is acknowledged that attitudes towards health behavior comprise both instrumental and affective beliefs. Between the two components, affective beliefs were not only a significant predictor of health behavior, but also a more powerful determinant than instrumental beliefs. This is in line with a previous study (Rivis, Sheeran, & Armitage. 2009: 2985-3019) determining the predictive validity of anticipated affect and moral norms in the TPB and demonstrated that anticipated affect increased the variance explained in intention by 5%. Intention mediated the influence of anticipated affect on behavior. However, results from Study 1 (Patcharee Duangchan. 2007) revealed that attitudes towards physical activity significantly predicted physical activity (β = .18, $p < .05$), indicating that affective beliefs may influence physical activity without any mediators. Another explanation may be due to the forming implementation intention used in the program which is discussed above.

In conclusion, the significant increase in physical activity may be due to 1) methods of performing activities concerning affective beliefs and 2) forming implementation intentions.

Change in BMI

After the SSII-Physical Activity Intervention Program, it was found that mean score of BMI significantly decreased from the baseline, indicating that the individual SSII-Physical Activity Intervention is effective in reducing risk factor of obesity-related Type 2 diabetes in overweight and obese schoolchildren. This finding is consistent with the previous studies (Saelens et al. 2002; Roach et al. 2003; Epstein et al. 2004; Nemet et al. 2005; Linde et al. 2006; German, Kirschenbaum, & Rich. 2007; Smith et al. 2009; Andrade et al. 2010; Kullanit Sakdisupa. 2004; Sujantra Ittikusumarn. 2005). The success of this

individual program could be explained by the increase in physical activity, which was, in turn, likely to have resulted from the manipulation of affective beliefs in the program. Forming implementation intentions as used in the program may again apply here to explain this finding.

Hypothesis 3: *The combined effects of the SSII-Healthy Eating and Physical Activity Intervention Program on behaviors, would be greater than that of the individual programs.*

Discussion of this hypothesis will be separately presented by each school as follows.

The combined effect on the School A

The SSII-Healthy Eating Intervention was first implemented in School A, and followed by the SSII-Physical Activity Intervention. Results showed that the combined effects of the SSII-Healthy Eating and Physical Activity Intervention Programs on two dependent variables, including (1) knowledge about obesity-related Type 2 diabetes and (2) healthy eating behavior, were greater than that of the individual SSII-Healthy Eating Intervention. Thus, hypothesis 3 was partially supported in the School A. Discussion of change in each dependent variable after the combined intervention would be presented below.

Knowledge about obesity-related Type 2 diabetes: The result revealed that all three means were significantly different from each other. Mean knowledge was significantly higher after the individual SSII-Healthy Eating Intervention Program (Mean=6.76) than before the individual program (Mean=5.81). The mean knowledge score after the combined intervention (Mean=8.14) was significantly higher than that after the individual program, and also significantly higher than the mean score at baseline. These results suggested that 1) the combined interventions were effective at producing increased knowledge about obesity-related Type 2 diabetes, and 2) the combined effect of the SSII-Healthy Eating and Physical Activity Intervention Programs on knowledge was greater than that of the individual program. This finding is as expected, indicating that providing students with information about physical activity during the later program could significantly increase existing remembering and understanding of information about risk factors, symptoms, prevention and treatment, and health consequences of obesity and Type 2 diabetes.

Healthy eating self-efficacy: The result demonstrated that mean score of healthy eating self-efficacy was significantly higher after the individual SSII-Healthy Eating

Intervention Program (Mean=48.67) than before the individual program (Mean=43.00). The mean score after the combined intervention (Mean=47.81) was also significantly higher than that before the individual program, but a small decrease in mean score was found after the combined intervention. These results suggested that 1) the combined interventions were effective at producing increased healthy eating self-efficacy, and 2) as there was no further improvement in self-efficacy between endpoint and combined measures, combined effect of the SSII-Healthy Eating and Physical Activity Intervention Programs on healthy eating self-efficacy was not greater than that of the individual program. Maintenance in healthy eating self-efficacy after the combined interventions although the SSII-Physical Activity Intervention was implemented may be due to association between physical activity self-efficacy and healthy eating self-efficacy. Although change in physical activity self-efficacy and change in healthy eating self-efficacy were not significantly correlated ($r = .391$, $p = .08$) after the combined interventions, correlation between physical activity self-efficacy and healthy eating self-efficacy demonstrated statistical significance ($r = .580$, $p < .001$). In addition, physical activity self-efficacy at the combined measures was significantly higher than that at the baseline measures ($t = -4.029$, $p < .001$). This may suggest that the SSII-Physical Activity Intervention increased students' physical activity self-efficacy and it is likely that the increased physical activity self-efficacy lead to maintenance in healthy eating self-efficacy after the combined interventions as significant difference in healthy eating self-efficacy between the baseline and the combined measures still exit.

Healthy eating self-control: The result revealed that mean score of healthy eating self-control was significantly higher after the individual SSII-Healthy Eating Intervention Program (Mean=56.86) than before the individual program (Mean=52.14). The mean score after the combined intervention (Mean=56.62) was not significantly different from that at baseline and after the individual program. These results suggested that 1) the combined interventions were as effective as the individual program at producing increased healthy eating self-control, and 2) as there was no significant improvement in self-control between endpoint and combined measures, combined effect of the SSII-Healthy Eating and Physical Activity Intervention Programs on healthy eating self-control was not greater than that of the individual program. A decrease in mean score of healthy eating self-control after the combined intervention, resulting in non-significant difference in self-control between the baseline and the combined measures, may be due to decreased self-control of healthy eating behavior. As suggested in the literature (Webb & Sheeran. 2003), the ability to self-regulate one's behavior is limited. According to the self-control strength model, exerting self-

control on an initial task reduces performance on a subsequent task that also requires self-control. Moreover, it appears that cognitive, emotional, and physical acts of self-control all use the same limited resource. If this limited resource is diminished, the person can not longer effectively regulate his/her behavior. For this finding, it is shown that healthy eating self-control increased after the individual program, but it is diminished at the end of the combined programs. Although the SSII-Physical Activity Intervention was later implemented, it seems that this program did not affect the healthy eating self-control as the program failed to increase physical activity self-control after the combined intervention, demonstrating no significant difference in mean score of physical activity self-control between the baseline and the combined measures. Non-significant increase in physical activity self-control, therefore, could not influence an increase in or even maintenance of healthy eating self-control.

Healthy eating behavior: The result showed that all three means were significantly different from each other. Mean behavior was significantly higher after the individual SSII-Healthy Eating Intervention Program (Mean=23.19) than before the individual program (Mean=22.00). The mean score after the combined intervention (Mean=25.19) was significantly higher than that before and after the individual program. These results suggested that 1) the combined interventions were effective at improving healthy eating behavior, and 2) combined effect of the SSII-Healthy Eating and Physical Activity Intervention Programs on healthy eating behavior was greater than that of the individual program. The increase in healthy eating behavior after the combined interventions following the SSII-Physical Activity Intervention was implemented may be explained in several ways. *First*, it may be due to an association between physical activity and healthy eating behavior. Although, in this study, change in physical activity and change in healthy eating behavior were not significantly correlated ($r = .151$, $p > .05$) after the combined interventions, the results from Study 1 (Patcharee Duangchan. 2007) demonstrated a significant correlation between physical activity and healthy eating behavior ($r = .45$, $p < .01$). In addition, physical activity at the combined measures was significantly higher than that at the baseline measures ($t = -4.058$, $p < .001$). This may suggest that the SSII-Physical Activity Intervention increased students' physical activity and it is likely that the increased physical activity lead to increase in healthy eating behavior after the combined interventions as significant difference in healthy eating behavior between the baseline and the combined measures was demonstrated. *Second,* it may be because of maintenance in healthy eating self-efficacy after the combined interventions. As suggested in a previous study (Roach et

al. 2003: 1357-1359) evaluating an intervention program designed to increase self-efficacy for weight loss. The sample was 73 students aged 18-23 years who were enrolled at a southern university. Results found that there was a significant relationship between change in self-efficacy and change in eating behavior for the intervention group ($r = 0.388$, $p < .01$), but not for the control group, suggesting that as self-efficacy improved, eating habits improved. In this study, it is possible that maintenance in healthy eating self-efficacy after the combined interventions improved healthy eating behavior. This finding is in line with response about having breakfast before and after the program, as there were an increased number of students reporting that they had breakfast everyday after the combined programs. *Third*, it may due to a strong correlation between intention-behavior resulting from forming implementation intentions in the program. This would be discussed in detail in hypothesis 5.

BMI: It was found that mean BMI was significantly lower after the individual SSII-Healthy Eating Intervention Program (Mean=27.02) than before the individual program (Mean=27.52). The mean BMI after the combined intervention (Mean=27.28) was not significantly different from that before and after the individual program. These results suggested that 1) the combined interventions was as effective as the individual program at producing reduction in BMI, and 2) combined effect of the SSII-Healthy Eating and Physical Activity Intervention Programs on BMI was not greater than that of the individual program. There have been some explanations for this finding. *First*, it may due to duration of the intervention. As suggested by a meta-analytic review of obesity prevention programs for children and adolescents (Stice et al. 2006), interventions with a relatively shorter duration produced a significantly larger effect than those that were longer in duration. This might be because interventions that are long in duration are not attractive to students, which causes them to disengage from the program. *Second*, because BMI naturally increases with age, maintenance of BMI, and in some cases even small increase in BMI, could be considered a success (Nemet et al. 2005).

The combined effect on the School B

The SSII-Physical Activity Intervention was first implemented in the School B, and followed by the SSII-Healthy Eating Intervention Program. Results showed that the combined effect on just knowledge about obesity-related Type 2 diabetes was greater than that of the individual SSII-Physical Activity Intervention. Thus, hypothesis 3 was hardly

supported in the School B. Discussion of change in each dependent variable after the combined intervention would be presented below.

Knowledge about obesity-related Type 2 diabetes: The result revealed that there was no significant increase in mean knowledge after the individual SSII-Physical Activity Intervention Program (Mean=7.25), comparing with before the individual program (Mean=6.45). The mean knowledge score after the combined intervention (Mean=8.40) was significantly higher than that after the individual program, and also significantly higher than the mean score at baseline. These results suggested that 1) the combined interventions were effective at producing increased knowledge about obesity-related Type 2 diabetes in School B, and 2) combined effect of the SSII-Physical Activity and Healthy Eating Intervention Programs on knowledge was greater than that of the individual program. This finding is as expected, indicating that activities aiming to enhance knowledge about obesity-related Type 2 diabetes; such as lecturing, questioning, small group discussion, used in the SSII-Healthy Eating Intervention could improve students' ability to recognize and understand information about risk factors, symptoms, prevention and treatment, and health consequences of obesity and Type 2 diabetes.

Physical activity self-efficacy: The result demonstrated that mean score of physical activity self-efficacy after the individual SSII-Physical Activity Intervention Program (Mean=34.80) was not significantly different from the mean score before the individual program (Mean=32.90). However, mean score after the combined intervention (Mean=36.50) was significantly higher than it was before the individual program. There was no significant difference in mean score between after the individual intervention and after the combined intervention program. It appears that 1) the combined interventions were effective at producing increased physical activity self-efficacy, and 2) as there was no significant increase in self-efficacy between endpoint and combined measures, combined effect of the SSII-Physical Activity and Healthy Eating Intervention Programs on physical activity self-efficacy was not greater than that of the individual program. An increase in physical activity self-efficacy after the combined interventions although the SSII- Healthy Eating Intervention was implemented may be due to association between physical activity self-efficacy and healthy eating self-efficacy. It is shown that there was significant correlation between physical activity self-efficacy and healthy eating self-efficacy after the combined interventions ($r = .580$, $p < .001$). This may suggest that the SSII- Healthy Eating Intervention produced students' healthy eating self-efficacy and thereby leading to increases in physical activity self-efficacy after the combined interventions as significant differences in

physical activity self-efficacy between the baseline and the combined measures was demonstrated. It is likely that implementation of the SSII- Healthy Eating Intervention Program after the SSII-Physical Activity Intervention could much more influence physical activity self-efficacy than the SSII-Physical Activity Intervention itself.

Physical activity self-control: It was demonstrated that mean score of physical activity self-control after the individual SSII-Physical Activity Intervention Program (Mean=31.95) was not significantly different from the mean score before the individual program (Mean=30.85). However, mean score after the combined intervention (Mean=33.55) was significantly higher than it was before the individual program. There was no significant difference in mean score between after the individual intervention and after the combined intervention program. This suggested that 1) the combined interventions were effective at improving physical activity self-control, and 2) combined effect of the SSII-Physical Activity and Healthy Eating Intervention Programs on physical activity self-control was not greater than that of the individual program. An explanation of this finding may be due to increase in physical activity self-efficacy as discussed above which is accord with the study of Anderson et al. (2006), demonstrating that physical activity self-efficacy had direct effect on physical activity self-control (β_{direct} = .18, $p < .001$). Again, it is likely that implementation of the SSII- Healthy Eating Intervention Program after the SSII-Physical Activity Intervention could produce higher physical activity self-control than the SSII-Physical Activity Intervention itself.

Physical activity: The result revealed that mean score of physical activity after the individual SSII-Physical Activity Intervention Program (Mean=52.25) was not significantly different from the mean score before the individual program (Mean=45.75). However, mean score after the combined intervention (Mean=58.05) was significantly higher than that before the individual program. There was no significant difference in mean score between the end point measure and combined intervention measure. These results suggested that 1) the combined interventions were effective at improving physical activity, and 2) as there was no significant improvement of physical activity between endpoint and combined measures, the combined effect of the SSII-Physical Activity and Healthy Eating Intervention Programs on physical activity was not greater than that of the individual program. The increase in physical activity after the combined interventions although the SSII-Healthy Eating Intervention was implemented second may be due to several reasons. *First*, it may be due to an association between physical activity and healthy eating behavior as

discussed above. It is demonstrated that, after the combined interventions, healthy eating behavior at the combined measures was significantly higher than that at the baseline measures ($t = -4.973$, $p < .001$). This may suggest that the SSII-Healthy Eating Intervention increased students' healthy eating behavior and it is likely that the increased healthy eating behavior lead to increase in physical activity after the combined interventions as a significant difference in physical activity between the baseline and the combined measures was demonstrated. *Second*, it may be because of increases in physical activity self-efficacy and physical activity self-control after the combined intervention. The study of Anderson et al. (2006) may again help explain this. Results of their study showed that physical activity self-efficacy had indirect effect on physical activity through physical activity self-control ($\beta_{total} = .12$, $p < .05$), whereas physical activity self-control had direct effect on physical activity ($\beta_{direct} = .36$, $p < .001$). This is consistent with the study of Smith et al. (2009) examining association of changes in self-efficacy, voluntary physical activity, and risk factors for Type 2 diabetes in a behavioral treatment for obese preadolescent and found that change in self-efficacy significantly predicted change in physical activity ($\beta = .44$, $p = .02$).

BMI: The result demonstrated that mean BMI was significantly lower after the individual SSII-Physical Activity Intervention Program (Mean=24.92) than before the individual program (Mean=25.38). The mean BMI after the combined intervention (Mean=25.24) was higher than that after the individual program, but still lower than the mean score at baseline. However, There was no significant different in mean BMI between endpoint measure and combined intervention measure. These results suggested that 1) the combined interventions were as effective as the individual program at producing a reduction in BMI, and 2) combined effect of the SSII-Physical Activity and Healthy Eating Intervention Programs on BMI was not greater than that of the individual program. Explanations for the combined effects of BMI in School A may apply here for discussion.

Hypothesis 4: *School A, where the SSII-Healthy Eating Intervention was first implemented, would have a lower BMI than School B, where the SSII-Physical Activity Intervention was first implemented.*

The results showed that there were significant differences in dependent variables associated with school after adjustment for differences in knowledge, physical activity self-efficacy, and BMI prior to the intervention ($F = 2.426$, $p = .038$). Univariate analysis showed that after the combined intervention program, there were differences in healthy eating self-

efficacy and physical activity self-control between School A and School B, where School A provided higher healthy eating self-efficacy and less physical activity self-control than School B (Healthy eating self-efficacy: mean=47.81 for School A vs 45.20 for School B; physical activity self-control: mean=29.29 for School A vs 33.55 for School B). It appears that the combined SSII-Healthy Eating Intervention and Physical Activity intervention programs was more effective in producing increased healthy eating self-efficacy, but less effective in improving physical activity self-control than the combined SSII-Physical Activity Intervention and Healthy Eating Intervention programs. Regarding BMI, although School A failed to demonstrated less decrease in BMI than School B, the combined SSII-Healthy Eating Intervention and Physical Activity intervention programs implemented in School A provided higher partial η^2 than the combined SSII-Physical Activity Intervention and Healthy Eating Intervention programs implemented in School B (partial η^2 = .25 for School A vs partial η^2 = .11 for School B). This suggests that implementation of the SSII-Healthy Eating Intervention program and followed by the SSII-Physical Activity Intervention may provide greater impact on BMI than the opposite one. This may be because changing eating behavior provides faster weight loss when compare with exercise. The study of Johnson et al. (1997) supports this explanation. In their study, dietary and exercise interventions for obese children were examined. Twenty-eight children were randomly assigned to one of the three interventions; NE-received a nutrition and eating-habit intervention for 7 weeks followed by an aerobic exercise intervention for 7 weeks; EN-received the opposite sequence; INFO-was educated on diet and exercise for 14 weeks. Results showed that NE group displayed uniform weight loss over the 16 sessions, whereas EN group did not lose weight until after session 9 when the nutrition component was introduced.

Hypothesis 5: *The reductions in BMI, and increases in healthy eating and physical activity would be accompanied by increases in self-efficacy and self-control if the PBC is good at predicting actual behavior change*.

Discussions for this hypothesis will be separately presented by each behavior as follows.

Prediction of BMI and healthy eating behavior

The results showed that reduction in BMI was not significantly correlated with increases in healthy eating self-efficacy, healthy eating self-control, and healthy eating behavior. In addition, increase in healthy eating behavior was not significantly predicted by

increases in self-efficacy and self-control. However, directions of correlations among those variables tend to be as expected. This finding is not consistent with Roach et al. (2003: 1357-1359) evaluating an intervention program designed to increase self-efficacy for weight loss. Results found that there was a significant relationship between change in self-efficacy and change in eating behavior for the intervention group ($r = 0.388$, $p < .01$), but not for the control group. In addition, Change in self-efficacy was also significantly correlated with weight loss in the intervention group ($r = -0.536$, $p < .01$), but not in the control group, demonstrating that as self-efficacy improved, eating habits improved and weight loss was greater. As suggested by the TPB, an additional analysis which included intention to perform healthy eating was performed and the result demonstrated, surprisingly, that healthy eating behavior was significantly predicted by a decrease in intention to perform healthy eating. In turn, increase in intention to perform healthy eating was significantly predicted by increase in healthy eating self-efficacy. This additional finding suggests that PBC, as it comprises of self-efficacy and self-control defined in this study, had no direct effect on healthy eating behavior, instead, it had indirect effect on healthy eating behavior through intention to perform healthy eating. This is contrary to the results of the Study 1 (Patcharee. 2007) demonstrating that, among PBC and intention, intention to perform healthy eating did not significantly predicted healthy eating behavior ($\beta = .129$, $p > .05$).

An explanation for this finding, which demonstrated direct effect of intention on behavior, may be because both components of the PBC were used in this study. As stated by Ajzen (2002: 8), a mixture of self-efficacy and controllability items significantly improved prediction of intentions but not of behavior. Perceived self-efficacy was found to be account for significant portions of variance in intentions, beyond attitudes and subjective norms, and in behavior, over and above intentions. In contrast, controllability added significantly to the prediction of behavior but not to the prediction of intentions. Another explanation may be due to forming implementation intention which is discussed above. Briefly, the implementation intention has been shown to enhance the prediction of behavior provided by the TPB, reduce the impact of habit on future behavior (Sheeran & Orbell. 2000), enhance people's ability to self-regulate their behavior (Webb & sheeran. 2003), and strengthen the intention-behavior relationship (Latimer et al. 2006; Milne et al. 2002; Prestwich et al. 2003). In the SSII-Healthy Eating Intervention Program, the students were assigned to form implementation intention to eat healthily during next week. By forming implementation intention, the intended behavior can be initiated more immediately, more efficiently, with

less effort, and in a relatively automatic fashion (Gollwitzer. 1999; Sheeran & Orbell. 2000; Webb & Sheeran. 2007). In this case, it is possible that implementation intention strengthens the intention-behavior relationship resulting in increase in healthy eating behavior. However, it is also found that healthy eating behavior was significantly predicted by a decrease in intention to perform healthy eating (β = -.556, $p < .01$), instead of an increase one as stated by the TPB. This finding is in line with a study of Armitage & Conner (1999: 83) using the TPB to predict consumption of a low-fat diet and found negative β (β = -.35, $p < .01$) for the prediction of behavior from intention, which reflects the fact that percentage of fat is measured in absolute terms. Thus, if one intends to eat low-fat diet, one would expect the proportion of fat to be lower, resulting in a negative association. This explanation may apply for this finding. Another explanation may be due to literal inconsistency, which is that students do not act on their stated intention (Ajzen & Fishbein. 1980, 2005).

Prediction of BMI and physical activity

The results showed that reduction in BMI was not significantly correlated with increases in physical activity self-efficacy, physical activity self-control, and physical activity. Contrary to the prediction of healthy eating behavior, increase in physical activity self-efficacy and increase in physical activity self-control together significantly predicted increase in physical activity, explaining 16.4% of variance, with only change in physical activity self-control being a significant predictor. This finding suggested that as physical activity self-control improved, physical activity improved. In other words, the PBC is good at predicting actual behavior change which confirms the results of the Study 1 (Patcharee. 2007) demonstrating that, PBC significantly predicted physical activity (β = .312, $p < .01$). This finding is also accord with the study of Anderson et al. (2006) mentioned above, showing that physical activity self-control had a direct effect on physical activity and physical activity self-efficacy had an indirect effect on physical activity through physical activity self-control. In this study, it is revealed that physical activity self-efficacy did not significantly predict physical activity; it is possible that physical activity self-control may be a mediator between the two variables. Impact of implementation intention may also help explain this as it is possible that forming implementation intentions enhanced people's ability to self-regulate their behavior, which thereby directly increase physical activity.

Overall, from the results suggested above, it is likely that, for healthy eating behavior, self-efficacy was a dominant predictor when compared with self-control; whereas

for physical activity, self-control was a dominant predictor. Reduction in BMI was not accompanied by increases in self-efficacy and self-control related to healthy eating and physical activity, even increases in behaviors. It is possible that there might be mediators; such as emotional eating (Andrade et al. 2010), among these variable correlations and this point should be further examined in this age group.

APPLICATIONS OF FINDINGS

1. It is suggested, from the study results, that interventions related to nutrition and healthy eating behavior should be implemented initially to obtain greater effect of the combined interventions on BMI.

2. As it is suggested that affective beliefs influence change in behavior, future behavior change interventions for combating obesity in children should target the affective component of attitude, which concern happiness, enjoyment, and use an interactive format of program delivery.

3. Health practitioner or professional interventionists, who require increases in healthy eating behavior as a major outcome, should apply strategies aiming at improving healthy eating self-efficacy in the behavior change interventions; including mastery experience, modeling, and verbal persuasions. In addition, for the combined intervention, the healthy eating intervention should be first implemented and followed by physical activity intervention. This order is suggested from the results of this study as well as the results of Study 2 as implementing the two interventions at the same time is likely to yield only maintenance in healthy eating behavior, but not an increase.

4. Health practitioner or professional interventionists, who require increases in physical activity as a major outcome, should apply strategies aiming at improving physical activity self-control in the behavior change interventions; including self-monitoring, self-reinforcement, stimulus control, and implementation intention.

5. Cooperative and interactive learning is important for behavioral interventions designed for children. Thus, having experience in these learning styles together with clear understanding of self-efficacy, self-control, and implementation intention concepts probably leads to program success.

LIMITATIONS AND RECOMMENATIONS

1. Obesity is considered as a major risk factor of Type 2 diabetes and other complications, such as abnormal lipid profiles. Risk for these complications, however, could be reversed with a 5% decrease in age-adjusted BMI percentile (Nemet et al. 2005). Unfortunately, blood testing was not performed in this study as the majority of students' parents refused this, therefore it was unable to assess whether the combined interventions provided positive effects on biochemical variables such as blood glucose and lipid profiles. Future research should perform blood testing in order to obtain clear reduction in risk for Type 2 diabetes and other complications of obesity.

2. A longitudinal, randomized clinical trial, larger sample sizes is needed to confirm a possible path from self-efficacy and self-control to healthy eating behavior and physical activity and to change in BMI. If such causal path is confirmed, interventions similar to SSII-Healthy Eating and Physical Activity Programs may have practical applications in other settings. In addition, program efficacy in terms of theoretical bases was also evaluated.

3. Long-term follow-up studies are needed to determine whether maintenance of behaviors and weight loss can be achieved over the longer term.

4. Although parental involvement was a part of this study, the specific effect of parental influences was unclear. In addition to the SSII-Healthy Eating and Physical Activity Intervention, additional "parent classes" might also be helpful in providing a forum for parents to support one another and share successes and challenges with family lifestyle changes. Thus, parent classes should be included in future study to determine if parent participation is associated with outcomes.

5. Intervention duration is important to consider because it is difficult to disseminate intensive programs in school given the competing demands for classroom time. Moreover, the long intervention duration also translate into higher dissemination costs because both training and delivery costs will be greater. Future studies should investigate the effect per hour of the intervention.

6. As it is suggested by the literature that physical activity self-control may be a mediator between physical activity self-efficacy and physical activity in adults. Future study might include an investigation to confirm this in schoolchildren, in order to make a theoretical contribution to the literature.

7. In this study, reduction in BMI was not accompanied by increases in self-efficacy and self-control related to healthy eating and physical activity, even increases in behaviors, therefore research investigating mediations among those variables may be needed.

8. The students participating in this study were in low-income and low-educated families, consent from their parents to participate in the programs was given and a majority of them were at a stage of being ready to change their behavior. Results may be biased and generalization to the population may be limited.

9. It should be noted that self-monitoring with forming implementation intentions are difficult for this age range. Thus, applying this strategy in schoolchildren should be dealt with carefully and even reviewed.

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APPENDIX A

Example of study measures

แบบสอบถาม
การบริโภคอาหารและการเคลื่อนไหวออกกำลังของนักเรียนชั้นประถมศึกษา
โรงเรียน.....กรุงเทพมหานคร

ชื่อ.....ชั้น.....เลขที่.....

แบบสอบถามนี้มี 5 ส่วน คือ

ส่วนที่ 1 ข้อมูลทั่วไปของนักเรียน
ส่วนที่ 2 ความรู้เกี่ยวกับโรคอ้วนและโรคเบาหวานชนิดที่ 2
ส่วนที่ 3 ความรู้สึกและความพร้อมในการปรับเปลี่ยนพฤติกรรม
ส่วนที่ 4 การรับรู้ความสามารถของตนเองในการบริโภคอาหารและการเคลื่อนไหวออกกำลัง
ส่วนที่ 5 การควบคุมตนเองในการบริโภคอาหารและการเคลื่อนไหวออกกำลัง

ส่วนที่ 1 ข้อมูลทั่วไป

คำชี้แจง ขอให้นักเรียนใส่เครื่องหมาย ✓ ลงใน ☐ หรือกรอกข้อมูลที่ตรงกับความเป็นจริงของนักเรียน และโปรดตอบทุกข้อ

1. เพศ ☐ ชาย ☐ หญิง
2. อายุ.....ปี.....เดือน
3. การรับประทานอาหารเช้าของนักเรียน
   - ☐ ไม่รับประทาน (ข้ามไปตอบข้อ 5 ต่อ)
   - ☐ รับประทานเป็นบางวัน
   - ☐ รับประทานทุกวัน
4. ส่วนใหญ่นักเรียนรับประทานอาหารเช้าจากที่ไหน
   ☐ ที่บ้าน ☐ ที่โรงเรียน ☐ อื่นๆ คือ.....
5. นักเรียนได้เงินมาโรงเรียนวันละ.....บาท

ส่วนที่ 2 ความรู้เกี่ยวกับโรคอ้วนและโรคเบาหวานชนิดที่ 2

คำชี้แจง ขอให้นักเรียนใส่เครื่องหมาย ✓ ลงในช่องว่างที่นักเรียนคิดว่าเป็นคำตอบที่ถูกที่สุดเพียงช่องเดียว และโปรดตอบคำถามทุกข้อ

ข้อความ	ถูก	ผิด	ไม่ทราบ
1. โรคอ้วน หมายถึง ภาวะที่ร่างกายมีสัดส่วนไม่พอเหมาะ			
2. คนอ้วนมีโอกาสเกิดโรคเบาหวานชนิดที่ 2 ได้มากกว่าคนที่มีน้ำหนักปกติ			
3. การกินพิซซ่าและน้ำอัดลมเป็นประจำ ไม่ทำให้เกิดโรคเบาหวานชนิดที่ 2 ได้			
4. วิธีการที่ดีที่สุดในการลดความอ้วนคือ รับประทานอาหารครบ 5 หมู่ที่ให้พลังงานต่ำในปริมาณที่เพียงพอกับความต้องการของร่างกาย			
5. คนที่เป็นโรคเบาหวานชนิดที่ 2 จะมีน้ำตาลในเลือดต่ำ			
6. การลดความอ้วน**ไม่สามารถ**ช่วยป้องกันการเกิดโรคเบาหวานชนิดที่ 2 ได้			
7. ผู้ที่อ้วนมักมีกระดูกและข้อต่อเสื่อมก่อนวัย			
8. เด็กวัยเรียนอายุ 11-13 ปี มีความต้องการพลังงานอาหารวันละ 2,000 แคลอรี			
9. โปรตีนเป็นสารอาหารที่ให้พลังงานสูงสุด ในบรรดาอาหาร 3 กลุ่ม คือ โปรตีน ไขมัน และคาร์โบไฮเดรท			
10. การกินอาหารที่มีกากใยสูงช่วยป้องกันการเกิดโรคเบาหวานชนิดที่ 2 ได้			
11. การนั่งดูรายการโทรทัศน์ที่สนุกสนานตื่นเต้นใช้พลังงานมากกว่าการเดินเล่น			
12. การออกกำลังกายทุกวัน วันละ 30 นาที มีผลทำให้สุขภาพแข็งแรง			
13. การลดความอ้วนที่ได้ผลเร็วควรงดอาหารมื้อเย็น			
14. เด็กชายอ๊อฟเป็นคนอ้วน การออกกำลังกายด้วยการเดินเร็วหรือขี่จักรยานจะเหมาะกับเขามากกว่าการกระโดดเชือก			
15. เด็กที่ออกกำลังกายสม่ำเสมอจะทำให้มีโอกาสเป็นโรคเบาหวานชนิดที่ 2 น้อยลง			

<u>ส่วนที่ 3</u> ความรู้สึกและความพร้อมในการปรับเปลี่ยนพฤติกรรม

<u>คำชี้แจง</u> ขอให้นักเรียนใส่เครื่องหมาย ✓ ลงใน ☐ ที่ตรงกับความรู้สึกนึกคิดของนักเรียนมากที่สุด และ<u>โปรดตอบคำถามทุกข้อ</u>

1. เพราะเหตุใดนักเรียนจึงเข้าร่วมกิจกรรมในโปรแกรมนี้ (**โปรดเลือกตอบเพียง 3 ตัวเลือก และเรียงลำดับความสำคัญ 1 ถึง 3**)
   - ☐ นักเรียนต้องการเข้าร่วมด้วยตนเอง
   - ☐ ผู้ปกครองของนักเรียนต้องการให้นักเรียนเข้าร่วม
   - ☐ นักเรียนต้องการมีความรู้เกี่ยวกับหลักการบริโภคอาหารและการเคลื่อนไหวออกกำลังให้มากขึ้น
   - ☐ นักเรียนต้องการลดน้ำหนัก
   - ☐ นักเรียนต้องการกินอาหารที่ดีต่อสุขภาพและต้องการให้ร่างกายกระฉับกระเฉงเคลื่อนไหวอยู่เสมอ
   - ☐ นักเรียนอยากได้ของรางวัล
   - ☐ ครูต้องการให้นักเรียนเข้าร่วม
   - ☐ อื่นๆ คือ.....

2. นักเรียนรู้สึกพอใจกับน้ำหนักและรูปร่างของตัวเองมากน้อยเพียงใด
   ☐ พอใจมาก ☐ พอใจ ☐ เฉยๆ ☐ ไม่พอใจ ☐ ไม่พอใจเลย

3. นักเรียนมั่นใจว่า การเข้าร่วมโปรแกรมครั้งนี้จะทำให้นักเรียนมีความสุขและสนุกมากน้อยเพียงใด
   - ☐ มากที่สุด
   - ☐ มาก
   - ☐ ไม่แน่ใจ
   - ☐ น้อย
   - ☐ น้อยที่สุด

4. นักเรียนรู้สึกว่า **การรับประทานอาหารเพื่อสุขภาพ เช่น ผักผลไม้ อาหารประเภทต้มนึ่งอบ** เป็นสิ่งที่....

☐	☐	☐	☐
4.1 ยุ่งยากมาก	ยุ่งยากปานกลาง	ยุ่งยากเล็กน้อย	ไม่ยุ่งยากเลย
☐	☐	☐	☐
4.2 อร่อยมาก	อร่อยปานกลาง	อร่อยเล็กน้อย	ไม่อร่อยเลย
☐	☐	☐	☐
4.3 ชื่นชอบมาก	ชื่นชอบปานกลาง	ชื่นชอบเล็กน้อย	ไม่ชื่นชอบเลย

5. นักเรียนรู้สึกว่า **การเคลื่อนไหวออกกำลังอย่างสม่ำเสมอ** เป็นสิ่งที่....

☐	☐	☐	☐
5.1 ยุ่งยากมาก	ยุ่งยากปานกลาง	ยุ่งยากเล็กน้อย	ไม่ยุ่งยากเลย
☐	☐	☐	☐
5.2 น่าสนใจมาก	น่าสนใจปานกลาง	น่าสนใจเล็กน้อย	ไม่น่าสนใจเลย
☐	☐	☐	☐
5.3 ชื่นชอบมาก	ชื่นชอบปานกลาง	ชื่นชอบเล็กน้อย	ไม่ชื่นชอบเลย
☐	☐	☐	☐
5.4 สนุกมาก	สนุกปานกลาง	สนุกเล็กน้อย	ไม่สนุกเลย

ข้อความ	จริงที่สุด	ค่อนข้างจริง	ไม่แน่ใจ	ค่อนข้างไม่จริง	ไม่จริงเลย
6. นักเรียนตั้งใจจะ**กินผัก ผลไม้ให้ได้มากในแต่ละมื้อ**					
7. นักเรียนตั้งใจจะ**ลดอาหารจานด่วน** เช่น ไก่ทอด พิซซ่า แฮมเบอร์เกอร์					
8. นักเรียนตั้งใจจะ**ลดเครื่องดื่มที่มีรสหวาน** เช่น น้ำอัดลม น้ำหวาน					
9. นักเรียนตั้งใจจะกิน**อาหารให้ครบ 5 หมู่** ทุกมื้อ					
10. นักเรียนพยายามที่จะ**ลดปริมาณอาหารในมื้อเย็น**					
11. นักเรียนพยายามที่จะ**ออกกำลังกายต่อเนื่องอย่างน้อยวันละ 30 นาที**					
12. นักเรียนพยายามจะ**ทำกิจกรรมที่ทำให้ร่างกายรู้สึกเหนื่อยหรือมีเหงื่อ** เช่น ทำงานบ้าน วิ่งเล่นกับเพื่อน เดินระยะทางใกล้แทนการใช้รถ					
นักเรียนตั้งใจจะ**ลดการอยู่กับที่เป็นเวลานานๆ** เช่น ดูโทรทัศน์/วีซีดี นั่งหน้าจอคอมพิวเตอร์					

ส่วนที่ 4 การรับรู้ความสามารถของตนเองด้านการบริโภคอาหารและการเคลื่อนไหวออกกำลัง

คำชี้แจง ขอให้นักเรียนใส่เครื่องหมาย ✓ ลงในช่องว่างที่ตรงกับความรู้สึกนึกคิดของนักเรียนมากที่สุดเพียงช่องเดียว และโปรดตอบคำถามทุกข้อ

ข้อความ	มั่นใจมากที่สุด	ค่อนข้างมั่นใจ	ไม่แน่ใจ	ไม่ค่อยมั่นใจ	ไม่มั่นใจเลย
1. ฉันมั่นใจว่าตัวเองสามารถจะกินผลไม้เป็นของว่างแทนไอศครีมหรือขนมหวานได้					
2. ฉันมั่นใจว่าตัวเองสามารถจะกินผักได้ทุกมื้อโดยไม่เกี่ยงงอน					
3. ฉันมั่นใจว่าตัวเองสามารถจะกินธัญพืช เช่น ข้าวกล้อง ถั่ว ทุกวันได้					
4. ฉันมั่นใจว่าตัวเองสามารถจะหลีกเลี่ยงอาหารจานด่วน เช่น ไก่ทอด พิซซ่า แฮมเบอร์เกอร์					
5. ฉันมั่นใจว่าตัวเองสามารถจะกินอาหารประเภทต้ม นึ่ง ลวก อบ แทนอาหารทอดหรือผัด					
6. ฉันมั่นใจว่าตัวเองสามารถจะลดขนมกรุบกรอบ เช่น มันฝรั่งทอด ข้าวเกรียบ					
7. ฉันมั่นใจว่าตัวเองสามารถจะลดของหวานและขนมที่มีแป้งและน้ำตาลมาก เช่น คุ้กกี้ โดนัท เค้ก					
8. ฉันมั่นใจว่าตัวเองสามารถจะดื่มนมจืดพร่องไขมันหรือนมจืดไขมันต่ำแทนนมรสอื่นๆ					
9. ฉันมั่นใจว่าตัวเองสามารถจะดื่มน้ำเปล่าแทนน้ำอัดลมหรือเครื่องดื่มรสหวานต่างๆ					
10. ฉันมั่นใจว่าตัวเองสามารถจะกินอาหารให้ครบ 5 หมู่ได้ทุกมื้อ					
11. ฉันมั่นใจว่าตัวเองสามารถจะกินอาหารเบาๆ ที่ให้พลังงานต่ำในมื้อเย็น เช่น ปลา หรือสลัด					
12. ฉันมั่นใจว่าตัวเองสามารถจะออกกำลังกายได้ทุกวันอย่างน้อย วันละ 30 นาที					
13. ฉันมั่นใจว่าตัวเองสามารถจะลดเวลาที่ใช้ในการนั่งดูโทรทัศน์/วีซีดี อยู่หน้าจอคอมพิวเตอร์ หรือนั่งเล่นเกม					
14. ฉันมั่นใจว่าตัวเองสามารถจะออกไปวิ่งหรือเดินแทนการนั่งดูโทรทัศน์หลังเลิกเรียน					

ข้อความ	มั่นใจมากที่สุด	ค่อนข้างมั่นใจ	ไม่แน่ใจ	ไม่ค่อยมั่นใจ	ไม่มั่นใจเลย
15. ฉันมั่นใจว่าตัวเองสามารถจะวิ่งเล่นกับเพื่อนในช่วงพักเรียนแทนการนั่งอยู่เฉยๆ					
16. ฉันมั่นใจว่าตัวเองสามารถจะช่วยผู้ปกครองทำงานบ้านจนเหงื่อออก เช่น กวาดบ้าน ถูบ้าน เมื่อมีเวลาว่าง					
17. ฉันมั่นใจว่าตัวเองสามารถจะบิดตัวหรือเคลื่อนไหวไปมาขณะดูโทรทัศน์/วีซีดี แทนการนั่งกินขนมขบเคี้ยว					
18. ฉันมั่นใจว่าตัวเองสามารถจะเดินระยะทางใกล้ๆ แทนการใช้รถ					
19. ฉันมั่นใจว่าตัวเองสามารถจะเล่นกีฬาหรือออกกำลังกายในวันเสาร์-อาทิตย์					

ส่วนที่ 5 การควบคุมตนเองในการบริโภคอาหารและการเคลื่อนไหวออกกำลัง

คำชี้แจง ขอให้นักเรียนใส่เครื่องหมาย ✓ ลงในช่องว่างที่ตรงกับความรู้สึกนึกคิดของนักเรียนมากที่สุดเพียงช่องเดียว และโปรดตอบคำถามทุกข้อ

ข้อความ	จริงที่สุด	จริง	ไม่แน่ใจ	ไม่จริง	ไม่จริงที่สุด
1. ฉันควบคุมตัวเองให้กินผัก ผลไม้ ให้มากขึ้นได้					
2. ฉันควบคุมตัวเองให้ลดการกินอาหารที่มีไขมัน อาหารทอด ได้					
3. การที่ฉันจะลดของหวานหรือเครื่องดื่มที่มีน้ำตาลเป็นส่วนประกอบ ขึ้นอยู่กับตัวฉันเอง					
4. ฉันอดไม่ได้จะซื้อขนมกรุบกรอบ เช่น มันฝรั่งทอด ข้าวเกรียบมากิน					
5. ฉันบังคับตัวเองให้กินผักได้มากขึ้นกว่าแต่ก่อน					
6. ฉันสังเกตตนเองว่ากินผลไม้เป็นของว่างแทนไอศครีมหรือขนมหวานได้มากขึ้น					
7. ในแต่ละวัน ฉันสามารถควบคุมตัวเองให้กินอาหารครบ 5 หมู่ได้ทุกมื้อ					
8. ฉันกินธัญพืช เช่น ข้าวกล้อง ถั่ว ได้สม่ำเสมอทุกวัน					
9. ฉันมักเผลอรับประทานอาหารประเภท ไก่ทอด พิซซ่า แฮมเบอร์เกอร์ อยู่เรื่อย					
10. ฉันเลือกกินอาหารประเภทต้ม นึ่ง ลวก อบ แทนอาหารทอดหรือผัด					

ข้อความ	จริงที่สุด	จริง	ไม่แน่ใจ	ไม่จริง	ไม่จริงที่สุด
11. ฉันสามารถควบคุมตัวเองให้ลดของหวานและขนมที่มีแป้งและน้ำตาลมาก เช่น คุ้กกี้ โดนัท เค้ก ได้					
12. ฉันบอกกับตัวเองให้ดื่มนมจืดพร่องไขมันหรือนมจืดไขมันต่ำแทนนมรสอื่นๆ					
13. ฉันบังคับตัวเองให้ดื่มน้ำเปล่าแทนน้ำอัดลมหรือน้ำหวานได้					
14. ฉันพบว่าฉันกินอาหารเบาๆ ที่ให้พลังงานต่ำในมื้อเย็น เช่น ปลาหรือสลัด					
15. ไม่ว่าจะมีการบ้านเยอะแค่ไหนก็ตาม ฉันก็ออกกำลังกายทุกวันได้ตามแผนที่วางไว้อย่างน้อยวันละ 30 นาที					
16. ฉันมักตามใจตัวเองที่จะใช้เวลาไปกับการนั่งดูโทรทัศน์/วีซีดีเป็นเวลานานๆ					
17. ในระยะนี้ ฉันออกไปวิ่งหรือเดินเล่นแทนการนั่งดูโทรทัศน์หลังเลิกเรียนมากขึ้น					
18. ฉันสามารถควบคุมตัวเองให้เล่นกีฬาหรือออกกำลังกายในวันหยุดเสาร์-อาทิตย์					
19. ฉันสังเกตตนเองว่าได้ช่วยพ่อแม่ทำงานบ้านมากขึ้นเมื่อมีเวลาว่าง					
20. ฉันบังคับตัวเองให้เดินระยะทางใกล้ๆ แทนการใช้รถ					
21. ขณะดูโทรทัศน์/วีซีดี ฉันเคลื่อนไหวร่างกายไปมาแทนการนั่งอยู่เฉยๆ					
22. ฉันสามารถควบคุมตัวเองให้ลดเวลาที่ใช้ในการนั่งหน้าจอคอมพิวเตอร์ หรือเล่นเกม					

แบบสอบถามการเคลื่อนไหวออกกำลังและการบริโภคอาหาร

แบบสอบถามนี้มี 2 ส่วน คือ

<u>ส่วนที่ 1</u> การทำกิจกรรมทางกายและการออกกำลังกายของนักเรียน

<u>ส่วนที่ 2</u> การบริโภคอาหารของนักเรียน

ชื่อ.....ชั้น ป...../.....เลขที่.....

<u>ส่วนที่ 1</u> การทำกิจกรรมทางกายและการออกกำลังกายของนักเรียน

คำชี้แจง โปรดทำเครื่อง √ ลงในช่องที่ตรงกับการกระทำของนักเรียน

ในสัปดาห์ที่ผ่านมา นักเรียนทำกิจกรรมต่อไปนี้บ่อยเพียงใด

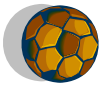
กิจกรรมในชีวิตประจำวัน	ไม่เคยทำเลย	ทำ 1 วัน	ทำ 2 วัน	ทำ 3 วัน	ทำ 4 วัน	ทำ 5 วัน	ทำ 6 วัน	ทำทุกวัน
1. ทำงานบ้านจนเหงื่อออก เช่น กวาดบ้าน ถูบ้าน								
2. ดูโทรทัศน์/วีซีดี ติดต่อกัน 2 ชั่วโมงขึ้นไป								
3. วิ่งเล่นกับเพื่อนในช่วงพักเรียน								
4. ช่วยผู้ปกครองทำงาน								
5. นั่งอ่านหนังสือติดต่อกัน 2 ชั่วโมงขึ้นไป								
6. นั่งเล่นเกมติดต่อกัน 2 ชั่วโมงขึ้นไป								
7. รับประทานอาหารขณะดูโทรทัศน์/วีซีดี								
8. เดินระยะทางใกล้ๆ แทนการใช้รถ								
9. อยู่หน้าจอคอมพิวเตอร์ติดต่อกัน 2 ชั่วโมงขึ้นไป								
10. ออกไปเดินเล่นหรือวิ่งเล่นแทนการนั่งดูโทรทัศน์หลังเลิกเรียน								

⛵ ในสัปดาห์ที่ผ่านมา นักเรียนเล่นกีฬาหรือออกกำลังกายชนิดใดบ้างต่อไปนี้ อย่างน้อยวันละ 30 นาที (เลือกได้มากกว่า 1 อย่าง) ขอให้นักเรียนในเครื่องหมาย √ ลงในช่องที่ตรงกับประเภทกีฬาหรือกิจกรรมที่นักเรียนกระทำ

○ ไม่ได้เล่นกีฬาหรือออกกำลังกายเลย

○ เล่นกีฬาหรือออกกำลังกาย โดย

- ☐ เล่นฟุตบอล
- ☐ ขี่จักรยาน
- ☐ กระโดดเชือก
- ☐ ตีแบดมินตัน
- ☐ ว่ายน้ำ
- ☐ บาสเก็ตบอล
- ☐ วอลเล่ย์บอล
- ☐ ปิงปอง
- ☐ เดิน
- ☐ วิ่ง
- ☐ เต้นแอโรบิค/เต้นรำ
- ☐ เทนนิส
- ☐ ยูโด/เทควันโด้
- ☐ วิดพื้น
- ☐ ซิท-อัพ
- ☐ อื่นๆ (โปรดระบุ .....)





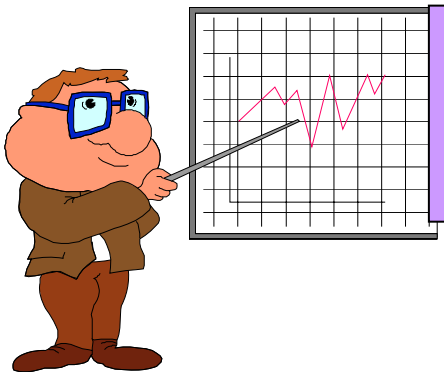
<u>ส่วนที่ 2</u> การบริโภคอาหารของนักเรียน

คำชี้แจง ขอให้นักเรียนใส่เครื่องหมาย √ ลงในช่องว่างที่ตรงกับความเป็นจริงของนักเรียน และ<u>โปรดทำให้ครบทุกข้อ</u>

ในสัปดาห์ที่ผ่านมา นักเรียนกินอาหารต่อไปนี้บ่อยเพียงใด

อาหาร	ไม่เคยกินเลย	กินเป็นบางวัน	กินทุกวัน
1. อาหารจานด่วน เช่น ไก่ทอด พิซซ่า แฮมเบอร์เกอร์ เฟรนช์ฟราย			
2. ขนมหวาน เช่น ไอศกรีม ช็อคโกแลต ลูกกวาด/ลูกอม น้ำแข็งใสราดน้ำหวาน			
3. น้ำอัดลม เช่น เป๊บซี่ โค้ก แฟนต้า มิรินด้า			
4. ขนมกรุบกรอบ ขบเคี้ยว เช่น มันฝรั่งทอด ข้าวเกรียบ			
5. น้ำหวาน เช่น ชาเย็น น้ำแดง โกโก้เย็น นมรสหวาน			
6. ขนมปังที่มีรสหวาน เช่น โดนัท คุ้กกี้ เค้ก เครับญี่ปุ่น โตเกียว			
7. ผักประเภทหัว เช่น แครอท ฟักทอง กะหล่ำปลี			
8. ผลไม้ เช่น มะละกอ ฝรั่ง แตงโม ส้ม แอปเปิ้ล			
9. ขนมไทยที่มีรสหวาน เช่น ลอดช่อง ทองหยิบ ทองหยอด			
10. ผักใบเขียว เช่น ผักบุ้ง ผักคะน้า ผักกาดขาว			
11. ธัญญาพืช เช่น ถั่ว ข้าวกล้อง ลูกเดือย			
12. อื่นๆ (โปรดระบุ.....)			

☺.....ขอขอบคุณนักเรียนทุกคนที่ให้ความร่วมมือในการตอบแบบสอบถาม.....☺

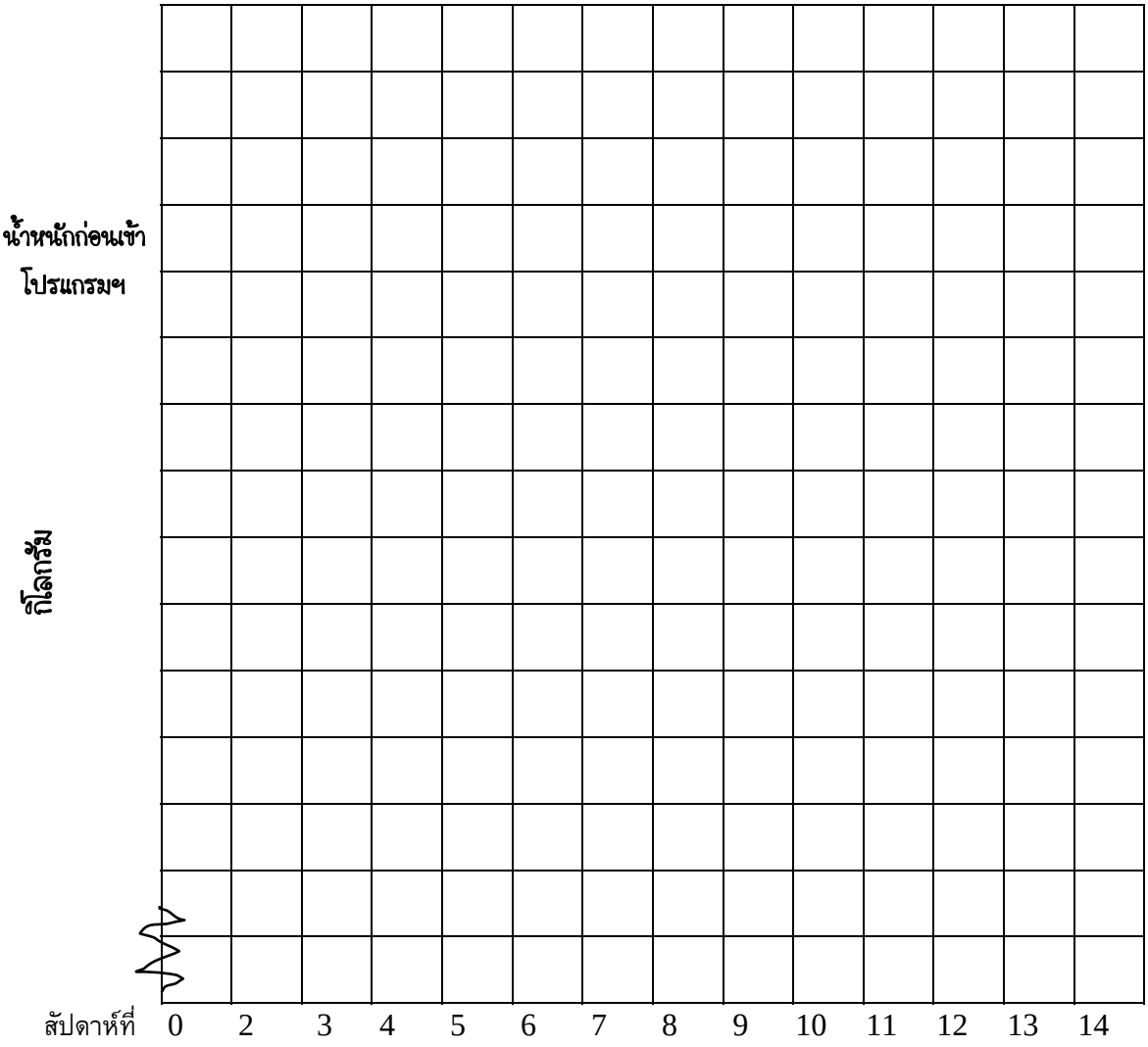


กราฟแสดงการเปลี่ยนแปลงของน้ำหนัก

ชื่อ-สกุล_____

น้ำหนักก่อนเข้าโปรแกรมฯ_____

น้ำหนักที่ตั้งเป้าไว้หลังจากจบโปรแกรมฯ_____



แบบสอบถามสำหรับผู้ปกครอง

<u>คำชี้แจง</u> ขอให้ท่านเติมคำตอบลงในช่องว่าง หรือใส่เครื่องหมาย √ ในช่องที่ตรงกับความเป็นจริงเกี่ยวกับนักเรียนในความปกครองของท่าน

1. ท่านเป็นผู้ปกครองของนักเรียน
   ชื่อ..... ชั้น ป.....
   เลขที่.....โรงเรียน.....

2. นักเรียนในความปกครองของท่านมีโรคประจำตัวหรือไม่
   ☐ ไม่มี ☐ มี (โปรดระบุ).....

3. ท่านเคยให้บุตรของท่านทานวิตามินหรืออาหารเสริม เช่น วิตามินรวม ซุปไก่สกัด น้ำมันตับปลา หรือไม่
   ☐ ไม่เคย
   ☐ เคย (โปรดระบุชื่อการค้า.....)
   ถ้าเคย ท่านให้บุตรของท่าน ทานวิตามินหรืออาหารเสริมดังกล่าว เป็นเวลานานเท่าใดโดยประมาณ
   .....

4. น้ำหนักของบิดา .....กิโลกรัม ส่วนสูงของบิดา.....เซนติเมตร

5. น้ำหนักของมารดา .....กิโลกรัม ส่วนสูงของมารดา.....เซนติเมตร

6. อายุของบิดา.....ปี อายุของมารดา.....ปี

7. ประวัติการให้นมบุตรตั้งแต่แรกคลอดของมารดานักเรียน
   ☐ ไม่ได้เลี้ยงด้วยนมแม่
   ☐ เลี้ยงด้วยนมแม่เป็นเวลา 1 - 3 เดือน
   ☐ เลี้ยงด้วยนมแม่เป็นเวลา 4 เดือนขึ้นไป

8. ประวัติการเป็นโรคเบาหวานของบิดามารดาของนักเรียน

บิดา	**มารดา**
☐ เป็นโรคเบาหวาน	☐ เป็นโรคเบาหวาน
☐ ไม่เป็นโรคเบาหวาน	☐ ไม่เป็นโรคเบาหวาน
☐ ไม่ทราบว่าเป็นโรคเบาหวานหรือไม่	☐ ไม่ทราบว่าเป็นโรคเบาหวานหรือไม่

9. ประวัติการเป็นโรคเบาหวานของปู่ย่าตายายของนักเรียน

ปู่หรือย่า	**ตาหรือยาย**
☐ เป็นโรคเบาหวาน	☐ เป็นโรคเบาหวาน
☐ ไม่เป็นโรคเบาหวาน	☐ ไม่เป็นโรคเบาหวาน
☐ ไม่ทราบว่าเป็นโรคเบาหวานหรือไม่	☐ ไม่ทราบว่าเป็นโรคเบาหวานหรือไม่

10. อาชีพของบิดา

☐ รับราชการ ☐ พนักงานรัฐวิสาหกิจ/เอกชน
☐ กิจการส่วนตัว ☐ ค้าขาย
☐ ไม่ได้ประกอบอาชีพ ☐ อื่นๆ คือ.....

11. อาชีพของมารดา

☐ รับราชการ ☐ พนักงานรัฐวิสาหกิจ/เอกชน
☐ กิจการส่วนตัว ☐ ค้าขาย
☐ แม่บ้าน ☐ อื่นๆ คือ.....

12. รายได้ต่อเดือนของครอบครัว

☐ น้อยกว่า 20,000 บาท ☐ 20,000-30,000 บาท
☐ 30,001-40,000 บาท ☐ 40,001-50,000 บาท
☐ 50,001-60,000 บาท ☐ มากกว่า 60,000 บาท

13. ระดับการศึกษาของบิดา

☐ ต่ำกว่าปริญญาตรี ☐ ปริญญาตรีหรือเทียบเท่า
☐ ปริญญาโท ☐ ปริญญาเอก
☐ อื่นๆ คือ.....

14. ระดับการศึกษาของมารดา

☐ ต่ำกว่าปริญญาตรี ☐ ปริญญาตรีหรือเทียบเท่า
☐ ปริญญาโท ☐ ปริญญาเอก
☐ อื่นๆ คือ.....

APPENDIX B

- Concepts, activity framework, and activity lesson plan
- Example of the SSII-Healthy Eating Intervention Program
- Example of the SSII-Physical Activity Intervention Program

โปรแกรมปรับเปลี่ยนพฤติกรรมที่ประยุกต์ใช้แนวคิดการควบคุมตนเอง การรับรู้ความสามารถของตนเอง และการแปลงเจตนาสู่การกระทำ เพื่อปรับเปลี่ยนตัวแปรทางจิต พฤติกรรมการบริโภคอาหารและการเคลื่อนไหวออกกำลังและดัชนีมวลกาย ในเด็กนักเรียน กรุงเทพมหานคร



โดย

นางพัชรี ดวงจันทร์

นิสิตปริญญาเอก (เน้นวิจัย) สาขาการวิจัยพฤติกรรมศาสตร์ประยุกต์

สถาบันวิจัยพฤติกรรมศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ

สารบัญ

ความเป็นมาของโปรแกรม

โรคอ้วนในเด็กกำลังเป็นปัญหาสุขภาพที่สำคัญของประเทศไทย ผลการสำรวจโรงเรียนชั้นประถมศึกษา 342 โรง ทั่วประเทศ โดยเครือข่ายวิจัยสุขภาพ มูลนิธิสารณสุขแห่งชาติในปี พ.ศ. 2548 พบว่า มีเด็กนักเรียนอ้วนร้อยละ 12 และท้วมร้อยละ 5 โดยเฉพาะเด็กนักเรียนในกรุงเทพฯ อ้วนถึงร้อยละ 15.5 และท้วมร้อยละ 7 และจากการสำรวจภาวะโภชนาการเกินและโรคอ้วนของนักเรียนช่วงชั้นที่ 3 และ 4 ปีการศึกษา 2550 ของโรงเรียนที่สังกัดสำนักงานคณะกรรมการการศึกษาขั้นพื้นฐานและสำนักการศึกษา กรุงเทพมหานคร จำนวน 158 โรง พบนักเรียนที่มีภาวะโภชนาการเกินและโรคอ้วนรวมกันคิดเป็นร้อยละ 14.87 โดยโรงเรียนที่มีร้อยละของเด็กนักเรียนที่มีภาวะโภชนาเกินส่วนใหญ่สังกัดสำนักงานคณะกรรมการการศึกษาขั้นพื้นฐาน โดยเฉพาะโรงเรียนที่อยู่ในเขตชั้นในของกรุงเทพมหานครซึ่งเป็นเขตเมือง นอกจากนี้ จากการสำรวจภาวะโภชนาการของเด็กนักเรียนชั้นประถมศึกษาปีที่ 4 โรงเรียนสาธิต ในเขตกรุงเทพมหานคร ที่มีอายุระหว่าง 9-11 ปี ในปี 2550 พบว่า มีนักเรียนที่อยู่ในภาวะเสี่ยงต่อการเกิดโรคอ้วน (ท้วม) และเป็นโรคอ้วนร้อยละ 16.45 และ ร้อยละ 13.93 ตามลำดับ ซึ่งรวมแล้วคิดเป็นร้อยละ 30.38 นอกจากนี้

โรคอ้วนเป็นปัจจัยเสี่ยงที่สำคัญของการเกิดโรคเบาหวานชนิดที่ 2 ซึ่งเกิดจากร่างกายดื้อต่อฤทธิ์อินซูลิน คนที่อ้วนร่างกายก็จะยิ่งดื้อต่ออินซูลินทำให้เสี่ยงต่อการเป็นโรคเบาหวาน ปัจจุบันหลายประเทศทั่วโลกพบเด็กที่เป็นโรคเบาหวานชนิดที่ 2 มากขึ้น โดยตัวเลขที่เพิ่มขึ้นดังกล่าวมีความสัมพันธ์กับจำนวนที่เพิ่มขึ้นของเด็กที่เป็นโรคอ้วน ซึ่งในประเทศไทยเองก็มีการศึกษาที่พบว่าเด็กและวัยรุ่นเป็นโรคเบาหวานชนิดที่ 2 กันมากขึ้น เด็กที่เป็นโรคอ้วนและเบาหวานจะเกิดผลเสียทั้งทางร่างกาย จิตใจ และสังคม การป้องกันเด็กไม่ให้เป็นโรคอ้วนและโรคเบาหวานย่อมเป็นการป้องกันผลเสียต่างๆ ที่จะตามมาอีกมากมาย รวมทั้งยังเป็นการลดจำนวนผู้ใหญ่ที่เป็นโรคเบาหวานในอนาคต

จากการที่โรคเบาหวานชนิดที่ 2 ในเด็กมีแนวโน้มเพิ่มขึ้น การพัฒนาให้เด็กมีทักษะในการควบคุมตนเองและการรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลังและการบริโภคอาหารซึ่งเป็นพฤติกรรมหลักในการป้องกันโรคเบาหวานจึงเป็นสิ่งสำคัญและจำเป็น เพื่อให้เด็กสามารถควบคุมและจัดการกับอิทธิพลต่างๆ ของสิ่งแวดล้อมในปัจจุบันที่ล้วนแต่ยั่วยุให้เด็กเดินเข้าสู่เส้นทางของการเกิดโรค นอกจากนี้มีงานวิจัยหลายเรื่องที่พบว่าทักษะการควบคุมตนเองและการรับรู้ความสามารถของตนเองสามารถปรับเปลี่ยนพฤติกรรมการเคลื่อนไหวออกกำลังและการบริโภคอาหารได้อย่างมีประสิทธิผล โปรแกรมนี้จะช่วยพัฒนาทักษะในการควบคุมตนเองและการรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลังและการบริโภคอาหาร ซึ่งจะเป็นประโยชน์ต่อการปรับเปลี่ยนพฤติกรรม เพื่อป้องกันไม่ให้เด็กเป็นโรคเบาหวานต่อไป

ตัวแปรตามของโปรแกรม

โปรแกรมปรับเปลี่ยนพฤติกรรมในการศึกษาครั้งนี้ แบ่งออกเป็น 2 โปรแกรมย่อย คือ โปรแกรมปรับเปลี่ยนพฤติกรรมการบริโภคอาหาร และโปรแกรมปรับเปลี่ยนพฤติกรรมการเคลื่อนไหวออกกำลัง ซึ่งทั้งสองโปรแกรมดังกล่าวประยุกต์ใช้แนวคิดการควบคุมตนเอง (**S**elf-control) การรับรู้ความสามารถของตนเอง (**S**elf-efficacy) และการแปลงเจตนาสู่การกระทำ (**I**mplementation **I**ntention) และต่อไปนี้จะขอเรียกทั้งสองโปรแกรมดังกล่าวว่า โปรแกรม Eat-SSII และโปรแกรม Exercise-SSII ตามลำดับ ตัวแปรตามของโปรแกรมทั้งสองแยกอธิบายตามประเภทของโปรแกรม ดังต่อไปนี้

1. ตัวแปรตามของโปรแกรม Eat-SSII ได้แก่
    1.1 ความรู้เกี่ยวกับโรคอ้วนและเบาหวานชนิดที่ 2
    1.2 การควบคุมตนเองด้านการบริโภคอาหารเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2
    1.3 การรับรู้ความสามารถของตนเองด้านการบริโภคอาหารเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2
    1.4 พฤติกรรมการบริโภคอาหาร
2. ตัวแปรตามของโปรแกรม Exercise-SSII ได้แก่
    2.1 การควบคุมตนเองด้านการเคลื่อนไหวออกกำลังเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2
    2.2 การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลังเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2
    2.3 พฤติกรรมการเคลื่อนไหวออกกำลัง

วัตถุประสงค์ของโปรแกรม

วัตถุประสงค์ของโปรแกรมปรับเปลี่ยนพฤติกรรมทั้ง 2 โปรแกรม สามารถแยกอธิบายตามประเภทของโปรแกรมได้ดังต่อไปนี้

1. โปรแกรม Eat-SSII มีวัตถุประสงค์ดังนี้

1.1 เพื่อพัฒนาตัวแปรทางจิตที่เกี่ยวข้องกับการบริโภคอาหาร โดยมีวัตถุประสงค์ย่อย คือ

1) เพื่อให้นักเรียนสามารถจดจำ เข้าใจความหมาย ความเชื่อมโยงระหว่างโรคอ้วนและเบาหวานชนิดที่ 2 ปัจจัยเสี่ยง ผลเสีย แนวทางการป้องกัน และเล็งเห็นถึงความสำคัญของการลดความเสี่ยงของโรคเบาหวานชนิดที่ 2

2) เพื่อให้นักเรียนมีการรับรู้ความสามารถของตนเองด้านการบริโภคอาหารเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 เพิ่มขึ้น

3) เพื่อให้นักเรียนมีการควบคุมตนเองด้านการบริโภคอาหารเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 เพิ่มขึ้น

1.2 เพื่อให้นักเรียนมีพฤติกรรมการบริโภคอาหารเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 เพิ่มมากขึ้น

1.3 เพื่อลดความเสี่ยงของการเกิดโรคเบาหวานชนิดที่ 2 ที่มีสาเหตุมาจากโรคอ้วน โดยมีวัตถุประสงค์ย่อย ดังนี้

1) เพื่อให้นักเรียนมีดัชนีมวลกาย (BMI) ลดลงสู่เกณฑ์มาตรฐาน หรือ ลดลงจากก่อนเข้าร่วมโปรแกรม

2) เพื่อให้นักเรียนมีความหนาของชั้นไขมัน (Skinfold thickness) ลดลงสู่เกณฑ์มาตรฐาน หรือ ลดลงจากก่อนเข้าร่วมโปรแกรม

3) เพื่อให้นักเรียนมีความยาวรอบเอวลดลงจากก่อนเข้าร่วมโปรแกรม

2. โปรแกรม Exercise-SSII มีวัตถุประสงค์ดังนี้

1.1 เพื่อพัฒนาตัวแปรทางจิตที่เกี่ยวข้องกับการเคลื่อนไหวออกกำลัง โดยมีวัตถุประสงค์ย่อย คือ

1) เพื่อให้นักเรียนมีการรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลังเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 เพิ่มขึ้น

2) เพื่อให้นักเรียนมีการควบคุมตนเองด้านการเคลื่อนไหวออกกำลังเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 เพิ่มขึ้น

1.2 เพื่อให้นักเรียนมีพฤติกรรมการเคลื่อนไหวออกกำลังเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 เพิ่มมากขึ้น

1.3 เพื่อลดความเสี่ยงของการเกิดโรคเบาหวานชนิดที่ 2 ที่มีสาเหตุมาจากโรคอ้วน โดยมีวัตถุประสงค์ย่อย ดังนี้

1) เพื่อให้นักเรียนมีดัชนีมวลกาย (BMI) ลดลงสู่เกณฑ์มาตรฐาน หรือ ลดลงจากก่อนเข้าร่วมโปรแกรม

2) เพื่อให้นักเรียนมีความหนาของชั้นไขมัน (Skinfold thickness) ลดลงสู่เกณฑ์มาตรฐาน หรือ ลดลงจากก่อนเข้าร่วมโปรแกรม

3) เพื่อให้นักเรียนมีความยาวรอบเอวลดลงจากก่อนเข้าร่วมโปรแกรม

กลุ่มเป้าหมาย

กลุ่มเป้าหมายของโปรแกรมปรับพฤติกรรมทั้งสองโปรแกรม คือ เด็กนักเรียนอายุระหว่าง 9-11 ปี (ชั้นประถมศึกษาปีที่ 4 และ 5) ที่ศึกษาอยู่ในโรงเรียนสังกัดกรุงเทพมหานคร และมีภาวะเสี่ยงต่อโรคอ้วนหรือมีภาวะอ้วน เมื่อใช้เกณฑ์ของโคลและคณะ (Cole et al. 2000) ร่วมกับเกณฑ์มาตรฐานดัชนีมวลกายตามอายุและเพศ (BMI-for-age) (CDC. 2005)

ลักษณะของโปรแกรม

ลักษณะของโปรแกรมปรับเปลี่ยนพฤติกรรมทั้ง 2 โปรแกรมในการศึกษาครั้งนี้ สามารถแยกอธิบายตามประเภทของโปรแกรมได้ดังต่อไปนี้

1. โปรแกรม Eat-SSII

โปรแกรมนี้เป็นหลักสูตรที่มีจุดมุ่งหมายเพื่อพัฒนาการควบคุมตนเองและการรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร รวมทั้งพฤติกรรมการบริโภคอาหาร โดยมีการจัดเนื้อหาและกิจกรรมที่ส่งเสริมการพัฒนาทั้งทางด้านการรู้คิดและพฤติกรรม กิจกรรมที่จัดขึ้นแบ่งออกเป็น 6 ครั้ง สัปดาห์ละ 1 ครั้งๆ ละ 100 นาที รวมทั้งหมด 600 นาที ในแต่ละครั้งใช้รูปแบบการเรียนรู้ที่หลากหลายเช่น การสอนแบบบรรยาย การฝึกทักษะ การฝึกแก้ปัญหา การทำแบบฝึกหัดที่บ้าน การอภิปราย การเรียนรู้แบบมีส่วนร่วมและแบบปฏิสัมพันธ์ เป็นต้น ภาพรวมของโปรแกรมแสดงดังภาคผนวกตาราง 1

ภาคผนวกตาราง 1 ภาพรวมกิจกรรมในโปรแกรม Eat-SSII

ครั้งที่	เนื้อหา/กิจกรรม
1	ความรู้ด้านโภชนาการ: ธงโภชนาการ พลังงานจากอาหาร (แคลอรี) อาหารทดแทนที่ให้พลังงานต่ำ และการอ่านฉลากโภชนาการ
2	การควบคุมตนเองด้านการบริโภคอาหาร
3	การเลือกซื้อ การเก็บ ปริมาณรับประทาน และวิธีการรับประทานอาหาร พร้อมทำกิจกรรม “ทัวร์ซุปเปอร์มาร์เก็ต”
4	อาหารเพื่อสุขภาพ: การสาธิต กิจกรรมการทำอาหาร การจัดเมนูอาหาร และการมอบหมายการบ้านเพื่อทำ/จัดเมนูอาหารเพื่อสุขภาพกับครอบครัว
5	การเผชิญอารมณ์หรือสถานการณ์ และทางเลือกในการแก้ปัญหาที่นำไปสู่การบริโภคที่ไม่เหมาะสม
6	ความรู้เกี่ยวกับโรคอ้วนและโรคแทรกซ้อน (เบาหวานชนิดที่ 2)

2. โปรแกรม Exercise-SSII

โปรแกรมนี้เป็นหลักสูตรที่มีจุดมุ่งหมายเพื่อพัฒนาการควบคุมตนเองและการรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง รวมทั้งพฤติกรรมการเคลื่อนไหวออกกำลัง โดยมีการจัดเนื้อหาและกิจกรรมที่ส่งเสริมการพัฒนาทั้งทางด้านการรู้คิดและพฤติกรรม กิจกรรมที่จัดขึ้นแบ่งออกเป็น 6 ครั้ง สัปดาห์ละ 1 ครั้งๆ ละ 100 นาที รวมทั้งหมด 600 นาที ในแต่ละครั้งใช้รูปแบบการเรียนรู้ที่หลากหลายเช่น การสอนแบบบรรยาย การฝึกทักษะ การทำแบบฝึกหัด การสาธิต การเรียนรู้แบบมีส่วนร่วม เป็นต้น ภาพรวมของโปรแกรมแสดงดังภาคผนวกตาราง 2

ภาคผนวกตาราง 2 ภาพรวมกิจกรรมในโปรแกรม Exercise-SSII

ครั้งที่	เนื้อหา/กิจกรรม
1	การใช้พลังงานในชีวิตประจำวัน: สัดส่วนของการเคลื่อนไหวออกกำลังที่ควรปฏิบัติในชีวิตประจำวัน และพลังงานที่ถูกเผาผลาญจากการออกกำลังกายหรือทำกิจกรรมต่างๆ
2	การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง
3	หลักการออกกำลังกายที่เหมาะสมกับวัยและตัวแบบของการออกกำลังกาย
4	การวางแผนกิจกรรมเพื่อเพิ่มการเผาผลาญพลังงานร่วมกับครอบครัว และการเลือกกิจกรรมทางกายที่เหมาะสมกับชีวิตประจำวันของตัวเอง
5	เดินเพื่อหาสาระของชีวิต (Walk rally)
6	ทบทวนบทเรียน

แนวคิดและเทคนิคที่ใช้ในการปรับพฤติกรรม

แนวคิดและเทคนิคที่ใช้ในการสร้างโปรแกรมปรับเปลี่ยนพฤติกรรมทั้ง 2 โปรแกรมในการศึกษาครั้งนี้ สามารถแยกอธิบายตามประเภทของโปรแกรมได้ดังต่อไปนี้

1. โปรแกรม Eat-SSII

โปรแกรมนี้มีวัตถุประสงค์เพื่อพัฒนาตัวแปรทางจิตและพฤติกรรมเพื่อให้นักเรียนมีพฤติกรรมการบริโภคอาหารเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 เพิ่มมากขึ้น ซึ่งพฤติกรรมดังกล่าวถือเป็นการกระทำของนักเรียนเองที่จะต้องปฏิบัติตัวในด้านการบริโภคอาหาร [ได้แก่ 1) การรับประทานผักและผลไม้ 2) การรับประทานธัญพืช 3) การหลีกเลี่ยงอาหารที่มีไขมันเป็นส่วนประกอบ 4) การหลีกเลี่ยงของหวานหรือเครื่องดื่มที่มีน้ำตาลเป็นส่วนประกอบ และ 5) การรับประทานอาหารให้ครบ 5 หมู่] โดยที่วิทยากรเป็นผู้ให้ความรู้และฝึกทักษะให้ แต่ไม่สามารถควบคุมดูแลได้ตลอดเวลา นักเรียนต้องเป็นผู้กระทำพฤติกรรมเหล่านั้นด้วยตนเองในชีวิตประจำวันและในสภาพแวดล้อมต่างๆ ให้ได้ จึงจะทำให้เกิดผลสำเร็จของการลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 คือ การมีดัชนีมวลกาย ความหนาของชั้นไขมัน และรอบเอวลดลง

ด้วยเหตุผลและความเหมาะสมดังกล่าว ในงานวิจัยนี้จึงได้เลือกใช้เทคนิคการปรับพฤติกรรมที่เป็นเทคนิคการควบคุมจากภายในตัวบุคคล โดยใช้ทั้งแนวคิดการลดอิทธิพลจากภายนอกลง ควบคู่ไปกับแนวคิดการเปลี่ยนกระบวนการทางปัญญา (ประทีป จินงี่. 2540: 161) สำหรับการลดอิทธิพลจากภายนอกลง ได้นำเทคนิคการควบคุมตนเอง (Self-control) และการแปลงเจตนาสู่การกระทำ (Implementation intention) มาสร้างเป็นโปรแกรม ส่วนการเปลี่ยนกระบวนการทางปัญญาได้นำทฤษฎีการเรียนรู้ทางปัญญาสังคม ได้แก่ การรับรู้ความสามารถของตนเอง (Self-efficacy) มาสร้างเป็นโปรแกรม

รายละเอียดของแนวคิด/เทคนิคที่นำมาสร้างเป็นโปรแกรม Eat-SSII ขอแยกนำเสนอเป็น 2 ประเภท คือ แนวคิดที่เกี่ยวข้องโดยตรงกับการพัฒนาตัวแปรตามของโปรแกรมซึ่งมี 4 ตัวแปร คือ ความรู้เกี่ยวกับโรคอ้วนและเบาหวานชนิดที่ 2 การควบคุมตนเองด้านการบริโภคอาหาร การรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร และพฤติกรรมการบริโภคอาหาร และแนวคิดที่ไม่เกี่ยวข้องโดยตรงกับการพัฒนาตัวแปรตามของโปรแกรม ดังต่อไปนี้

1.1 แนวคิดที่เกี่ยวข้องโดยตรงกับการพัฒนาตัวแปรตามของโปรแกรม

1) แนวคิดเกี่ยวกับโรคอ้วนและเบาหวานชนิดที่ 2 โดยมีกิจกรรมในการบรรยาย การตั้งคำถาม การนำเสนอกรณีศึกษา การเล่นเกม และการอภิปรายกลุ่มย่อย เพื่อให้นักเรียนสามารถจดจำและเข้าใจเกี่ยวกับความหมาย ความเชื่อมโยงระหว่างโรคอ้วนและเบาหวานชนิดที่ 2 ปัจจัยเสี่ยง ผลเสีย แนวทางการป้องกัน และความสำคัญของการป้องกันโรคเบาหวานชนิดที่ 2

แนวคิดที่ 1 ถูกนำมาใช้ในการปรับเปลี่ยนตัวแปรตามด้านการรู้คิด ได้แก่ ความรู้เกี่ยวกับโรคอ้วนและเบาหวานชนิดที่ 2

2) แนวคิดการสร้างการรับรู้ความสามารถของตนเอง (Bandura. 1977, 1997; Allen. 2004) เพื่อให้นักเรียนมีการรับรู้ความสามารถของตนเองด้านการบริโภคอาหารเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 โดยมีแนวคิดย่อย ประกอบด้วย

2.1 การสร้างประสบการณ์ที่ประสบความสำเร็จ เพื่อให้นักเรียนได้รับประสบการณ์โดยตรงจากการฝึกทักษะที่เกี่ยวข้องกับการบริโภคอาหาร และมีความเชื่อว่าเขาสามารถที่จะทำได้ โดยมีกิจกรรมประกอบด้วย การบรรยาย การตั้งคำถาม การเล่นเกม การฝึกซ้อมและลงมือปฏิบัติจริงทั้งรายบุคคลและรายกลุ่ม การให้ทำแบบฝึกหัด การอภิปรายกลุ่มย่อย การฝึกคิดเป็นรายบุคคลและรายกลุ่ม และการนำประสบการณ์เดิมของนักเรียนมาเป็นข้อมูลย้อนกลับ

2.2 การใช้ตัวแบบ โดยมีกิจกรรมประกอบด้วย การให้นักเรียนเห็นตัวแบบที่ประสบความสำเร็จจากการแสดงพฤติกรรม เช่น นักเรียนที่ประสบความสำเร็จจากการลดน้ำหนักแต่ละสัปดาห์เนื่องจากการควบคุมการบริโภคอาหาร หรือ นักเรียนที่สามารถแสดงพฤติกรรมได้ตามที่มอบหมาย ซึ่งจะทำให้นักเรียนรู้สึกว่าเขาก็สามารถที่จะประสบความสำเร็จได้ถ้าเขาพยายามจริงและไม่ย่อท้อ การสาธิตการทำอาหารเพื่อสุขภาพ ซึ่งจะช่วยให้นักเรียนเกิดการเรียนรู้พฤติกรรมหรือทักษะใหม่ๆ ที่เป็นผลจากการแสดงของตัวแบบ (ผู้สาธิต) การให้นักเรียนได้เห็นตัวแบบ (เพื่อนในกลุ่ม) แสดงพฤติกรรมทางบวกแล้วได้รับการเสริมแรง ซึ่งจะช่วยกระตุ้นนักเรียนให้แสดงพฤติกรรมทางบวกหรือระงับพฤติกรรมทางลบ รวมทั้งการให้ผู้ปกครองเป็นตัวแบบในการบริโภคอาหาร

2.3 การใช้คำพูดชักจูง เป็นการส่งเสริมทั้งทางตรงและทางอ้อมเพื่อทำให้นักเรียนรู้สึกว่าเขาสามารถที่จะประสบความสำเร็จได้ โดยกิจกรรมประกอบด้วย การนำสมาชิกในครอบครัวเข้ามามีส่วนร่วมในโปรแกรม การชี้แนะ การกล่าวชื่นชมในความสำเร็จ การใช้คำพูดโน้มน้าวให้ทำ และการโทรศัพท์เตือน/พูดคุยระหว่างสัปดาห์

แนวคิดที่ 2 ถูกนำมาใช้ในการปรับเปลี่ยนตัวแปรตามด้านการรู้คิด คือ การรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร

3) เทคนิคการควบคุมตนเอง (Kazdin. 2001) เพื่อพัฒนาการควบคุมตนเองด้านการบริโภคอาหาร โดยใช้เทคนิคการควบคุมเงื่อนไขนำ และการควบคุมผลกรรม ดังนี้

3.1 การควบคุมเงื่อนไขนำ ได้แก่ การควบคุมสิ่งเร้า โดยมีกิจกรรมคือ การกำจัดสิ่งเร้าที่ทำให้เกิดการบริโภคอาหารที่เสี่ยงต่อโรคเบาหวานชนิดที่ 2 เช่น รับประทานอาหารเฉพาะที่โต๊ะอาหารเท่านั้น ไม่ซื้อของว่างที่ให้พลังงานสูงไว้ในบ้าน เป็นต้น ในขณะที่สร้างสิ่งเร้าที่

เฉพาะเจาะจงเพื่อให้เกิดพฤติกรรมการบริโภคอาหารที่ลดความเสี่ยงต่อโรคเบาหวานชนิดที่ 2 เช่น จัดหาอาหาร/ของว่างพลังงานต่ำไว้ในที่ที่เห็นได้ง่าย เป็นต้น

3.2 การควบคุมผลกรรม ซึ่งประกอบด้วยกิจกรรม 4 ขั้นตอน คือ การกำหนดพฤติกรรมเป้าหมาย การสังเกตและบันทึกพฤติกรรมด้วยตนเอง การประเมินผล และการให้แรงเสริมตนเอง

แนวคิดที่ 3 ถูกนำมาใช้ในการปรับเปลี่ยนตัวแปรตามด้านการรู้คิด คือ การควบคุมตนเองด้านการบริโภคอาหาร และตัวแปรตามด้านพฤติกรรม คือ พฤติกรรมการบริโภคอาหาร

4) แนวคิดการแปลงเจตนาสู่การกระทำ (Gollwitzer. 1993) เพื่อให้นักเรียนเพิ่มการกระทำพฤติกรรมการบริโภคอาหาร โดยมีกิจกรรมคือ ให้นักเรียนวางแผนที่จะกระทำพฤติกรรมการบริโภคอาหารให้ชัดเจนในแง่ของ ชนิดอาหาร/เครื่องดื่ม วัน เวลา และสถานที่ ทั้งนี้เพื่อเป็นการเพิ่มความสัมพันธ์ระหว่างสิ่งเร้ากับการตอบสนอง และความสัมพันธ์ระหว่างเจตนาในการกระทำพฤติกรรมและพฤติกรรม ทำให้พฤติกรรมเกิดขึ้นอย่างเป็นอัตโนมัติ ซึ่งเป็นกลไกหลักตามแนวคิดนี้

แนวคิดที่ 4 ถูกนำมาใช้ในการปรับเปลี่ยนตัวแปรตามด้านพฤติกรรม คือ พฤติกรรมการบริโภคอาหาร

5) แนวคิดเกี่ยวกับการสร้างความตระหนัก ความตระหนักเป็นปัจจัยที่สำคัญในการพัฒนาการควบคุมตนเอง (สมโภชน์ เอี่ยมสุภาษิต. 2549) การสร้างความตระหนักมีกิจกรรมประกอบด้วย การให้ข้อมูลย้อนกลับ การให้ชั่งและบันทึกน้ำหนักของตนเองทุกสัปดาห์ และการให้บันทึกพฤติกรรมการบริโภคอาหารประจำวัน

แนวคิดที่ 5 เป็นส่วนที่สอดแทรกอยู่ในขั้นตอนการดำเนินกิจกรรมของโปรแกรมทั้ง 6 ครั้ง

1.2 แนวคิดที่ไม่เกี่ยวข้องโดยตรงกับการพัฒนาตัวแปรตามของโปรแกรม (แต่ใช้ในการขับเคลื่อนขั้นตอนการดำเนินกิจกรรม)

6) แนวคิดการเรียนรู้โดยใช้กระบวนการกลุ่ม (กรมอนามัย. 2544) ซึ่งประกอบด้วย 5 ขั้นตอน ดังนี้

6.1 ขั้นจัดตั้งจุดมุ่งหมายของการเรียนการสอน

6.2 ขั้นกิจกรรมหรือการจัดประสบการณ์การเรียนรู้ โดยประสบการณ์นั้นควรเป็นประสบการณ์ขั้นเริ่มแรกที่นักเรียนสามารถเข้าใจได้อย่างถ่องแท้ด้วยตนเอง ซึ่งจะเกิดขึ้นได้เมื่อนักเรียนเป็นผู้ลงมือหรือเป็นผู้คิดค้นเสาะแสวงหาสิ่งที่ต้องการเรียนรู้ด้วยตนเอง โดยมีหลักการคือ

- นักเรียนจะเป็นผู้ลงมือทำกิจกรรมการเรียนรู้ด้วยตนเอง โดยกิจกรรมนั้นจะช่วยให้นักเรียนมีส่วนร่วมทางกาย (Physical involvement) อารมณ์ (Ego or Emotional involvement)

สังคม (Social involvement) และสติปัญญา (Intellectual involvement) เพื่อเป็นแนวทางในการพัฒนาองค์ความรู้ของเด็กในทุกๆ ด้านไปพร้อมๆ กัน

- มีการแบ่งกลุ่มนักเรียนออกเป็นกลุ่มย่อยๆ เพื่อให้มีส่วนร่วมแลกเปลี่ยนประสบการณ์การเรียนรู้และทำงานต่างๆ ร่วมกัน หรือเล่นเกมร่วมกัน ซึ่งนักเรียนจะมีการพัฒนาวิธีการทำงานและการอยู่ร่วมกับผู้อื่น ตลอดจนมีมนุษยสัมพันธ์ที่ดี

6.3 ขั้นวิเคราะห์ โดยให้นักเรียนได้ร่วมวิเคราะห์ประสบการณ์ การเรียนรู้ แลกเปลี่ยนความคิดเห็นเกี่ยวกับสิ่งที่ตัวเองได้พบและรู้สึกระหว่างการทำงานในกลุ่ม ซึ่งจะนำไปสู่การพัฒนาความคิดและสติปัญญา หรือเห็นความจริงในสิ่งที่เรียน เพราะนักเรียนจะเป็นผู้ค้นพบสิ่งที่ต้องการเรียนรู้ด้วยตนเอง

6.4 การสรุปและนำหลักการไปประยุกต์ใช้ เมื่อนักเรียนได้รับแนวคิดที่ถูกต้องเหมาะสมแล้ว วิทยากรจะต้องแนะแนวทางให้นักเรียนอภิปรายเพื่อหาข้อสรุปหลักการของสิ่งที่ได้เรียนมา เพื่อช่วยให้นักเรียนมีโอกาสคิดเพื่อนำประสบการณ์ที่ได้รับไปประยุกต์ให้เข้ากับตนเองในการปรับปรุงพฤติกรรมของตนในที่ต่างๆ เช่น ที่บ้าน ที่สาธารณะอื่นๆ หรือสิ่งแวดล้อมอื่นๆ นอกเหนือจากในห้องเรียน รวมทั้งนำไปใช้เพื่อแก้ปัญหาที่อาจจะเกิดขึ้นต่อไปในอนาคต

6.5 ขั้นประเมินผล เพื่อจะได้ทราบผลของกิจกรรมว่าตรงตามจุดมุ่งหมายที่กำหนดไว้มากน้อยเพียงใด การประเมินผลจะช่วยให้ทราบถึงพัฒนาการของนักเรียน ความเข้าใจในเนื้อหา วิธีการเรียนรู้ หรือ ระดับของทักษะที่ต้องการพัฒนา ตลอดจนช่วยให้วิทยากรประเมินผลกิจกรรมของตนว่าได้ประสบผลสำเร็จมากน้อยเพียงใด โดยวิธีการประเมินอาจทำได้โดยการประเมินผลสัมฤทธิ์ของกลุ่ม เช่น ดูผลการทำงานของกลุ่ม ความสามัคคี ความมีส่วนร่วมของสมาชิกในกลุ่ม และการประเมินผลสัมฤทธิ์ของบุคคล เช่น ให้นักเรียนประเมินผลตนเองและของสมาชิกในกลุ่ม ให้ข้อเสนอแนะและติชมร่วมกับสมาชิกคนอื่นๆ ในกลุ่ม เป็นต้น

<u>แนวคิดที่ 6</u> เป็นส่วนที่สอดแทรกอยู่ในขั้นตอนการดำเนินกิจกรรมของโปรแกรมทั้ง 6 ครั้ง

7) แนวคิดเกี่ยวกับการใช้เกมประกอบการเรียนการสอน (อรรถพร จินดามณี. 2548) โดยประเภทของเกมที่นำมาใช้ในโปรแกรม ได้แก่ เกมละลายพฤติกรรม และ เกมเพื่อประสบการณ์การเรียนรู้

<u>แนวคิดที่ 7</u> เป็นส่วนที่สอดแทรกอยู่ในขั้นตอนการดำเนินกิจกรรมของโปรแกรมทั้ง 6 ครั้ง

จากแนวคิดและเทคนิคที่ใช้ในการปรับเปลี่ยนตัวแปรทางจิตและพฤติกรรมซึ่งเป็นตัวแปรตามของโปรแกรม Eat-SSII ดังกล่าวข้างต้น สามารถสรุปความสัมพันธ์ระหว่าง กิจกรรม ตัวแปรตามที่ต้องการปรับเปลี่ยน แนวคิด/เทคนิคที่ใช้ และวิธีดำเนินกิจกรรม ดังแสดงในภาคผนวกตาราง 3

ภาคผนวกตาราง 3 ความสัมพันธ์ระหว่างกิจกรรม ตัวแปรตามที่ต้องการปรับเปลี่ยน แนวคิด/เทคนิคที่ใช้ และวิธีดำเนินกิจกรรมของโปรแกรม Eat-SSII

ครั้งที่	เนื้อหา/กิจกรรม	ตัวแปรตามที่ต้องการปรับเปลี่ยน	แนวคิด/เทคนิคที่ใช้	วิธีดำเนินกิจกรรม
1	ความรู้ด้านโภชนาการ: ธงโภชนาการ พลังงานจากอาหาร (แคลอรี) อาหารทดแทนที่ให้พลังงานต่ำ และการอ่านฉลากโภชนาการ	1. การรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร	1.1 การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการบริโภคอาหาร	- การบรรยายความรู้ - การตั้งคำถาม - การเล่นเกม - การฝึกซ้อมและลงมือปฏิบัติจริง - การอภิปรายกลุ่มย่อย - การฝึกคิดเป็นรายบุคคลและรายกลุ่ม - การให้ข้อมูลย้อนกลับ
			1.2 การใช้คำพูดชักจูง	- การพูดโน้มน้าวให้ทำ - การชี้แนะ
2	การควบคุมตนเองด้านการบริโภคอาหาร	1. การควบคุมตนเองด้านการบริโภคอาหาร 2. พฤติกรรมการบริโภคอาหาร	การควบคุมผลกรรม	- การให้ฝึกการควบคุมตนเองตาม 4 ขั้นตอนในห้องเรียน - การมอบหมายให้ดำเนินการควบคุมตนเองด้านการบริโภคอาหารตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมบริโภคอาหาร
		3. การรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร	การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการบริโภคอาหาร	- การติดตามผลการควบคุมตนเองของนักเรียนและให้ข้อมูลย้อนกลับ

ครั้งที่	เนื้อหา/กิจกรรม	ตัวแปรตามที่ต้องการปรับเปลี่ยน	แนวคิด/เทคนิคที่ใช้	วิธีดำเนินกิจกรรม
3	การเลือกซื้อ การเก็บ ปริมาณเสริฟ และวิธีการรับประทานอาหาร พร้อมทำกิจกรรม “ทัวร์ซุปเปอร์มาร์เก็ต”	1. การควบคุมตนเองด้านการบริโภคอาหาร 2. พฤติกรรมการบริโภคอาหาร	การควบคุมสิ่งเร้า	- การกำจัดสิ่งเร้าที่เป็นตัวแนะพฤติกรรมการบริโภคอาหารที่ไม่เหมาะสม - การสร้างสิ่งเร้าที่เฉพาะเจาะจงซึ่งเป็นตัวแนะพฤติกรรมการบริโภคอาหารที่เหมาะสม
			การควบคุมผลกรรม	- การดำเนินการควบคุมตนเองด้านการบริโภคอาหาร 4 ขั้นตอน ตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมบริโภคอาหาร
		3. การรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร	3.1 การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการบริโภคอาหาร	- การฝึกซ้อมและลงมือปฏิบัติจริงในการเลือกซื้ออาหาร - การมอบหมายงานกลุ่มและอภิปรายกลุ่มย่อย - การให้ข้อมูลย้อนกลับ
			3.2 การใช้คำพูดชักจูง	- การชี้แนะ - การกล่าวชื่นชมในความสำเร็จ
4	อาหารเพื่อสุขภาพ: การสาธิต กิจกรรมการทำอาหาร การจัดเมนูอาหาร และการมอบหมายการบ้านเพื่อทำ/จัดเมนูอาหารเพื่อสุขภาพกับครอบครัว	1. การรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร	1.1 การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการบริโภคอาหาร	- การฝึกซ้อมและลงมือปฏิบัติจริงในการทำอาหาร - การมอบหมายงาน - การให้ข้อมูลย้อนกลับ
			1.2 การใช้ตัวแบบ	- การสาธิตการทำอาหารโดยวิทยากร - การเห็นตัวแบบทางพฤติกรรมจากเพื่อนในกลุ่ม - การให้ผู้ปกครองเป็นตัวแบบในการแสดงพฤติกรรม
			1.3 การใช้คำพูดชักจูง	- การนำสมาชิกในครอบครัวเข้ามามีส่วนร่วม - การชี้แนะ - การกล่าวชื่นชมในความสำเร็จ

ครั้งที่	เนื้อหา/กิจกรรม	ตัวแปรตามที่ต้องการปรับเปลี่ยน	แนวคิด/เทคนิคที่ใช้	วิธีดำเนินกิจกรรม
4 (ต่อ)		2. การควบคุมตนเองด้านการบริโภคอาหาร 3. พฤติกรรมการบริโภคอาหาร	การควบคุมผลกรรม	- การดำเนินการควบคุมตนเองด้านการบริโภคอาหาร 4 ขั้นตอน ตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมบริโภคอาหาร
5	การเผชิญอารมณ์หรือสถานการณ์และทางเลือกในการแก้ปัญหาที่นำไปสู่การบริโภคที่ไม่เหมาะสม	1. การควบคุมตนเองด้านการบริโภคอาหาร 2. การรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร	การเผชิญปัญหาและทักษะการแก้ปัญหา	- การชี้แนะ - การอภิปรายกลุ่มย่อย - การฝึกทักษะ - การให้ข้อมูลย้อนกลับ
		3. พฤติกรรมการบริโภคอาหาร	การควบคุมผลกรรม	- การดำเนินการควบคุมตนเองด้านการบริโภคอาหาร 4 ขั้นตอน ตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมบริโภคอาหาร
6	ความรู้เกี่ยวกับโรคอ้วนและเบาหวานชนิดที่ 2	1. ความรู้เกี่ยวกับโรคอ้วนและเบาหวานชนิดที่ 2	แนวคิดเกี่ยวกับโรคอ้วนและเบาหวานชนิดที่ 2	- การบรรยายความรู้ - การตั้งคำถาม - การเล่นเกม - การอภิปรายกลุ่มย่อย
		2. การรับรู้ความสามารถของตนเองด้านการบริโภคอาหาร	2.1 การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการบริโภคอาหาร	- การให้ข้อมูลย้อนกลับ
			2.2 การใช้คำพูดชักจูง	- การชี้แนะ - การกล่าวชื่นชมในความสำเร็จ
		3. การควบคุมตนเองด้านการบริโภคอาหาร 4. พฤติกรรมการบริโภคอาหาร	การควบคุมผลกรรม	- การดำเนินการควบคุมตนเองด้านการบริโภคอาหาร 4 ขั้นตอน ตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมบริโภคอาหาร

2. โปรแกรม Exercise-SSII

โปรแกรมนี้มีวัตถุประสงค์เพื่อพัฒนาตัวแปรทางจิตและพฤติกรรมเพื่อให้นักเรียนมีพฤติกรรมการเคลื่อนไหวออกกำลังเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 เพิ่มมากขึ้น ซึ่งพฤติกรรมดังกล่าวถือเป็นการกระทำของนักเรียนเองที่จะต้องปฏิบัติตัวในด้านการเคลื่อนไหวออกกำลัง [ได้แก่ 1) การออกกำลังกายในระดับปานกลางถึงหนักทุกวัน อย่างน้อยวันละ 30 นาที 2) การทำกิจกรรมนอกเหนือจากการออกกำลังกาย ที่ทำให้ร่างกายรู้สึกเหนื่อย มีเหงื่อ หรือ หัวใจเต้นเร็วขึ้น ในยามว่าง เช่น ช่วยพ่อแม่ทำงานบ้าน วิ่งเล่น เดินระยะทางใกล้แทนการใช้รถ เป็นต้น 3) การหลีกเลี่ยงการอยู่กับที่เป็นเวลานานๆ เช่น การดูโทรทัศน์ นั่งฟังเพลง เล่นเกมคอมพิวเตอร์] โดยที่วิทยากรเป็นผู้ให้ความรู้และฝึกทักษะให้ แต่ไม่สามารถควบคุมดูแลได้ตลอดเวลา นักเรียนต้องเป็นผู้กระทำพฤติกรรมเหล่านั้นด้วยตนเองในชีวิตประจำวันและในสภาพแวดล้อมต่างๆ ให้ได้ จึงจะทำให้เกิดผลสำเร็จของการลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 คือ การมีดัชนีมวลกาย ความหนาของชั้นไขมัน และรอบเอวลดลง

ด้วยเหตุผลและความเหมาะสมดังกล่าว ในงานวิจัยนี้จึงได้เลือกใช้เทคนิคการปรับพฤติกรรมที่เป็นเทคนิคการควบคุมจากภายในตัวบุคคล โดยใช้ทั้งแนวคิดการลดอิทธิพลจากภายนอกลง ควบคู่ไปกับแนวคิดการเปลี่ยนกระบวนการทางปัญญา (ประทีป จินงี่. 2540: 161) สำหรับการลดอิทธิพลจากภายนอกลง ได้นำเทคนิคการควบคุมตนเอง (Self-control) และการแปลงเจตนาสู่การกระทำ (Implementation intention) มาสร้างเป็นโปรแกรม ส่วนการเปลี่ยนกระบวนการทางปัญญาได้นำทฤษฎีการเรียนรู้ทางปัญญาสังคม ได้แก่ การรับรู้ความสามารถของตนเอง (Self-efficacy) มาสร้างเป็นโปรแกรม

รายละเอียดของแนวคิด/เทคนิคที่นำมาสร้างเป็นโปรแกรม Exercise-SSII ขอนำเสนอเฉพาะแนวคิดที่เกี่ยวข้องโดยตรงกับการพัฒนาตัวแปรตามของโปรแกรมซึ่งมี 3 ตัวแปร คือ การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง และพฤติกรรมการเคลื่อนไหวออกกำลัง เนื่องจากแนวคิดที่ไม่เกี่ยวข้องโดยตรงกับการพัฒนาตัวแปรตาม ในโปรแกรมนี้ใช้แนวคิด/เทคนิคเช่นเดียวกับโปรแกรม Eat-SSII ซึ่งได้กล่าวถึงโดยละเอียดแล้ว

แนวคิดที่เกี่ยวข้องโดยตรงกับการพัฒนาตัวแปรตามของโปรแกรม

1) แนวคิดการสร้างการรับรู้ความสามารถของตนเอง (Bandura. 1977, 1997; Allen. 2004) เพื่อให้นักเรียนมีการรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลังเพื่อลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 โดยมีแนวคิดย่อย ประกอบด้วย

1.1 การสร้างประสบการณ์ที่ประสบความสำเร็จ เพื่อให้นักเรียนได้รับประสบการณ์โดยตรงจากการฝึกทักษะที่เกี่ยวข้องกับการออกกำลังกายและการทำกิจกรรมเพื่อเพิ่ม

การเผาผลาญพลังงานในร่างกาย และมีความเชื่อว่าเขาสามารถที่จะทำได้ โดยมีกิจกรรมประกอบด้วย การบรรยาย การตั้งคำถาม การเล่นเกม การฝึกซ้อมและลงมือปฏิบัติจริงทั้งรายบุคคลและรายกลุ่ม การให้ทำแบบฝึกหัด การอภิปรายกลุ่มย่อย การฝึกคิดเป็นรายบุคคลและรายกลุ่ม และการนำประสบการณ์เดิมของนักเรียนมาเป็นข้อมูลย้อนกลับ

1.2 การใช้ตัวแบบ โดยมีกิจกรรมประกอบด้วย การให้นักเรียนเห็นตัวแบบที่ประสบความสำเร็จจากการแสดงพฤติกรรม เช่น นักเรียนที่ประสบความสำเร็จจากการลดน้ำหนักแต่ละสัปดาห์เนื่องจากการเพิ่มการใช้พลังงานโดยการออกกำลังกายและการทำกิจกรรมทางกายอื่นๆ หรือ นักเรียนที่สามารถแสดงพฤติกรรมได้ตามที่มอบหมาย ซึ่งจะทำให้นักเรียนรู้สึกว่าเขาก็สามารถที่จะประสบความสำเร็จได้ถ้าเขาพยายามจริงและไม่ย่อท้อ การสาธิตการออกกำลังกายที่เหมาะสมกับวัยเด็ก ซึ่งจะช่วยให้นักเรียนเกิดการเรียนรู้พฤติกรรมหรือทักษะใหม่ๆ ที่เป็นผลจากการแสดงของตัวแบบ (ผู้สาธิต) การให้นักเรียนได้เห็นตัวแบบ (เพื่อนในกลุ่ม) แสดงพฤติกรรมทางบวกแล้วได้รับการเสริมแรง ซึ่งจะช่วยกระตุ้นนักเรียนให้แสดงพฤติกรรมทางบวกหรือระงับพฤติกรรมทางลบ รวมทั้งการให้ผู้ปกครองเป็นตัวแบบในการเคลื่อนไหวออกกำลัง

1.3 การใช้คำพูดชักจูง เป็นการส่งเสริมทั้งทางตรงและทางอ้อมเพื่อทำให้นักเรียนรู้สึกว่าเขาสามารถที่จะประสบความสำเร็จได้ โดยกิจกรรมประกอบด้วย การนำสมาชิกในครอบครัวเข้ามามีส่วนร่วมในโปรแกรม การชี้แนะ การกล่าวชื่นชมในความสำเร็จ การพูดโน้มน้าวให้ทำ และการโทรศัพท์เตือน/พูดคุยระหว่างสัปดาห์

<u>แนวคิดที่ 1</u> ถูกนำมาใช้ในการปรับเปลี่ยนตัวแปรตามด้านการรู้คิด คือ การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง

2) เทคนิคการควบคุมตนเอง (Kazdin. 2001) เพื่อพัฒนาการควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง โดยใช้เทคนิคการควบคุมเงื่อนไขนำ และการควบคุมผลกรรม ดังนี้

2.1 การควบคุมเงื่อนไขนำ ได้แก่ การควบคุมสิ่งเร้า โดยมีกิจกรรมคือ การทำให้สิ่งเร้าที่เป็นตัวแนะพฤติกรรมการเคลื่อนไหวออกกำลังเด่นชัดขึ้น เช่น การจัดสถานที่และอุปกรณ์สำหรับการออกกำลังกายไว้ในบ้าน เป็นต้น

2.2 การควบคุมผลกรรม ซึ่งประกอบด้วยกิจกรรม 4 ขั้นตอน คือ การกำหนดพฤติกรรมเป้าหมาย การสังเกตและบันทึกพฤติกรรมด้วยตนเอง การประเมินผล และการให้แรงเสริมตนเอง รวมทั้งการให้การเสริมแรงจากภายนอก

<u>แนวคิดที่ 2</u> ถูกนำมาใช้ในการปรับเปลี่ยนตัวแปรตามด้านการรู้คิด คือ การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง และตัวแปรตามด้านพฤติกรรม คือ พฤติกรรมการเคลื่อนไหวออกกำลัง

3) แนวคิดการแปลงเจตนาสู่การกระทำ (Gollwitzer. 1993) เพื่อให้นักเรียนเพิ่มการกระทำพฤติกรรมการเคลื่อนไหวออกกำลัง โดยมีกิจกรรมคือ ให้นักเรียนวางแผนที่จะกระทำพฤติกรรมการเคลื่อนไหวออกกำลังให้ชัดเจนในแง่ของ ประเภทของการออกกำลังกาย/กิจกรรม วัน เวลา และสถานที่ ทั้งนี้เพื่อเป็นการเพิ่มความสัมพันธ์ระหว่างสิ่งเร้ากับการตอบสนอง และความสัมพันธ์ระหว่างเจตนาในการกระทำพฤติกรรมและพฤติกรรม ทำให้พฤติกรรมเกิดขึ้นอย่างเป็นอัตโนมัติ ซึ่งเป็นกลไกหลักตามแนวคิดนี้

แนวคิดที่ 3 ถูกนำมาใช้ในการปรับเปลี่ยนตัวแปรตามด้านพฤติกรรม คือ พฤติกรรมการเคลื่อนไหวออกกำลัง

4) แนวคิดเกี่ยวกับการสร้างความตระหนัก ความตระหนักเป็นปัจจัยที่สำคัญในการพัฒนาการควบคุมตนเอง (สมโภชน์ เอี่ยมสุภาษิต. 2549) การสร้างความตระหนักมีกิจกรรมประกอบด้วย การให้ข้อมูลย้อนกลับ การให้ชั่งและบันทึกน้ำหนักของตนเองทุกสัปดาห์ และการให้บันทึกพฤติกรรมการเคลื่อนไหวออกกำลังประจำวัน

แนวคิดที่ 4 เป็นส่วนที่สอดแทรกอยู่ในขั้นตอนการดำเนินกิจกรรมของโปรแกรมทั้ง 6 ครั้ง

จากแนวคิด/เทคนิคที่ใช้ในการปรับเปลี่ยนตัวแปรทางจิตและพฤติกรรมซึ่งเป็นตัวแปรตามของโปรแกรม Exercise-SSII ดังกล่าวข้างต้น สามารถสรุปความสัมพันธ์ระหว่าง กิจกรรม ตัวแปรตามที่ต้องการปรับเปลี่ยน แนวคิด/เทคนิคที่ใช้ และวิธีดำเนินกิจกรรม ดังแสดงในภาคผนวกตาราง 4

ภาคผนวกตาราง 4 ความสัมพันธ์ระหว่างกิจกรรม ตัวแปรตามที่ต้องการปรับเปลี่ยน แนวคิด/เทคนิคที่ใช้ และวิธีดำเนินกิจกรรมของโปรแกรม Exercise-SSII

ครั้งที่	เนื้อหา/กิจกรรม	ตัวแปรตามที่ต้องการปรับเปลี่ยน	แนวคิด/เทคนิคที่ใช้	วิธีดำเนินกิจกรรม
1	การใช้พลังงานในชีวิตประจำวัน: สัดส่วนของการเคลื่อนไหวออกกำลังที่ควรปฏิบัติในชีวิตประจำวัน และพลังงานที่ถูกเผาผลาญจากการออกกำลังกายหรือทำกิจกรรมต่างๆ	1. การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง	1.1 การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเคลื่อนไหวออกกำลัง	- การตั้งคำถาม - การเล่นเกม - การมอบหมายการบ้าน - การอภิปรายกลุ่มย่อย - การฝึกคิดเป็นรายบุคคลและรายกลุ่ม - การให้ข้อมูลย้อนกลับ
			1.2 การใช้คำพูดชักจูง	- การกล่าวชื่นชมความสำเร็จ - การชี้แนะ
2	การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง	1. การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 2. พฤติกรรมการเคลื่อนไหวออกกำลัง	การควบคุมผลกรรม	- การให้ฝึกการควบคุมตนเองตาม 4 ขั้นตอนในห้องเรียน - การมอบหมายให้ดำเนินการควบคุมตนเองด้านการเคลื่อนไหวออกกำลังตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมเคลื่อนไหวออกกำลัง
		3. การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง	การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเคลื่อนไหวออกกำลัง	- การติดตามผลการควบคุมตนเองของนักเรียนและให้ข้อมูลย้อนกลับ

ครั้งที่	เนื้อหา/กิจกรรม	ตัวแปรตามที่ต้องการปรับเปลี่ยน	แนวคิด/เทคนิคที่ใช้	วิธีดำเนินกิจกรรม
3	หลักการออกกำลังกาย และการสาธิตการออกกำลังกายที่เหมาะสมกับวัย	1. การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง	1.1 การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเคลื่อนไหวออกกำลัง	- การฝึกซ้อมและลงมือปฏิบัติจริงในการออกกำลังกาย/การฝึกทักษะ - การมอบหมายงาน - การบรรยายความรู้และการตั้งคำถาม - การให้ข้อมูลย้อนกลับ
			1.2 การใช้ตัวแบบ	- การสาธิตการออกกำลังกายโดยวิทยากร - การเห็นตัวแบบทางพฤติกรรมจากเพื่อนในกลุ่ม - การให้ผู้ปกครองเป็นตัวแบบในการแสดงพฤติกรรม
			1.3 การใช้คำพูดชักจูง	- การนำสมาชิกในครอบครัวเข้ามามีส่วนร่วม - การชี้แนะ - การพูดโน้มน้าวให้ทำ - การกล่าวชื่นชมในความสำเร็จ
		2. การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 3. พฤติกรรมการเคลื่อนไหวออกกำลัง	การควบคุมผลกรรม	- การดำเนินการควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 4 ขั้นตอน ตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนเคลื่อนไหวออกกำลัง
4	การวางแผนกิจกรรมเพื่อเพิ่มการเผาผลาญพลังงานร่วมกับครอบครัว และการเลือกกิจกรรมทางกายที่เหมาะกับลีลาชีวิต/ชีวิตประจำวันของตัวเอง	1. การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง	1.1 การสร้างประสบการณ์ที่ประสบความสำเร็จ	- การให้ข้อมูลย้อนกลับ - การมอบหมายงาน
			1.2 การใช้คำพูดชักจูง	- การนำสมาชิกในครอบครัวเข้ามามีส่วนร่วมในการวางแผน/เลือกกิจกรรม - การชี้แนะ - การพูดโน้มน้าวให้ทำ
			1.3 การใช้ตัวแบบ	- การให้ผู้ปกครองเป็นตัวแบบแสดงพฤติกรรม

ครั้งที่	เนื้อหา/กิจกรรม	ตัวแปรตามที่ต้องการปรับเปลี่ยน	แนวคิด/เทคนิคที่ใช้	วิธีดำเนินกิจกรรม
4 (ต่อ)		2. การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 3. พฤติกรรมการเคลื่อนไหวออกกำลัง	การควบคุมผลกรรม	- การดำเนินการควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 4 ขั้นตอน ตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมการเคลื่อนไหวออกกำลัง
5	เดินเพื่อหาสาระของชีวิต (Walk rally)	1. การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง	1.1 การสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเคลื่อนไหวออกกำลัง	- การมอบหมายงาน - การลงมือปฏิบัติจริง - การให้ข้อมูลย้อนกลับ
			1.2 การใช้คำพูดชักจูง	- การชี้แนะ - การกล่าวชื่นชมในความสำเร็จ
		2. การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 3. พฤติกรรมการเคลื่อนไหวออกกำลัง	การควบคุมผลกรรม	- การดำเนินการควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 4 ขั้นตอน ตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมการเคลื่อนไหวออกกำลัง
6	ทบทวนบทเรียน	1. การรับรู้ความสามารถของตนเองด้านการเคลื่อนไหวออกกำลัง	1.1 การสร้างประสบการณ์ที่ประสบความสำเร็จ	- การให้ข้อมูลย้อนกลับ
			1.2 การใช้คำพูดชักจูง	- การชี้แนะ - การกล่าวชื่นชมในความสำเร็จ
		2. การควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 3. พฤติกรรมการเคลื่อนไหวออกกำลัง	การควบคุมผลกรรม	- การดำเนินการควบคุมตนเองด้านการเคลื่อนไหวออกกำลัง 4 ขั้นตอน ตามที่ได้ฝึกมา - การเสริมแรงจากภายใน
			การแปลงเจตนาสู่การกระทำ	- การให้วางแผนกระทำพฤติกรรมการเคลื่อนไหวออกกำลัง

ขั้นตอนการดำเนินโปรแกรม

ขั้นตอนการเตรียมการก่อนการจัดกิจกรรม

ขั้นตอนการเตรียมการก่อนการจัดกิจกรรมแบ่งเป็น 2 ส่วน คือ

1. ในส่วนวิทยากร ผู้ช่วย หรือผู้ประสานงานกิจกรรม (Facilitators) ควรศึกษาแนวคิดทฤษฎีที่เกี่ยวข้องกับโรคอ้วนและโรคเบาหวานชนิดที่ 2 แนวคิดเกี่ยวกับการสร้างการรับรู้ความสามารถของตนเอง เทคนิคการควบคุมตนเอง แนวคิดการแปลงเจตนาสู่การกระทำ รวมทั้งแนวคิดที่เกี่ยวข้องกับการฝึกอบรม เทคนิค รูปแบบของการจัดกิจกรรมการเรียนรู้ โดยเฉพาะการใช้เกมและกระบวนการกลุ่ม

2. ในส่วนการเตรียมการก่อนการดำเนินกิจกรรม

2.1 กำหนดลักษะของกลุ่มเป้าหมายให้ชัดเจน คือ

- เป็นนักเรียนอายุ 9-11 ปี ที่มีดัชนีมวลกายตั้งแต่เปอร์เซ็นไทล์ที่ 85 ขึ้นไป เมื่อเทียบจากกราฟแสดงเกณฑ์อ้างอิงการเจริญเติบโตตามมาตรฐานดัชนีมวลกายตามอายุและเพศ (BMI-for-age) สำหรับเด็กอายุ 2 – 20 ปี ร่วมกับเกณฑ์ของโคลและคณะ (Cole. et al. 2000)
- มีความสมัครใจและได้รับการยินยอมจากผู้ปกครองให้เข้าร่วมกิจกรรม
- ไม่มีโรคประจำตัวที่เป็นอุปสรรคต่อการเข้าร่วมกิจกรรมตลอดโปรแกรม
- มีปัญหาทางพฤติกรรมการบริโภคอาหารและพฤติกรรมการเคลื่อนไหวออกกำลังในระดับต่ำ ไม่สม่ำเสมอ หรือไม่ถูกต้อง โดยมีการคัดกรองนักเรียนเกี่ยวกับพฤติกรรมการบริโภคอาหารและพฤติกรรมการเคลื่อนไหวออกกำลังย้อนหลัง 1 สัปดาห์ โดยใช้แบบสอบถามที่ให้นักเรียนตอบด้วยตนเอง รวมทั้งเก็บข้อมูลภูมิหลังของนักเรียน ซึ่งประกอบด้วย อาชีพ รายได้ ระดับการศึกษา พฤติกรรมการบริโภคอาหาร และพฤติกรรมการเคลื่อนไหวออกกำลังของบิดามารดาหรือผู้ปกครอง จากนั้นพิจารณานักเรียนที่มีระดับพฤติกรรมการบริโภคอาหารและการเคลื่อนไหวออกกำลังอยู่ในระดับต่ำ ไม่สม่ำเสมอ หรือไม่ถูกต้อง แล้วรับสมัครนักเรียนที่มีคุณลักษณะตามเกณฑ์ที่กำหนดไว้ และยินยอมสมัครใจเข้าร่วมกิจกรรม

2.2 ติดต่อประสานงานกับครูหรือผู้ประสานงานของโรงเรียน เพื่อชี้แจงวัตถุประสงค์ ความสำคัญ ประโยชน์ และรายละเอียดขั้นตอนในการทำกิจกรรมตลอดโปรแกรม

2.3 จัดเตรียมสถานที่และอุปกรณ์ต่างๆ

2.4 เชิญผู้ปกครองและนักเรียนเข้าร่วมประชุมเพื่อชี้แจงวัตถุประสงค์ ความสำคัญ ประโยชน์ และรายละเอียดขั้นตอนในการทำกิจกรรมตลอดโปรแกรม

2.5 ให้นักเรียนฝึกบันทึกพฤติกรรมการบริโภคอาหารและการเคลื่อนไหวออกกำลังประจำวัน เพื่อเตรียมความพร้อมสำหรับการเก็บข้อมูลพฤติกรรมในช่วงดำเนินกิจกรรม

ขั้นตอนการเก็บข้อมูลก่อนเข้าร่วมโปรแกรม

เป็นการเก็บข้อมูลของตัวแปรซึ่งเป็นวัตถุประสงค์หลักของโปรแกรม ดังนี้

1. ตัวแปรทางจิตและพฤติกรรม โดยให้กลุ่มเป้าหมายทำแบบวัดความรู้ การรับรู้ความสามารถของตนเอง การควบคุมตนเอง พฤติกรรมการบริโภคอาหาร และพฤติกรรมการเคลื่อนไหวออกกำลัง

2. ตัวแปรความเสี่ยงของโรคเบาหวานชนิดที่ 2 โดยผู้วิจัยเก็บข้อมูลดัชนีมวลกาย ความหนาของไขมัน และ ความยาวรอบเอวของกลุ่มกลุ่มเป้าหมายที่เข้าร่วมโปรแกรม

ขั้นตอนปรับเปลี่ยนพฤติกรรมตามโปรแกรม Eat-SSII และ Exercise-SSII

1. ให้กลุ่มเป้าหมายดำเนินกิจกรรมตามโปรแกรม Eat-SSII ตามด้วยโปรแกรม Exercise-SSII หรือ อาจเริ่มด้วยโปรแกรม Exercise-SSII แล้วตามด้วยโปรแกรม Eat-SSII โดยการทำกิจกรรมสัปดาห์ละ 1 ครั้งๆ ละ 100 นาที

2. ในระหว่างการดำเนินกิจกรรมตามโปรแกรมในแต่ละครั้ง ผู้วิจัยดำเนินการเพิ่มเติมดังนี้

2.1 ให้กลุ่มเป้าหมายชั่งน้ำหนักและพลอตกราฟน้ำหนักของตนเองลงบนกราฟน้ำหนักส่วนบุคคลซึ่งผู้วิจัยได้เตรียมไว้ให้ 1 คน ต่อ 1 แผ่น

2.2 ในระหว่างโปรแกรม Eat-SSII ให้กลุ่มเป้าหมายบันทึกการบริโภคอาหารประจำวัน และในระหว่างโปรแกรม Exercise-SSII ให้กลุ่มเป้าหมายบันทึกการเคลื่อนไหวออกกำลังประจำวัน แล้วนำส่งอาจารย์ผู้ประสานงานในวันรุ่งขึ้น โดยทุกครั้งที่นักเรียนนำมาส่งจะได้แต้มสะสม 1 แต้ม ซึ่งเมื่อสะสมครบ 7 แต้ม นักเรียนจะได้รับรางวัล

ขั้นตอนการประเมินผลโปรแกรม

มีการประเมินผล ดังนี้

1. การประเมินผลกิจกรรมในโปรแกรมแต่ละครั้งตามวัตถุประสงค์ของกิจกรรม ซึ่งมิใช่การประเมินผลตามตัวแปรตาม เช่น การสังเกตความร่วมมือ การมีส่วนร่วม ความสำเร็จของงานที่ได้มอบหมาย ความสนใจของนักเรียน การตอบคำถามของนักเรียน เป็นต้น

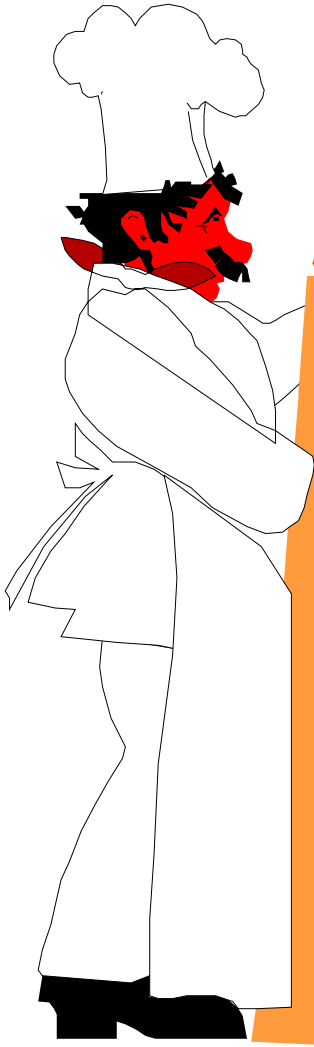
2. การประเมินผลตามวัตถุประสงค์หลักของแต่ละโปรแกรม ดังนี้

2.1 ตัวแปรทางจิตและพฤติกรรม โดยให้กลุ่มเป้าหมายทำแบบวัดความรู้ การรับรู้ความสามารถของตนเอง การควบคุมตนเอง พฤติกรรมการบริโภคอาหาร และพฤติกรรมการเคลื่อนไหวออกกำลัง

2.2 ตัวแปรความเสี่ยงของโรคเบาหวานชนิดที่ 2 โดยผู้วิจัยเก็บข้อมูลดัชนีมวลกาย ความหนาของไขมัน และ ความยาวรอบเอวของกลุ่มกลุ่มเป้าหมายที่เข้าร่วมโปรแกรม

3. การประเมินความพึงพอใจโดยรวมของโปรแกรม โดยให้กลุ่มเป้าหมายตอบแบบสอบถามความพึงพอใจในการเข้าร่วมโปรแกรมรวมทั้งให้ข้อเสนอแนะเพิ่มเติม

รายละเอียดของโปรแกรม Eat-SSII และโปรแกรม Exercise-SSII ขอนำเสนอโดยละเอียดในลักษณะแผนการเรียนการสอน ซึ่งประกอบด้วย กิจกรรม วัตถุประสงค์ของกิจกรรม ขั้นตอนการดำเนินกิจกรรม อุปกรณ์/สื่อการสอน เวลาที่ใช้ และการประเมินผลกิจกรรม ดังต่อไปนี้



โปรแกรมปรับเปลี่ยนพฤติกรรมที่ประยุกต์ใช้แนวคิด

การควบคุมตนเอง การรับรู้ความสามารถของตนเอง

และการแปลงเจตนาสู่การกระทำ

เพื่อปรับเปลี่ยนตัวแปรทางจิต และพฤติกรรมการบริโภคอาหาร

(โปรแกรม Eat-SSII)

ครั้งที่ 1

ความรู้ด้านโภชนาการ ธงโภชนาการ พลังงานจากอาหาร (แคลอรี) อาหารทดแทนที่ให้พลังงานต่ำ และการอ่านฉลากโภชนาการ

กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
1) กิจกรรมสร้างสัมพันธ์ รู้จักฉัน รู้จักเธอ..รู้จักเรา	1) เพื่อให้เกิดความคุ้นเคยระหว่างสมาชิกและวิทยากร 2) เพื่อสร้างบรรยากาศที่เป็นกันเองของกลุ่ม	1) วิทยากรแนะนำตนเองและทีมงาน 2) ให้สมาชิกแนะนำชื่อเล่นของตนเองโดยให้จับมือกันเป็นวงกลม จากนั้นวิทยากรกำหนดให้ใครคนหนึ่งเป็นผู้เริ่มต้นการแนะนำตัว โดยให้สมาชิกทุกคนปรบมือตามสูตร 12312312121 พร้อมกันจากนั้น ให้ผู้เริ่มต้นปรบมือ 2 ครั้ง แล้วตามด้วยชื่อเล่นของตนเอง เช่น 12312312121 ปับ..ปับ..วิน 3) สมาชิกทุกคนในกลุ่มปรบมือตามสูตรข้างต้นแล้วให้สมาชิกทางซ้ายมือ (หรือขวามือก็ได้) ปรบมือ 2 ครั้ง แล้วตามด้วยชื่อเล่นของตนเอง 4) ทำเช่นนี้จนครบชื่อสมาชิกทุกคน 5) วิทยากรให้สมาชิกช่วยกันสรุปว่าได้อะไรจากกิจกรรมนี้ (*ตัวอย่างแง่คิดที่วิทยากรเสนอจากที่นักเรียนสรุป เช่น* จากกิจกรรมนี้สมาชิกจะได้รู้จักเพื่อนๆ สมาชิกรวมทั้งวิทยากรเป็นการสร้างความคุ้นเคย และบรรยากาศที่เป็นกันเอง และเตรียมความพร้อมก่อนเข้าสู่กิจกรรมต่อไป)	15 นาที	-	-	1) 100% ของสมาชิกเข้าร่วมกิจกรรม 2) จากการสุ่มตัวอย่างสมาชิกในการจำชื่อคน : สมาชิกที่ถูกสุ่ม สามารถจำชื่อสมาชิกอื่นได้อย่างถูกต้องอย่างน้อย 3 ชื่อ 3) จากการสังเกต 100% ของสมาชิกมีความสนุกสนานเป็นกันเองและมีความสัมพันธ์ที่ดีต่อกัน

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2) ฐานความรู้ด้านโภชนาการ	1) เพื่อให้นักเรียนทราบวัตถุประสงค์ของกิจกรรม	1) วิทยากรกล่าวนำเข้าสู่วัตถุประสงค์ของกิจกรรมว่า ในครั้งนี้จะเป็นการเรียนรู้ด้านโภชนาการเพื่อให้นักเรียนสามารถเลือกรับประทานอาหารที่ช่วยลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 ได้อย่างถูกต้อง ซึ่งกิจกรรมจะถูกแบ่งออกเป็น 4 ฐาน คือ - ฐานอาหาร 5 หมู่ - ฐานการคำนวณพลังงานจากอาหาร - ฐานธงโภชนาการและอาหารทดแทน - ฐานฉลากโภชนาการ ซึ่งแต่ละฐานจะมีวิทยากรประจำอยู่ หลังจากนั้นให้นักเรียนทั้งหมด แบ่งออกเป็น 4 กลุ่ม แต่ละกลุ่มให้ตั้งชื่อกลุ่ม 2) วิทยากรชี้แจงต่อไปว่าแต่ละฐานมีเวลาทำกิจกรรม 15 นาที พอหมดเวลาจะมีการเปิดเพลง ให้นักเรียนแต่ละกลุ่มเดินต่อแถวและจับเอวกันเพื่อไปทำกิจกรรมในฐานต่อไป	5 นาที	-	-	1) วิทยากรได้ชี้แจงวัตถุประสงค์ของกิจกรรมให้นักเรียนได้รับทราบ
2.1 ฐานอาหารหลัก 5 หมู่	1) เพื่อให้นักเรียนเข้าใจ/ทบทวนเรื่องสารอาหารหลัก 5 หมู่	1) วิทยากรประจำฐานถามว่า กลุ่มนี้มีชื่อกลุ่มว่าอะไร ให้พูดเสียงดังๆ พร้อมกัน 3 ครั้ง	15 นาที	1) โปสเตอร์อาหารหลัก 5 หมู่ 2) ใบงานอาหารหลัก 5 หมู่	เพื่อสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเลือกบริโภคอาหาร	1) นักเรียนสามารถทำกิจกรรมตามใบงานอาหาร 5 หมู่ ได้อย่างถูกต้อง 2) ทุกคนในกลุ่มมีส่วนร่วมในการทำกิจกรรมกลุ่มทุกขั้นตอน

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2.1 ฐานอาหารหลัก 5 หมู่ (ต่อ)	2) เพื่อให้นักเรียนสามารถวิเคราะห์ได้ว่าเมนูอาหารที่ตนรับประทานมีสารอาหารครบ 5 หมู่หรือไม่	2) ให้นักเรียนทบทวนความรู้เกี่ยวกับสารอาหารหลัก 5 หมู่ โดยให้ทุกคนช่วยกันระดมความคิด แล้วเติมข้อมูลลงในช่องว่างตามใบงานอาหารหลัก 5 หมู่ เมื่อเสร็จแล้วให้ช่วยกันนำเสนอและอธิบาย 3) วิทยากรให้ข้อมูลย้อนกลับเกี่ยวกับผลงานที่กลุ่มได้รับมอบหมายตามใบงาน และสรุปความรู้เกี่ยวกับอาหาร 5 หมู่สั้นๆ อีกครั้ง				
2.2 ฐานการคำนวณพลังงานจากอาหาร	1) เพื่อให้นักเรียนมีทักษะในการคำนวณพลังงานจากอาหารที่รับประทานในแต่ละวัน	1) วิทยากรประจำฐานถามว่า กลุ่มนี้มีชื่อกลุ่มว่าอะไร ให้พูดเสียงดังๆ พร้อมกัน 3 ครั้ง 2) วิทยากรแจกตารางแสดงพลังงานของอาหารแต่ละชนิด ผลไม้ เครื่องดื่ม อาหารว่างและขนม ให้แก่นักเรียนทุกคนในกลุ่ม แล้วอธิบายถึงความหมายของคำว่า “แคลอรี” หรือ “กิโลแคลอรี” 3) วิทยากรให้ข้อมูลเบื้องต้นแก่นักเรียนว่า เด็กวัยเรียนควรได้รับพลังงานจากอาหารวันละ 1,600 กิโลแคลอรี่ แต่ถ้าเด็กวัยเรียนที่มีน้ำหนักเกินหรือต้องการลดน้ำหนัก การได้รับพลังงานจากอาหาร 1,200 กิโลแคลอรี่ ก็ถือว่าเพียงพอแล้ว จากนั้น ฝึกให้นักเรียนคำนวณพลังงานจากอาหารที่รับประทานในแต่ละวันตามใบงาน เพื่อจะได้เป็นการควบคุมพลังงานที่ได้รับจากอาหารในแต่ละวันไม่ให้มากเกินความต้องการของร่างกาย	15 นาที	1) ใบงานการคำนวณพลังงานจากอาหาร 2) ตารางแสดงพลังงานของอาหารจานเดียว ผลไม้ เครื่องดื่ม และอาหารว่าง	1) เพื่อสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเลือกบริโภคอาหาร 2) เพื่อให้กำลังใจและชักจูงให้นักเรียนบันทึกพลังงานที่ได้รับจากการบริโภคอาหารในแต่ละวัน	1) ทุกคนในกลุ่มมีส่วนร่วมในการทำกิจกรรมกลุ่มทุกขั้นตอน 2) นักเรียนทุกคนสามารถคำนวณพลังงานจากอาหารที่รับประทานในแต่ละวัน ตามใบงานการคำนวณพลังงานจากอาหารได้อย่างถูกต้อง 3) วิทยากรกลุ่มได้พูดให้กำลังใจและชักจูงให้นักเรียนบันทึกพลังงานที่ได้รับจากการบริโภคอาหารในแต่ละวัน

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		4) วิทยากรให้ข้อมูลย้อนกลับเกี่ยวกับการคำนวณพลังงานจากอาหารตามใบงาน และขอให้นักเรียนควบคุมพลังงานจากอาหารที่รับประทานในแต่ละวันไม่ให้เกิน 1,200 กิโลแคลอรี โดยการบันทึกชนิดอาหารและพลังงานที่ได้รับจากอาหารลงในแบบบันทึกตามที่ได้ฝึกไป และให้กำลังใจว่าทุกคนสามารถทำได้เช่นเดียวกับที่นักเรียนสามารถทำได้ดีในวันนี้				
2.3 ฐานธงโภชนาการและอาหารทดแทน	1) เพื่อให้นักเรียนเข้าใจสัดส่วนและปริมาณของอาหารที่ควรบริโภคใน 1 วัน จากธงโภชนาการ 2) เพื่อให้นักเรียนเข้าใจเรื่องอาหารทดแทน 3) เพื่อให้นักเรียนพัฒนาทักษะการเลือกรับประทานอาหารทดแทน	1) วิทยากรประจำฐานถามว่า กลุ่มนี้มีชื่อกลุ่มว่าอะไร ให้พูดเสียงดังๆ พร้อมกัน 3 ครั้ง 2) วิทยากรแจกภาพต่อจิ๊กซอว์ธงโภชนาการให้กลุ่มช่วยกันต่อ เมื่อต่อเสร็จแล้วให้ช่วยกันแสดงความคิดเห็นจากภาพต่อที่ได้ว่ามีความหมายอย่างไร 3) วิทยากรให้ข้อมูลย้อนกลับเกี่ยวกับความหมายของภาพต่อจิ๊กซอว์ที่นักเรียนในกลุ่มช่วยกันแสดงความคิดเห็น และสรุปข้อมูลสำคัญซึ่งนำเสนอในธงโภชนาการอีกครั้งโดยใช้โปสเตอร์ประกอบ (*ตัวอย่างการสรุป* เช่น ธงโภชนาการมีรูปร่างเป็นสามเหลี่ยมหัวกลับ บ่งบอกถึงกลุ่มอาหารที่ควรบริโภคใน 1 วัน จากมากลงไปหาน้อย โดยด้านบนของธงเป็นกลุ่มอาหารที่เน้นให้กินมากที่สุด...(ต่อ)	15 นาที	1) ภาพต่อจิ๊กซอว์ธงโภชนาการ 2) ธงโภชนาการขนาดโปสเตอร์ 3) ภาพสี/โมเดลอาหารทดแทนหลากหลายชนิด	เพื่อสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเลือกบริโภคอาหาร	1) นักเรียนในกลุ่มสามารถต่อจิ๊กซอว์ธงโภชนาการได้อย่างถูกต้อง 2) ทุกคนในกลุ่มมีส่วนร่วมในการแสดงความคิดเห็นเกี่ยวกับความหมายของภาพต่อธงโภชนาการ 3) ทุกคนในกลุ่มมีส่วนร่วมในการทำกิจกรรมการจัดกลุ่มอาหารทดแทน 4) นักเรียนทุกกลุ่มสามารถจัดกลุ่มภาพสี/โมเดลอาหารทดแทนได้อย่างถูกต้อง

กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
		และลดหลั่นลงมาเรื่อยๆ จนถึงปลายธงข้างล่างเป็นกลุ่มอาหารที่เน้นให้กินน้อยที่สุด ร่างกายของคนเราต้องการอาหารในแต่ละกลุ่มไม่เท่ากัน ธงโภชนาการจะเป็นแนวทางที่ช่วยบอกให้ทราบว่าเราควรกินอาหารแต่ละกลุ่มเป็นสัดส่วนเท่าไหร่ในแต่ละวัน) 4) วิทยากรนำภาพสี/โมเดลอาหารทดแทนในแต่ละกลุ่มตามที่แสดงในธงโภชนาการให้นักเรียนในกลุ่มดู แล้วให้ช่วยกันระดมสมองจัดกลุ่มภาพสี/โมเดลอาหารทดแทน เช่น ข้าว ก๋วยเตี๋ยว บะหมี่ ขนมจีน ก็ให้จัดอยู่ในกลุ่มเดียวกันเป็นต้น 5) วิทยากรให้ข้อมูลย้อนกลับเกี่ยวกับกลุ่มอาหารทดแทนที่นักเรียนในกลุ่มช่วยกันจัด และสรุปความรู้เกี่ยวกับธงโภชนาการและอาหารทดแทนสั้นๆ อีกครั้ง				
2.4 ฐานฉลากโภชนาการ	1) เพื่อให้สมาชิกเข้าใจข้อมูลโภชนาการที่แสดงตามถุงขนม กล่องเครื่องดื่มชนิดต่างๆ	1) วิทยากรประจำฐานถามว่า กลุ่มนี้มีชื่อกลุ่มว่าอะไร ให้พูดเสียงดังๆ พร้อมกัน 3 ครั้ง 2) วิทยากรแจกตัวอย่างอาหาร ขนม เครื่องดื่มหลากหลายชนิดให้กับนักเรียนในกลุ่ม ...(ต่อ)	15 นาที	ตัวอย่างอาหารขนมและเครื่องดื่ม	เพื่อสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเลือกบริโภคอาหาร	1) นักเรียนในกลุ่มเลือกอาหารและของว่างที่มีพลังงานต่ำ มีประโยชน์ต่อร่างกาย มีน้ำตาลและเกลือในปริมาณน้อย 2) ทุกคนในกลุ่มมีส่วนร่วมในการระดมความคิดและเลือกอาหาร

กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
	2) เพื่อให้สมาชิกสามารถเลือกรับประทานอาหาร ขนม หรือของว่างที่ให้พลังงานต่ำ จากการอ่านข้อมูลโภชนาการ	3) วิทยากรถามนักเรียนในกลุ่มว่าจะเลือกทานอาหาร ขนม และเครื่องดื่มประเภทใดบ้าง เพราะเหตุใดจึงเลือกอาหาร ขนมและเครื่องดื่มดังกล่าว 4) ให้สมาชิกในกลุ่มระดมความคิด อภิปราย แล้วนำเสนออาหาร ขนมและเครื่องดื่ม ที่กลุ่มสรุปเลือกให้วิทยากรประจำฐานฟัง 5) หลังจากเสร็จสิ้นการนำเสนอ วิทยากรให้ข้อมูลย้อนกลับในประเด็นวิธีการเลือกรับประทานอาหาร ได้แก่ - พลังงานจากอาหาร ขนมและเครื่องดื่ม เป็นเท่าไหร่ - จะดูได้ตรงไหนว่าอาหารหรือขนมนั้น มีพลังงานเท่าไหร่ - อาหารแต่ละชนิดมีสารอาหารหลักคืออะไร จำเป็นต่อร่างกายหรือไม่ - ในอาหาร ขนมและเครื่องดื่ม แต่ละชนิดมีน้ำตาล เกลือและน้ำมัน อยู่หรือไม่ มากน้อยอย่างไร 6) ให้สมาชิกช่วยกันสรุปหลักในการเลือกทานอาหาร ขนมและเครื่องดื่มที่ถูกหลักโภชนาการและช่วยลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 วิธีการอ่านฉลากโภชนาการ...(ต่อ)				3) นักเรียนในกลุ่มมีส่วนร่วมในการสรุปหลักในการเลือกอาหาร และ ของว่าง รวมทั้งวิธีการอ่านฉลากโภชนาการ

กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
		และข้อมูลที่ควรดูในฉลาก โดยวิทยากรช่วยเสริมในประเด็นที่ขาด				
3. สรุปกิจกรรม	1) เพื่อให้นักเรียนได้แนวคิดรวมยอดเกี่ยวกับสิ่งที่ได้เรียนรู้จากการทำกิจกรรมในครั้งนี้	1) วิทยากรกล่าวสรุปกิจกรรมว่า จากกิจกรรมประจำฐานทั้ง 4 ฐาน คือ - ฐานอาหาร 5 หมู่ - ฐานการคำนวณพลังงานจากอาหาร - ฐานธงโภชนาการและอาหารทดแทน - ฐานฉลากโภชนาการ ทำให้นักเรียนได้เรียนรู้หลักการทางโภชนาการ ซึ่งจะช่วยให้นักเรียนสามารถเลือกรับประทานอาหารที่ช่วยลดความเสี่ยงของโรคเบาหวานชนิดที่ 2 ได้อย่างถูกต้องต่อไป และขอให้นักเรียนนำสิ่งที่ได้เรียนรู้จากกิจกรรมไปใช้ในชีวิตประจำวัน	10 นาที	-	-	1) วิทยากรได้สรุปแนวคิดรวบยอดของกิจกรรมให้นักเรียนได้รับทราบ

ใบงาน
อาหารหลัก 5 หมู่ และสารอาหาร

คำชี้แจง

1. ขอให้นักเรียนเติมข้อมูลสารอาหารที่มีมากและตัวอย่างแหล่งของสารอาหาร ลงในช่องว่างตามหมวดหมู่ของอาหาร
2. นักเรียนคิดว่าอาหารหลัก 5 หมู่ในก๋วยเตี๋ยวราดหน้าหมู มีอะไรบ้าง

อาหารหลัก	สารอาหารที่มีมาก	ตัวอย่างแหล่งสารอาหาร	อาหารหลัก 5 หมู่ ในก๋วยเตี๋ยวราดหน้าหมู
หมู่ที่ 1: เนื้อสัตว์	โปรตีน	เนื้อไก่	เนื้อหมู
หมู่ที่ 2: แป้ง/น้ำตาล			
หมู่ที่ 3: ผัก			
หมู่ที่ 4: ผลไม้			
หมู่ที่ 5: ไขมัน			

3. ให้เลือกอาหารจานโปรดของกลุ่มขึ้นมา 1 ชนิด เพื่อเป็นอาหารมื้อเย็น แล้วช่วยกันวิเคราะห์ว่า มีสารอาหารครบทุกประเภทหรือไม่ ถ้าไม่ครบ จะแก้ปัญหาอย่างไรเพื่อให้ได้สารอาหารครบทั้ง 5 หมู่ในมื้อเย็นนั้น

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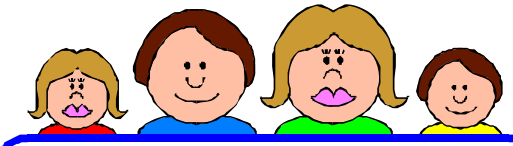


ใบงาน
การคำนวณพลังงานที่ได้รับจาก
อาหารใน 1 วัน

อาหารเช้า		อาหารว่าง		อาหารกลางวัน		อาหารว่าง		อาหารเย็น		อาหารว่าง	
ชื่ออาหาร	ปริมาณพลังงาน	ชื่ออาหาร	ปริมาณพลังงาน	ชื่ออาหาร	ปริมาณพลังงาน	ชื่ออาหาร	ปริมาณพลังงาน	ชื่ออาหาร	ปริมาณพลังงาน	ชื่ออาหาร	ปริมาณพลังงาน
โจ๊กหมู 1 ชาม		นมพร่องมันเนย 1 แก้ว		ข้าวมันไก่ 1 จาน		-	-	- ข้าวกล้อง 1 ทัพพี - แกงจืดตำลึงหมูสับ 1 ชาม		มะละกอ 1 ชิ้น	

พลังงานรวมที่ได้จากอาหารในแต่ละวัน = ...
.....

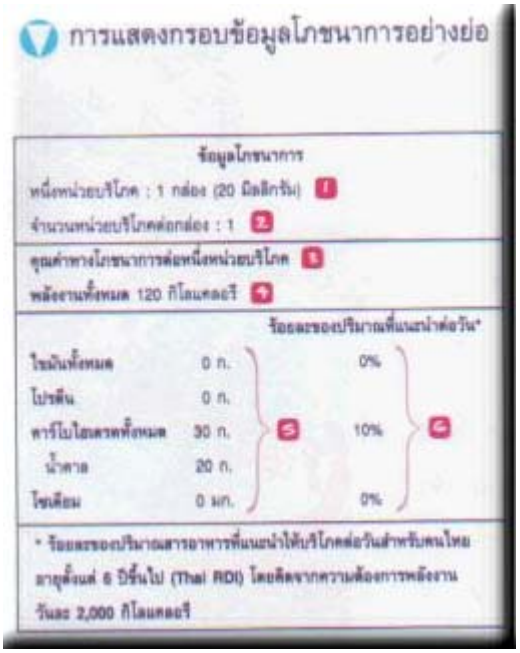
ประเด็นที่อาจเพิ่มเติม

- พลังงานรวมที่คำนวณได้อยู่ในเกณฑ์ที่แนะนำไว้ตามช่วงอายุหรือไม่
- ถ้าต้องการลดน้ำหนัก พลังงานรวมนี้เหมาะสมหรือไม่ อย่างไร


ธงโภชนาการ
ข้าว
วันละ 8-12 ทัพพี
ผัก
วันละ 4-6 ทัพพี
ผลไม้
วันละ 3-5 ส่วน
นม
วันละ 1-2 แก้ว
เนื้อสัตว์
วันละ 6-12 ช้อนกินข้าว
น้ำมัน น้ำตาล เกลือ
วันละน้อยๆ
เพื่อสุขภาพที่ดี
กินอาหารให้หลากหลาย ในสัดส่วนที่เหมาะสม

อาหารหลัก 5 หมู่

การอ่านฉลากโภชนาการ



ที่มา: http://www.csjoy.com/story/food/food.htm

การแสดงกรอบข้อมูลโภชนาการแบบย่อ

ข้อมูลโภชนาการ

หนึ่งหน่วยบริโภค : ..... (.....)

จำนวนหน่วยบริโภคต่อ ..... : .....

คุณค่าทางโภชนาการต่อหนึ่งหน่วยบริโภค

พลังงานทั้งหมด ..... กิโลแคลอรี

		ร้อยละของปริมาณที่แนะนำต่อวัน*
ไขมันทั้งหมด	..... ก.	..... %
โปรตีน	..... ก.	
คาร์โบไฮเดรตทั้งหมด	..... ก.	..... %
น้ำตาล	..... ก.	
โซเดียม	..... มก.	..... %

*ร้อยละของปริมาณสารอาหารที่แนะนำให้บริโภคต่อวันสำหรับคนไทยอายุตั้งแต่ 6 ปีขึ้นไป (Thai RDI) โดยคิดจากความต้องการพลังงานวันละ 2,000 กิโลแคลอรี

ที่มา: http://www.fda.moph.go.th/fda-net/html/new/label/label.html

ข้อมูลโภชนาการ

หนึ่งหน่วยบริโภค : 1/2 ซอง (30 กรัม)
จำนวนหน่วยบริโภคต่อซอง : 2

คุณค่าทางโภชนาการต่อหนึ่งหน่วยบริโภค
พลังงานทั้งหมด 160 กิโลแคลอรี (พลังงานจากไขมัน 80 กิโลแคลอรี)

	ร้อยละของปริมาณที่แนะนำต่อวัน*
ไขมันทั้งหมด 9 ก.	14 %
ไขมันอิ่มตัว 4 ก.	19 %
โคเลสเตอรอล 0 มก.	0 %
โปรตีน 3 ก.	
คาร์โบไฮเดรตทั้งหมด 17 ก.	6 %
ใยอาหาร น้อยกว่า 1 ก.	4 %
น้ำตาล 0 ก.	
โซเดียม 220 มก.	9 %

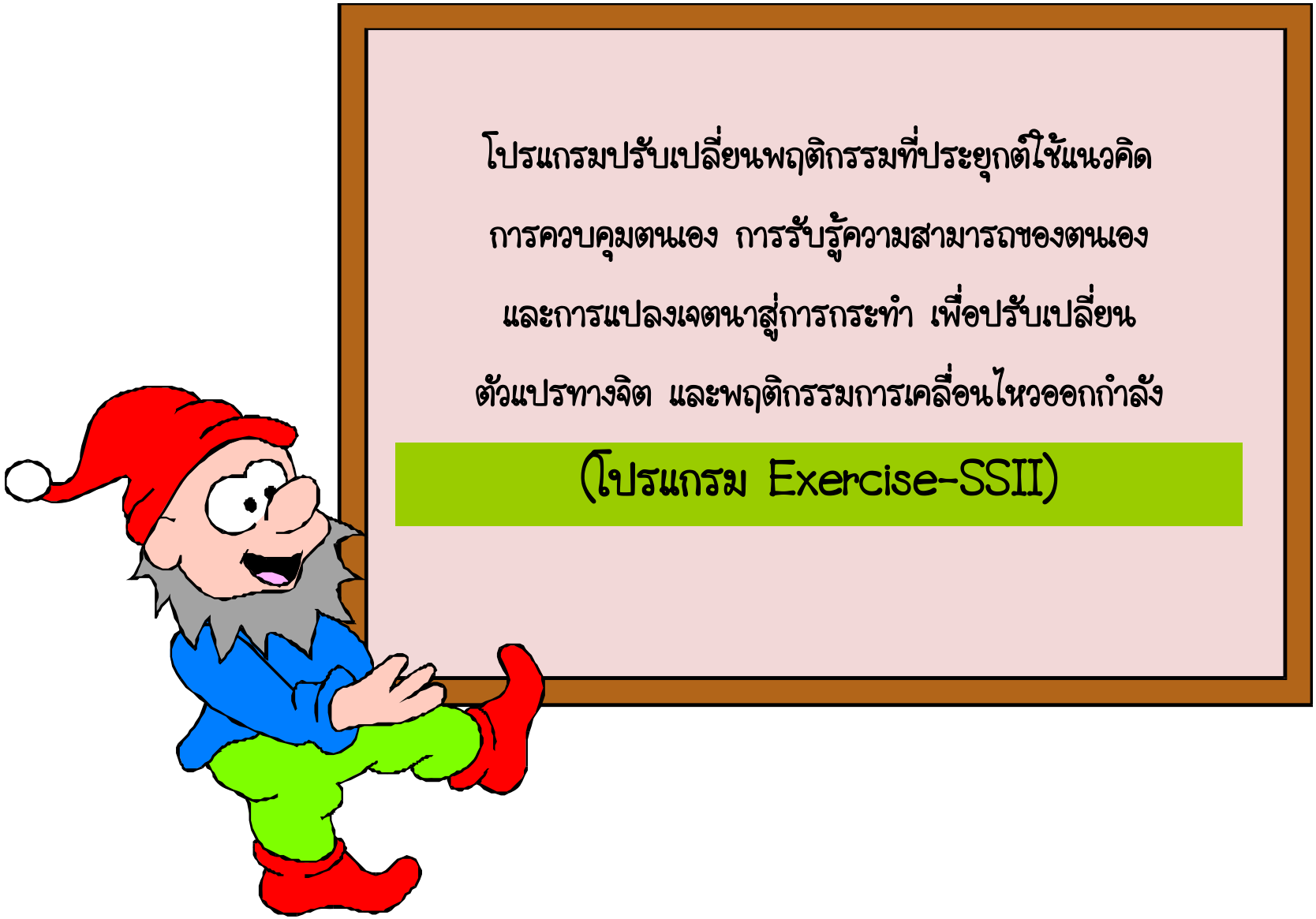
ร้อยละของปริมาณที่แนะนำต่อวัน*			
วิตามินเอ	0 %	**วิตามินบี 1**	6 %
วิตามินบี 2	2 %	**แคลเซียม** น้อยกว่า	2 %
เหล็ก	2 %		

*ร้อยละของปริมาณสารอาหารที่แนะนำให้บริโภคต่อวันสำหรับคนไทยอายุตั้งแต่ 6 ปีขึ้นไป (Thai RDI) โดยคิดจากความต้องการพลังงานวันละ 2,000 กิโลแคลอรี

ความต้องการพลังงานของแต่ละบุคคลแตกต่างกัน ผู้ที่ต้องการพลังงานวันละ 2,000 กิโลแคลอรี ควรได้รับสารอาหารต่าง ๆ ดังนี้

ไขมันทั้งหมด	น้อยกว่า	65 ก.
ไขมันอิ่มตัว	น้อยกว่า	20 ก.
โคเลสเตอรอล	น้อยกว่า	300 มก.
คาร์โบไฮเดรตทั้งหมด		300 ก.
ใยอาหาร		25 ก.
โซเดียม	น้อยกว่า	2,400 มก.

พลังงาน (กิโลแคลอรี) ต่อกรัม : ไขมัน - 9 ; โปรตีน - 4 ; คาร์โบไฮเดรต - 4

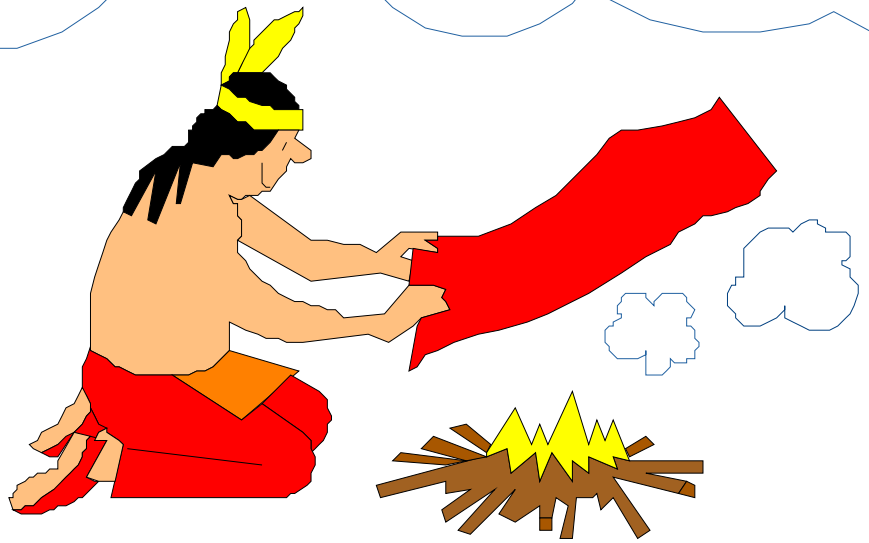

โปรแกรมปรับเปลี่ยนพฤติกรรมที่ประยุกต์ใช้แนวคิด
การควบคุมตนเอง การรับรู้ความสามารถของตนเอง
และการแปลงเจตนาสู่การกระทำ เพื่อปรับเปลี่ยน
ตัวแปรทางจิต และพฤติกรรมการเคลื่อนไหวออกกำลัง
(โปรแกรม Exercise-SSII)

ครั้งที่ 1

การใช้พลังงานในชีวิตประจำวัน :

สัดส่วนของการเคลื่อนไหวออกกำลังที่ควรปฏิบัติในชีวิตประจำวัน

และพลังงานที่ถูกเผาผลาญจากการออกกำลังกายหรือทำกิจกรรมต่างๆ



กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
1A) กิจกรรมสร้างสัมพันธ์ รู้จักฉัน รู้จักเธอ ..รู้จักเรา	1) เพื่อให้เกิดความคุ้นเคยระหว่างสมาชิกและวิทยากร 2) เพื่อสร้างบรรยากาศที่เป็นกันเองของกลุ่ม	1) วิทยากรแนะนำตนเองและทีมงาน 2) ให้สมาชิกแนะนำชื่อเล่นของตนเองโดยให้จับมือกันเป็นวงกลม จากนั้นวิทยากรกำหนดให้ใครคนหนึ่งเป็นผู้เริ่มต้นการแนะนำตัว โดยให้สมาชิกทุกคนปรบมือตามสูตร 12312312121 พร้อมกันจากนั้น ให้ผู้เริ่มต้นปรบมือ 2 ครั้ง แล้วตามด้วยชื่อเล่นของตนเอง เช่น 12312312121 ปับ..ปับ..วิน 3) สมาชิกทุกคนในกลุ่มปรบมือตามสูตรข้างต้นแล้วให้สมาชิกทางซ้ายมือ (หรือขวามือก็ได้) ปรบมือ 2 ครั้ง แล้วตามด้วยชื่อเล่นของตนเอง 4) ทำเช่นนี้จนครบชื่อสมาชิกทุกคน 5) วิทยากรให้สมาชิกช่วยกันสรุปว่าได้อะไรจากกิจกรรมนี้ (*ตัวอย่างแง่คิดที่วิทยากรเสนอจากที่นักเรียนสรุป เช่น* จากกิจกรรมนี้สมาชิกจะได้รู้จักเพื่อนๆ สมาชิกรวมทั้งวิทยากรเป็นการสร้างความคุ้นเคย และบรรยากาศที่เป็นกันเอง และเตรียมความพร้อมก่อนเข้าสู่กิจกรรมต่อไป)	15 นาที	-	-	1) 100% ของสมาชิกเข้าร่วมกิจกรรม 2) จากการสุ่มตัวอย่างสมาชิกในการจำชื่อคน : สมาชิกที่ถูกสุ่ม สามารถจำชื่อสมาชิกอื่นได้อย่างถูกต้องอย่างน้อย 3 ชื่อ 3) จากการสังเกต 100% ของสมาชิกมีความสนุกสนานเป็นกันเอง และมีความสัมพันธ์ที่ดีต่อกัน

กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
1B) งูกินหาง	1) เพื่อสร้างบรรยากาศที่เป็นกันเองของกลุ่ม 2) เพื่อให้นักเรียนได้เคลื่อนไหวออกกำลัง	*ในกรณีที่โปรแกรม Exercise-SSII ถูกนำมาใช้ต่อจากโปรแกรม Eat-SSII ให้เปลี่ยนจากเกมดังกล่าวข้างต้น เป็นเกม “งูกินหาง” ดังนี้* 1) ให้แบ่งผู้เล่นออกเป็นกลุ่มๆ ละ 5 คน แล้วเข้าแถว หัวแถวเป็นหัวงู หางแถวเป็นหางงู 2) แจกผ้าให้หางงูแต่ละกลุ่ม หัวงูมีหน้าที่พยายามเอาผ้ามาจากหางงูให้ได้ ส่วนหางงูมีหน้าที่พยายามหนีไม่ให้หัวงูเอาผ้าไปได้ ส่วนคนอื่นๆ มีหน้าที่พยายามตามเกาะอย่าให้แตกแถว กลุ่มที่สามารถเอาผ้ามาได้เป็นกลุ่มชนะ	15 นาที	1) ผ้าผืนเล็กประกอบการเล่นเกม	-	1) นักเรียนทุกคนมีความสนใจและเล่นเกมอย่างสนุกสนาน

กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
1) การใช้พลังงานในชีวิตประจำวัน	1) เพื่อให้นักเรียนเข้าใจว่ากิจกรรมในชีวิตประจำวันแต่ละอย่างใช้พลังงานมากน้อยต่างกัน และสามารถเลือกทำกิจกรรมที่ใช้พลังงานแทนการอยู่กับที่ 2) เพื่อให้นักเรียนเข้าใจประเภทและสัดส่วนของการเคลื่อนไหวออกกำลังที่ควรปฏิบัติในชีวิตประจำวัน 3) เพื่อให้นักเรียนเข้าใจและสามารถแยกความแตกต่างระหว่างการออกกำลังกายที่มีการเผาผลาญพลังงานในระดับเบา ปานกลาง และหนักได้	1) วิทยากรชี้แจงจุดมุ่งหมายของกิจกรรมว่า ในครั้งนี้เป็นการเรียนรู้เพื่อให้นักเรียนเข้าใจประเภทและสัดส่วนของกิจกรรมต่างๆ ที่ควรปฏิบัติในชีวิตประจำวัน และพลังงานที่ถูกเผาผลาญจากการออกกำลังกายหรือทำกิจกรรมในชีวิตประจำวัน โดยกิจกรรมต่อจากนี้แบ่งออกเป็น 2 ส่วน คือ - มาเคลื่อนไหวกันเถอะ - เบา กลาง หนัก ดังรายละเอียดต่อไปนี้ • **มาเคลื่อนไหวกันเถอะ** 2) วิทยากรให้ข้อมูลว่าการทำกิจกรรมต่างๆ ไม่ว่าจะเป็นงานบ้าน เดินหรือวิ่ง เล่นกีฬาล้วนแล้วแต่ทำให้เราใช้พลังงานทั้งนั้น จากนั้นให้เล่นเกม “ทายใจ ทายท่า ต่อภาพ” 3) ให้สมาชิกจับกลุ่มกัน 5 กลุ่มๆ ละ 4 คน 4) แต่ละกลุ่มจะได้คำใบ้ 1 ชุดที่เป็นชื่อกิจกรรมต่างๆ ทั้งประเภทกีฬา กิจกรรมในชีวิตประจำวันและอาการ กริยาต่างๆ ชุดละ 6 คำที่เหมือนกัน รวมทั้งได้รับภาพต่อการเคลื่อนไหวในชีวิตประจำวันเพื่อสุขภาพ	5 นาที 30 นาที	1) กระดาษคำใบ้ (5 ชุด) สำหรับทายท่าใบ้กิจกรรม 2) ภาพต่อการเคลื่อนไหวในวิถีชีวิตประจำวันเพื่อสุขภาพ 3) โปสเตอร์สามเหลี่ยมการเคลื่อนไหวในวิถีชีวิตประจำวันเพื่อสุขภาพ	1) เพื่อสร้างประสบการณ์ที่ประสบความสำเร็จด้านการเคลื่อนไหวออกกำลัง 2) เพื่อให้นักเรียนได้รับกำลังใจและคำพูดชักจูงในการเคลื่อนไหวออกกำลังในชีวิตประจำวัน	1) นักเรียนทุกคนมีส่วนร่วมในการเล่นเกมทายใจทายท่า ต่อภาพ 2) นักเรียนทุกคนมีความสนใจและสนุกในการเล่นเกม 3) นักเรียนทุกกลุ่มสามารถต่อภาพจิ๊กซอว์การเคลื่อนไหวในชีวิตประจำวัน และให้ความหมายของภาพได้อย่างถูกต้อง

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		5) วิทยากรอธิบายกติกาการเล่นเกมว่า แต่ละกลุ่มให้จับคู่ย่อย 2 คู่ คู่แรกให้เล่นใบ้คำ โดยให้คนที่หนึ่งทำท่าใบ้กิจกรรมที่ได้ 3 คำแล้วให้อีกคนทายว่าเป็นกิจกรรมอะไร ขณะที่รอทายท่าใบ้ให้ผู้ทายวิ่งเยาะๆ ไปด้วยจนกว่าจะทายได้ แล้วสลับกันให้คนที่ทำท่าใบ้มาเป็นผู้ทายอีก 3 คำที่เหลือ เมื่อเสร็จแล้วมาแปะมือให้อีกคู่ทำการต่อภาพจิกซอว์ที่ได้รับ หลังจากนั้นให้ระดมสมองแสดงความคิดเห็นว่าภาพต่อนั้นมีความหมายว่าอย่างไร 6) กลุ่มที่เสร็จแล้วให้พูดดังๆ ว่า"โย่" แล้วให้ทีมวิทยากรไปตรวจสอบความเรียบร้อย และให้ข้อมูลย้อนกลับเกี่ยวกับความหมายของภาพต่อจิ๊กซอว์ที่นักเรียนช่วยกันแสดงความคิดเห็น กลุ่มที่เสร็จเร็วและอธิบายได้ชัดเจนที่สุดถือว่าชนะ และได้รับคะแนนเรียงตามลำดับลดหลั่นกันลงมาจาก 5 ถึง 1 ซึ่งคะแนนนี้เมื่อเอาไปรวมกับคะแนนที่จะได้ในกิจกรรมต่อไป กลุ่มไหนได้มากที่สุดจะได้รับรางวัล โดยจะให้แก่กลุ่มที่ได้ที่ 1 และ 2 เท่านั้น				

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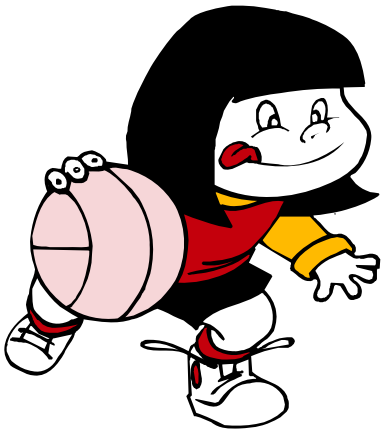
		7) วิทยากรกล่าวชมเชยทีมที่ได้คะแนนมาก และให้กำลังใจทีมที่ได้คะแนนน้อย แล้วบอกว่าเป็นเกมที่สนุกได้ใช้ทักษะไหวพริบและความสามัคคีของกลุ่ม แล้วให้นักเรียนช่วยกันสรุปเนื้อหาที่ได้จากการเล่นเกม (*ตัวอย่างข้อสรุปที่ได้* เช่น สรุปว่าทุกกิจกรรมมีการใช้พลังงานทั้งนั้นเพียงแต่มีความมากน้อยแตกต่างกันขึ้นอยู่กับชนิดของกิจกรรมที่ทำ โดยเมื่อดูจากภาพต่อที่สมบูรณ์จะเห็นว่า กิจกรรมที่อยู่ตรงฐานของสามเหลี่ยมเป็นกิจกรรมที่ควรทำให้ได้ทุกวัน และลดหลั่นจำนวนวันเรื่อยๆ จนถึงยอดของสามเหลี่ยมเป็นกิจกรรมที่ควรหลีกเลี่ยงหรือทำน้อยที่สุด เนื่องจากเป็นกิจกรรมที่ใช้พลังงานน้อยที่สุด) วิทยากรช่วยเสริมในประเด็นที่ขาดและสรุปข้อมูลสำคัญของสามเหลี่ยมการเคลื่อนไหวในวิถีชีวิตประจำวันอีกครั้ง โดยใช้โปสเตอร์ประกอบ				

กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
		• **เบา กลาง หนัก** 1) วิทยากรให้สมาชิกเล่นเกม “ฝืนธรรมชาติ” ร่วมกัน โดยวิทยากรอธิบายกติกาการเล่นเกมว่า - ถ้าบอกว่าซ้าย ให้สมาชิกก้าวไปทางขวา 1 ก้าว ถ้าบอกว่า ขวา ให้สมาชิกก้าวไปทางซ้าย 1 ก้าว ถ้าบอกว่า หน้า ให้สมาชิกถอยหลัง 1 ก้าว และถ้าบอกว่า หลัง ให้สมาชิกเดินไปข้างหน้า 1 ก้าว - ให้สมาชิกทำความคุ้นเคยกับกติกาซัก 2 รอบ หลังจากนั้นวิทยากรให้เล่นเกมจริง โดยผู้ที่ทำผิดจะต้องออกจากการเล่นเกม และจะเล่นไปเรื่อยๆ จนได้ผู้ชนะ 3 คน ที่จะได้รับรางวัล 2) วิทยากรกล่าวกับนักเรียนว่า การออกกำลังกายหรือทำกิจกรรมในชีวิตประจำวันที่สามารถช่วยลดน้ำหนักและส่งผลให้ความเสี่ยงของเบาหวานชนิดที่ 2 ลดลง ควรเป็นกิจกรรมที่มีการเผาผลาญพลังงานในระดับปานกลาง ถึง หนัก โดยที่เราจะรู้ได้โดย หลังจากทำกิจกรรมเหล่านั้นเราจะรู้สึกเหนื่อย มีเหงื่อซึม หรือหายใจเร็ว หัวใจเต้นแรงขึ้นกว่าตอนที่เรานั่งอยู่ในท่าปกติ แต่ก็ยังสามารถพูดได้เป็นประโยคชัดเจน ไม่หอบมาก	30 นาที	4) ใบงาน “เบา กลาง หนัก” 5) รางวัลสำหรับผู้ชนะการเล่นเกม		4) นักเรียนทุกกลุ่มสามารถจัดกลุ่มชนิดของกิจกรรมในชีวิตประจำวัน/การออกกำลังกายตามการเผาผลาญพลังงานในระดับเบา ปานกลาง และหนักได้อย่างถูกต้อง 5) ตัวแทนนักเรียนมีส่วนร่วมในการสรุปข้อคิดที่ได้จากกิจกรรม 6) มีปรากฏชนิดของการออกกำลังกายในระดับปานกลางถึงหนักในชีวิตประจำวันของนักเรียน เมื่อดูจากแบบบันทึกพฤติกรรมการเคลื่อนไหวออกกำลัง

กิจกรรม	จุดมุ่งหมายของกิจกรรม	ขั้นตอนการดำเนินกิจกรรม	เวลา	สื่อ/อุปกรณ์/วิทยากร	เป้าหมายที่ต้องการสร้าง	การประเมินผล
		3) แบ่งนักเรียนออกเป็นกลุ่มๆ ละ 4 คน แล้วมอบหมายให้นักเรียนระดมความคิด อภิปราย เพื่อแยกความแตกต่างและจัดกลุ่มกิจกรรมในชีวิตประจำวัน/การออกกำลังกายที่มีการเผาผลาญพลังงานในระดับที่แตกต่างกัน ตามใบงาน “เบา กลาง หนัก” 4) เมื่อหมดเวลาวิทยากรเป่านกหวีดให้แต่ละกลุ่มหยุดทำใบงาน 5) วิทยากรให้นักเรียนช่วยกันเฉลยคำตอบในใบงาน กล่าวชมเชยกลุ่มที่ทำถูก และให้คำอธิบายเพิ่มเติมสำหรับข้อที่มีบางกลุ่มทำผิด 6) ให้นักเรียนช่วยกันนับคะแนนข้อถูก รวมคะแนนแล้วนำคะแนนที่ได้ไปรวมกับคะแนนจากกิจกรรมที่ผ่านมา กลุ่มที่ได้คะแนนมากเป็นลำดับที่ 1 และ 2 จะได้รับรางวัล 7) ให้นักเรียนช่วยกันสรุปข้อคิดที่ได้จากกิจกรรม และคิดว่าจะนำไปประยุกต์ใช้ในชีวิตประจำวันได้อย่างไร 8) วิทยากรมอบหมายให้สมาชิกเลือกการออกกำลังกายในระดับปานกลาง-หนักไปปฏิบัติในชีวิตประจำวัน ให้ได้อย่างน้อย 30 นาทีอย่างต่อเนื่อง และสะสมให้ได้ 60 นาทีในหนึ่งวัน ซึ่งอาจจะสลับสับเปลี่ยนในแต่ละวัน รวมทั้งบันทึกสิ่งที่ทำลงในแบบบันทึกพฤติกรรมการเคลื่อนไหวออกกำลัง พร้อมกับให้กำลังใจว่าทุกคนสามารถทำได้				



ใบงาน
"เบา กลาง หนัก"

คำชี้แจง ขอให้นักเรียนเลือกชนิดของกิจกรรมในชีวิตประจำวันหรือการออกกำลังกายต่อไปนี้มาใส่ให้ตรงช่องของระดับของการเผาผลาญพลังงาน 3 ระดับ คือ เบา ปานกลาง หนัก

ชนิดของกิจกรรมในชีวิตประจำวันหรือการออกกำลังกาย

-เดินช้าๆ
-กวาดบ้าน
- ซิตอัพ
-เล่นโยคะ
-ขนของขึ้นบันได
-วิ่งเล่นกับเพื่อน
-นั่งเล่นกีตาร์
-แข่งฟุตบอล
-เล่นวอลเล่ย์บอลกับเพื่อน
-วิ่งแข่ง
-เล่นเทนนิส
-ว่ายน้ำ
-เต้นแอโรบิค
-พาสุนัขไปเดินเล่น
-นั่งคุยโทรศัพท์
-เล่นแบดมินตันกับเพื่อน
-ยูโด/คาราเต้/เทควันโด้
-ขี่จักรยาน

เบา	ปานกลาง	หนัก


คำใบ้สำหรับแต่ละกลุ่ม
- ว่ายน้ำ
- นั่งดูโทรทัศน์
- รดน้ำต้นไม้
- เล่นแบดมินตัน
- เดินขึ้นบันได
- ถูบ้าน


เพื่อสุขภาพที่ดี
ควรออกกำลังกายสม่ำเสมอ
ลดหรือหลีกเลี่ยง
การนั่งนอน
ที่ไม่จำเป็น เช่น
ดูโทรทัศน์,
เล่นเกมส์คอมพิวเตอร์
2-3 วันต่อสัปดาห์
กิจกรรมเบลิดเบลิน
กิจกรรมเข้าจังหวะ,
รำวง, ชักคะเย่อ, ตีชิบ,
มอญซ่อนผ้า, วู้ดินหาง
ฝึกความแข็งแรง
และยืดหยุ่น เช่น
ดันพื้น, ดึงข้อ,
นอนยกขา, กายบริหาร,
โหนราว
3-5 วัน ต่อสัปดาห์
ออกกำลังกายแบบแอโรบิก
(อย่างน้อย 20 นาที ต่อวัน)
ปั่นจักรยาน, ว่ายน้ำ,
เล่นเสก็ต, วิ่ง, กระโดดเชือก,
เต้นแอโรบิก
เล่นกีฬา
(อย่างน้อย 20 นาที ต่อวัน)
วอลเลย์บอล, เทนนิส,
บาสเก็ตบอล, วิ่งเปี้ยว,
ฟุตบอล, วิ่งผลัด
ทุกวัน
การขึ้นบันได, เก็บของเล่น
ช่วยคุณพ่อคุณแม่เก็บกวาด,
ทำความสะอาดบ้านและบริเวณรอบๆ,
เดินไปบ้านญาติของ,
ถีบจักรยานไปโรงเรียน,
เดินไปโรงเรียน, ไปเดินเล่น
และอย่าลืม! ดื่มน้ำสะอาดอย่างน้อยวันละ 8 แก้วนะครับ
ออกกำลังกาย เป็นประจำอย่างน้อยวันละ 1 ชั่วโมง
ข้อมูล : กองออกกำลังกายเพื่อสุขภาพ กรมอนามัย กระทรวงสาธารณสุข

APPENDIX C

Results about satisfaction and feeling after participating in the program

ความคิดเห็นจากกลุ่มตัวอย่างใน โรงเรียนวัดดิสหงสาราม

ความรู้สึกความประทับใจ

1. ได้ความรู้ว่าความสามัคคีในการเล่นเกมส์ต่าง ๆ และการได้ผลเสียต่อการกินอาหารที่เกินตัว (2)
2. ได้ความรู้เรื่องการออกกำลังกาย (3)
3. ครูใจดีและสอนสนุก และสอนให้นำไปใช้ในชีวิตประจำวัน (3)
4. ครูเป็นคนที่มีความสามารถ (1)
5. สนุกที่ได้วิ่งเล่น (3)
6. ได้เล่นเกมส์ และได้ทำกิจกรรมทั้ง 4 ฐาน (5)
7. วันนี้ได้ความรู้มากมาย และได้รู้ว่าการลดความอ้วนจะได้ไม่มีพุง (4)
8. รักพี่ ๆ ทุกคนและ อาจารย์ที่มาอบรม เด็ก ๆ และพวกหนูขอสัญญาว่าจะนำไปปฏิบัติ ในชีวิตจริง (1)
9. ได้เรียนรู้โรคอ้วนว่าเป็นอย่างไรว่าเราอ้วนหรือเปล่า และได้รู้การออกกำลังกายและเรียนรู้การอ่านแคลอลี่อาหาร เรียนรู้โภชนาการ (2)
10. อยากให้จัดแบบนี้อีก เพราะหนูอยากจดจำใบหน้าของพวกพี่ๆ
11. ได้ฝึกสมองเพื่อหมั่นเรียนรู้ (1)
12. ได้เล่นสนุกถึงหนูไม่ได้เข้าร่วมกิจกรรมแต่หนูก็ได้เรียนรู้กับเพื่อนๆ (1)
13. ได้ความรู้เรียนโรคอ้วน (6)
14. ครูเป็นนางฟ้าในใจหนู (1)
15. อยากให้ครูมาสอนพวกเราอีกและให้ครูพีสอนให้อดทนไม่อ่อนไหวกับโรคที่จะเกิดขึ้น (2)
16. อยากทำกิจกรรมแบบนี้อีก (2)

แบบประเมินภาพรวมของการเข้าร่วมกิจกรมในโปรแกรม

1. นักเรียนได้รับความรู้และประโยชน์อะไรบ้างจากการเข้าร่วมกิจกรรมของโครงการ

- ทำให้ได้รู้ว่าไม่ควรกินอาหารมาก
- ได้ความรู้มาก และได้ทำกิจกรรมกับพวกพี่ๆ ด้วย
- ได้เรียนรู้เกี่ยวกับโรคอ้วน
- เรียนรู้การคำนวณแคลลอลี่ (3)
- ได้รู้อาหารหลัก 5 หมู่
- ได้ทำกิจกรรมกับเพื่อนๆ
- ได้รู้ว่าเวลาที่เรากินน้ำอัดลมจะเป็นโรคกระเพาะ
- ได้เล่นเกมส์กับเพื่อนในกลุ่ม
- ได้ความรู้และได้ลดความอ้วน

2. การเปลี่ยนแปลงที่เกิดขึ้นในตัวนักเรียนหลังจากเข้าร่วมกิจกรรมมีอะไรบ้าง

- น้ำหนักลดลง (8)
- น้ำหนักลดลงและได้เล่นเกมส์
- ใช้กับชีวิตประจำวันได้
- นิสัยการกินต่อสุขภาพดีขึ้น (2)
- มีความรู้มากขึ้น
- ทำให้มีสุขภาพแข็งแรง

3. นักเรียนมีความรู้สกอย่างไรต่อการเข้าร่วมกิจกรรม และสิ่งที่นักเรียนประทับใจมีอะไรบ้าง

- การทำอาหารสนุกมาก
- ได้รู้วิธีทำน้ำปั่น
- ได้รู้วิธีการทำอาหาร
- รู้สึกดีใจที่พี่ๆ มาอบรม
- ทำไปชิมไป เพื่อสุขภาพ
- สนุกที่ได้ทำอาหาร

4. นักเรียนมีข้อเสนอแนะหรือต้องการให้ปรับปรุงสิ่งใดบ้างในการจัดกิจกรรมต่อไป

- การทำอาหาร การวิเคราะห์ตัวเอง (2)
- ขอให้มีเกมส์มาเล่น
- อยากให้มีการนำเต้นออกกำลังกาย
- สถานที่กิจกรรม ความสามัคคีในกลุ่ม

5. นักเรียนจะนำความรู้และประสบการณ์เกี่ยวกับการบริโภคอาหารและการเคลื่อนไหวออกกำลังที่ได้เข้าร่วมกิจกรรมไปประยุกต์ใช้ในชีวิตประจำวันอย่างไรบ้าง

- รับประทานอาหารให้ครบ 5 หมู่
- นำไปแนะนำให้ครอบครัว และคนในชุมชน
- กาควบคุมอาหาร การออกกำลังกาย
- ออกกำลังกายทุกวัน (4)
- ปรับปรุงตัวเอง
- เล่นกีฬา
- เลือกซื้ออาหารที่มีประโยชน์

6. ถ้ามีการจัดกิจกรรมลักษณะเช่นนี้อีก นักเรียนจะเข้าร่วมกิจกรรมหรือไม่ เพราะเหตุใด

- เข้าร่วมกิจกรรมแล้วสนุก (6)
- เข้าร่วมเพราะจะได้มีความรู้มากๆ เกี่ยวกับโรคอ้วน (5)
- เข้าร่วมเพราะได้ลดความอ้วน (2)
- เข้าร่วมเพราะอยากทำอาหารอีก
- ออกกำลังกาย (2)

ความคิดเห็นจากกลุ่มตัวอย่างใน โรงเรียนสวัสดีวิทยา

ความรู้สึกความประทับใจ

1. สนุกที่ครูมาสอน (4)
2. ดีใจที่ครูเอาของมาให้ และชอบเอาของมาแจกเด็กๆ (3)
3. ไม่อยากให้ครูไปเพราะครูใจดีมากและสอนสิ่งที่มีประโยชน์
4. อยากให้ครูอยู่ต่อเพราะครูใจดี
5. อยากให้ครูพีมาสอนอีก เป็นคนตลกดี ครูพีเป็นคนดีไม่ดุ
6. อยากให้ครูมาทำกิจกรรมที่โรงเรียนอีกครูสอนให้ลดน้ำหนัก
7. ประทับใจที่ครูมาสอนเรื่องโรคอ้วน
8. อยากให้ครูมาอีก มาสอนเรื่องโรคอ้วน
9. ได้ความรู้ และได้รู้ว่ากินอะไรดี กินอะไรไม่ดี

แบบประเมินภาพรวมของการเข้าร่วมกิจกรรมในโปรแกรม

1. **นักเรียนได้รับความรู้และประโยชน์อะไรบ้างจากการเข้าร่วมกิจกรรมของโครงการ**
   - ได้รับความรู้เกี่ยวกับโภชนาการ ว่าวันหนึ่งควรได้รับประทานอาหารกี่แคลลอลี่ และก็ได้รู้ว่าการทำก๋วยเตี๋ยวลุยสวนทำอย่างไร และได้ทำน้ำผลไม้ด้วย อร่อยมาก (2)
   - ทำให้ได้รู้วิธีการลดความอ้วน ได้ทานอาหารที่ช่วยลดความอ้วน และก็ได้รู้การทำก๋วยเตี๋ยวลุยสวน ทำน้ำผลไม้ และได้รู้วิธีการซื้ออาหารและโภชนาการ และการดูแคลอลี่ของอาหาร ได้รู้จักเพื่อนหลายคนและได้รู้จักครูที่สอนอีกหลายคน (7)
   - ได้รู้วิธีการรับประทานอาหารและวิธีการดูโซนสีอาหารแต่ละชนิด
   - ได้รู้วิธีการดูแคลลอลีของอาหาร
   - ได้ความรู้เรื่องโรคอ้วน เพราะว่าโตขึ้นเป็นผู้ใหญ่เป็นโรคอ้วนมี 75%
   - ได้ความรู้เกี่ยวกับการเข้าร่วมกิจกรรมของโครงการโรคอ้วน (2)
   - ได้ความรู้เกี่ยวกับการกินอาหารที่ที่สามารถลดน้ำหนักและมีประโยชน์ต่อตัวเรา (5)

2. **การเปลี่ยนแลงที่เกิดขึ้นในตัวนักเรียนหลังจากเข้าร่วมกิจกรรมมีอะไรบ้าง**
   - น้ำหนักลดลง ได้ทำอาหารให้ผู้ปกครองรับประทาน (2)
   - บางทีก็น้ำหนักขึ้น บางทีก็น้ำหนักลด และทำให้รู้ว่าการลดน้ำหนักไม่ได้ยากกว่าที่คิด และได้ทำให้รู้เรื่องการลดความอ้วนและทำให้รู้การกินอาหารที่มีประโยชน์ (2)
   - ทำอาหารและทำน้ำผลไม้ (2)

- น้ำหนักลด (10)
- ได้ทำอาหารให้ผู้ปกครองรับประทาน
- มีความรู้และทำให้จากอ้วนกลายเป็นผอม
- ได้ความรู้เรื่องการลดความอ้วน และทำให้ได้รู้การรับประทานอาหารที่มีประโยชน์
- ทำอาหาร และของหวานเป็น

3. นักเรียนมีความรู้สึกอย่างไรต่อการเข้าร่วมกิจกรรม และสิ่งที่นักเรียนประทับใจมีอะไรบ้าง

- ประทับใจทุกครั้งที่ได้ทำกิจกรรม ความรู้สึกที่จะบอกคุณครูและพี่ๆ มีมากล้นไม่รู้จะพูดอะไรก็รักคุณครูที่สุดเลยค่ะ
- รู้สึกน้ำหนักลดและดีใจที่ได้เข้าร่วมโครงการนี้ (4)
- ทำให้รู้สึกมีความสุขและช่วยสอนการลดน้ำหนัก สิ่งที่ประทับใจที่สุด คือการทำก๋วยเตี๋ยว และทำชานมถั่วแดง
- อยากให้ครูมาสอนอีก (2)
- สนุกมาก อยากให้มีต่อไปนาน ๆ (4)
- ประทับใจที่ พี่ และ ครู เข้ามาในโรงเรียน (4)
- ดี ที่ได้ทำอาหาร
- สนุกมากและครูสอนดี
- ประทับใจที่ได้เล่นเกมส์ และออกกำลังกาย (2)

4. นักเรียนมีข้อเสนอแนะหรือต้องการให้ปรับปรุงสิ่งใดบ้างในการจัดกิจกรรมต่อไป

- ทำอาหารเพิ่มขึ้นและขอให้ทำก๋วยเตี๋ยวลุยสวนทุกๆวันในการทำกิจกรรมที่โรงเรียน
- อยากให้ครูเข้มงวดกว่านี้ เด็กจะได้ไม่ดื้อ
- อยากให้ทำอาหารมากขึ้น (2)
- อยากให้ทำอาหารอร่อย
- ออกกำลังกาย น้ำหนักลด (2)

5. นักเรียนจะนำความรู้และประสบการณ์เกี่ยวกับการบริโภคอาหารและการเคลื่อนไหวออกกำลังที่ได้เข้าร่วมกิจกรรมไปประยุกต์ใช้ในชีวิตประจำวันอย่างไรบ้าง

- ใน 1 วันกินอาหาร 1200 กิโลแคลอลี่ จะตั้งใจลดน้ำหนัก
- ช่วยกันนำไปบอกคนอื่น และบอกกับครอบครัวและบอกแก่คนที่ไม่รู้การลดความอ้วนต้องทำอย่างไร

- ออกกำลังกายทุกวัน (6)
- พยายามลดน้ำหนัก
- จะนำวิธีการลดความอ้วนไปบอกให้กับแม่และน้อง (3)
- วิ่งออกกำลังกาย

6. ถ้ามีการจัดกิจกรรมลักษณะเช่นนี้อีก นักเรียนจะเข้าร่วมกิจกรรมหรือไม่ เพราะเหตุใด

- เข้าแน่นอน เพราะครูใจดี ครูน่ารัก และได้ลดความอ้วนด้วย
- เข้าร่วมเพราะช่วยให้รู้ว่าการลดโรคอ้วนต้องทำอย่างไร และได้ทำอาหารที่มีประโยชน์อีกหลายอย่าง
- เข้าเพราะอยากให้น้ำหนักลดลง (5)
- เข้าร่วมเพราะได้รู้ว่าโรคอ้วนนั้นแย่ขนาดไหน
- เข้าเพราะสนุก และอยากให้มีต่อไปอยากนี้ไปนาน ๆ (3)
- เข้าเพราะเป็นกิจกรรมที่ดี
- เข้าเพราะมีความประทับใจมาก
- เข้าเพราะได้ความรู้เรื่องการทานอาหาร (2)

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