

**THE EFFECTIVENESS OF THE PHYSICAL ACTIVITY
PROMOTION PROGRAM ON PERCEIVED SELF-EFFICACY,
PHYSICAL ACTIVITY, AND PHYSICAL FITNESS IN THAI
ADOLESCENT GIRLS**



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THE EFFECTIVENESS OF THE PHYSICAL ACTIVITY PROMOTION PROGRAM ON PERCEIVED SELF-EFFICACY, PHYSICAL ACTIVITY, AND PHYSICAL FITNESS IN THAI ADOLESCENT GIRLS

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ABSTRACT

The purpose of this quasi-experimental study was to investigate the effects of a physical activity promotion program on perceived self-efficacy (PSE), physical activity (PA), and physical fitness (PF) in adolescent girls. The study sample was recruited from grades 7 and 8 (ages 11-14 years) in two public schools in the Chonburi province. Simple random sampling was used to assign one school into the experimental group and the other into the control group. The study participants consisted of 81 seventh and eighth graders, with 43 participants in the experimental group and 38 participants in the control group. Both groups received general information of physical activity, but the experimental group also received the physical activity promotion program based on Pender's health promotion model and self-efficacy theory. The program consisted of provision of knowledge, discussion of participants' experiences, modeling, increasing social support from peers, promoting enjoyment, motivation, and practice of aerobic dances, with the use of goal setting and self-monitoring, for three times per week, totaling eight weeks and follow-up at the 12th week. Data were collected using questionnaires, the Perceived Self-efficacy to Physical Activity and the Physical Activity Questionnaires, including physical fitness which consisted of 30 seconds of sit-ups, 30 seconds of push-ups, sit and reach, and 800 meters run/walk at baseline, on the eighth week when the intervention ended, and on the 12th week follow-up. Repeated measures ANOVA and repeated measures ANCOVA were employed in the data analysis.

The results revealed that the scores of the experimental group in the PSE, PA and light activity were significantly higher than those of the control group by the eighth week. Although, the mean scores of three PA components were higher than the control group, the two groups did not differ significantly. However, these effects could not be maintained by the 12th week. Furthermore, the PF scores were not significantly different between the experimental and control groups at the eighth and 12th weeks.

The findings of this study have suggested that after 8 weeks, this program is effective to enhance PSE and PA in adolescent girls. Therefore, implementing this program to promote PSE and PA among adolescent girls in school is recommended because they become interested and active in participating activities. Also, this program should be developed to sustain PSE and PA including increased PF.

**KEY WORDS: PERCEIVED SELF-EFFICACY/ PHYSICAL ACTIVITY/
PHYSICAL FITNESS/ADOLESCENT GIRLS**

150 pp.

ผลของโปรแกรมส่งเสริมการออกกำลังกายต่อการรับรู้ความสามารถในการออกกำลังกาย การออกกำลังกาย และสมรรถภาพทางกายในหญิงวัยรุ่น

(THE EFFECTIVENESS OF THE PHYSICAL ACTIVITY PROMOTION PROGRAM ON PERCEIVED SELF-EFFICACY, PHYSICAL ACTIVITY, AND PHYSICAL FITNESS IN THAI ADOLESCENT GIRLS)

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บทคัดย่อ

การวิจัยครั้งนี้เป็นการศึกษาแบบกึ่งทดลอง มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมส่งเสริมการออกกำลังกายต่อการรับรู้ความสามารถในการออกกำลังกาย การออกกำลังกาย และสมรรถภาพทางกายของหญิงวัยรุ่น กลุ่มตัวอย่างเป็นหญิงวัยรุ่นชั้นมัธยมศึกษาที่ 1 และ 2 อายุระหว่าง 11-14 ปี จากโรงเรียนรัฐบาล 2 แห่งในจังหวัดชลบุรี กลุ่มทดลองได้รับการสุ่มอย่างง่ายจากหนึ่งโรงเรียน ที่เหลือเป็นกลุ่มควบคุม กลุ่มตัวอย่างรวมทั้งสิ้น 81 ราย เป็นหญิงวัยรุ่นกลุ่มทดลอง จำนวน 43 ราย และกลุ่มควบคุม จำนวน 38 ราย ทั้งสองกลุ่มได้รับความรู้ทั่วไปเกี่ยวกับการเคลื่อนไหวออกแรงและออกกำลังกาย กลุ่มทดลองได้รับโปรแกรมส่งเสริมการออกกำลังกายซึ่งใช้กรอบแนวคิดการส่งเสริมสุขภาพของเพนเดอร์ และทฤษฎีการรับรู้ความสามารถของแบนคูรา ซึ่งประกอบด้วย การให้ความรู้ การแลกเปลี่ยนประสบการณ์ของตนเองและจากตัวแบบ การสนับสนุนจากเพื่อน ความสนุกสนาน แรงจูงใจ และฝึกออกกำลังกายแบบแอโรบิก ตลอดจนการวางแผนเป้าหมายและการบันทึกกิจกรรมที่ได้ปฏิบัติ เป็นเวลาสัปดาห์ละ 3 ครั้ง นาน 8 สัปดาห์ และติดตามสัปดาห์ที่ 12 การเก็บรวบรวมข้อมูลโดยใช้แบบสอบถามการรับรู้ความสามารถตนเองต่อการออกกำลังกาย และแบบวัดการเคลื่อนไหวร่างกาย ตลอดจนการทดสอบสมรรถภาพทางกายคือ ลูกนั่ง 30 วินาที ดันพื้น 30 วินาที นั่งงอตัวไปข้างหน้า และวิ่งหรือเดิน 800 เมตร จำนวน 3 ครั้ง คือ ก่อนได้รับโปรแกรม สัปดาห์ที่ 8 และ 12 วิเคราะห์ข้อมูลด้วยสถิติการวิเคราะห์ความแปรปรวนแบบวัดซ้ำและความแปรปรวนร่วมแบบวัดซ้ำ

ผลการศึกษาพบว่ากลุ่มทดลองมีระดับการรับรู้ความสามารถในการออกกำลังกาย การออกกำลังกาย และกิจกรรมการเล่นสูงกว่ากลุ่มควบคุมในสัปดาห์ที่ 8 แม้ว่า 3 กิจกรรมย่อยของการออกกำลังกายในกลุ่มทดลองสูงกว่ากลุ่มควบคุมแต่ทั้งสองกลุ่มไม่มีความแตกต่างกัน พฤติกรรมเหล่านี้ไม่สามารถคงอยู่เมื่อติดตามในสัปดาห์ที่ 12 นอกจากนั้นสมรรถภาพทางกายของหญิงวัยรุ่นทั้งสองกลุ่มไม่แตกต่างกันทั้งสัปดาห์ที่ 8 และ 12

ผลการศึกษานี้เสนอแนะถึงประสิทธิภาพของโปรแกรมส่งเสริมการออกกำลังกายในหญิงวัยรุ่น มีผลต่อการเพิ่มการรับรู้ความสามารถในการออกกำลังกายและการออกกำลังกายของหญิงวัยรุ่น ดังนั้นจึงควรนำโปรแกรมนี้สู่การปฏิบัติเพื่อเพิ่มการรับรู้ความสามารถในการออกกำลังกาย และการออกกำลังกายของหญิงวัยรุ่นในโรงเรียนต่อไปเพราะทำให้หญิงวัยรุ่นสนใจและเข้าร่วมกิจกรรมการออกกำลังกาย นอกจากนั้นควรพัฒนาโปรแกรมเพื่อติดตามระดับการรับรู้ความสามารถของตนเองในการออกกำลังกาย และการออกกำลังกายให้ดำรงอยู่ต่อไป รวมทั้งการเพิ่มสมรรถภาพทางกาย

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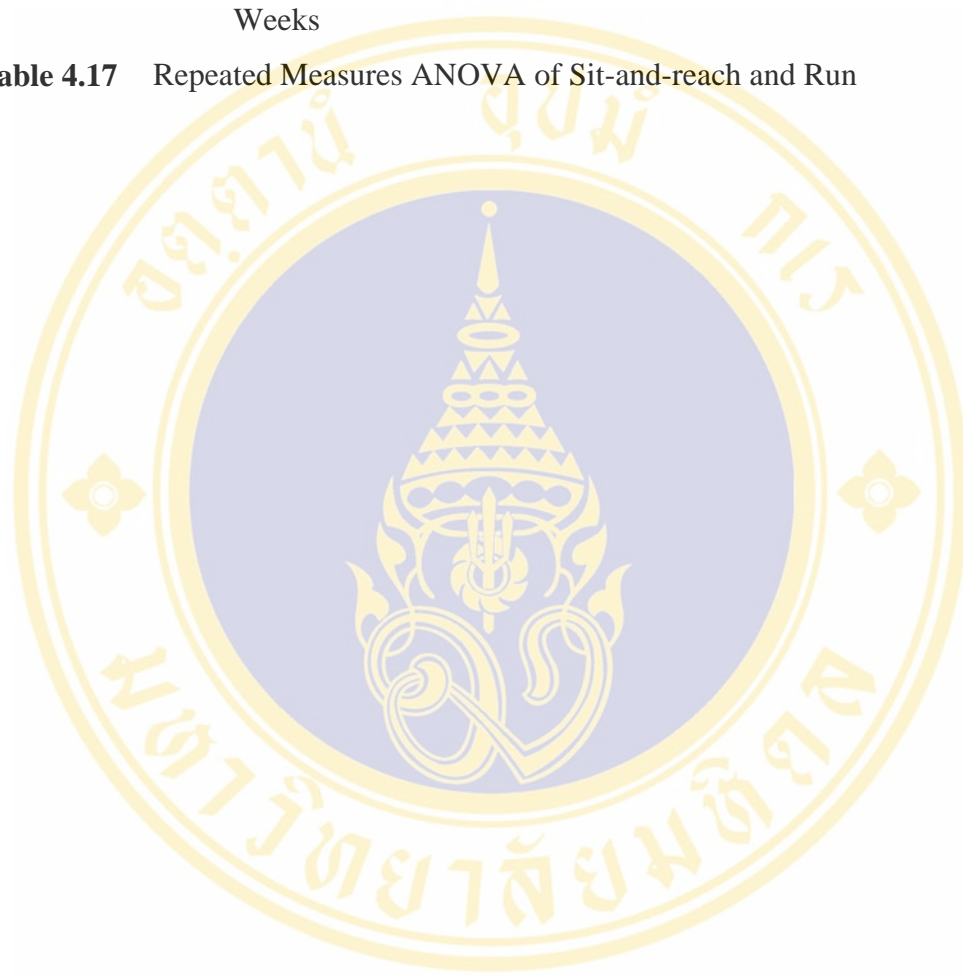


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CHAPTER I

INTRODUCTION

Background and Significance of the Study

Regular physical activity is a vital component of a healthy lifestyle for people of all ages. Most importantly, physical activity habits developed early in life can be sustained in adult life (Tammelin Näyhä, Hills, & Järvelin, 2003; Telama, Yang, Laakso, & Viikari, 1997; USDHHS, 2008). However, levels of physical activity decline with age (Sallis, Prochaska, & Taylor, 2000). In particular, levels of physical activity decline rapidly in both girls and boys during adolescence and early adulthood (Anderssen et al., 1996; Goran, Gowe, Nagy, & Johnson, 1998; Kimm et al., 2002; National Statistical Office, 2003; Telama & Yang, 2000). The rate of decline in physical activities of adolescent girls is reported at 7.4%, whereas that of boys is reported at 2.7% per year (Sallis, Alcaraz, McKenzie, & Hovell, 1999). However, after the age of 13, girls are significantly less active than boys are (Charoneying, 2005; Biddle, Gorely, & Stensel, 2004; Kimm et al., 2002; National Statistical Office, 2003). In Thailand, boys aged 12-14 years (82.2%) generally perform more physical activity than girls do (80.9%). Similarly, 78.6% of boys aged 15-19 years participate in physical activity, whereas 59.3% of girls participate in physical activity (National Statistical Office, 2003). The decline in physical activity of adolescent girls is a product of gender-role socialization. With their widening hips and developing breasts, girls are often interested in traditionally feminine and less athletic activities. Moreover, adolescent girls lack confidence in their physical abilities and are embarrassed about exercising in public places (Shaffer & Kipp, 2007). To increase physical activity, therefore, intervention programs should be implemented among adolescent girls.

Existing evidence has indicated that physical activity has multiple health benefits among children and adolescents including the enhancement of normal growth and development, weight control, and protection from chronic diseases like type II

diabetes, osteoporosis, cardiovascular disease (CVD), etc. (CDC, 2001). Some of the psychological benefits are reduced feelings of depression, reduced anxiety, reduced anger, and increased psychological wellbeing (Biddle, 2000; Field, Diego, & Saunders, 2001; Kirkcaldy, Shephard, & Siefen, 2002; Strong et al., 2005; USDHHS, 2008). Moreover, physical activity improves academic performances (Sallis et al., 2000) and parental relationships, decreases sedentary lifestyles, and may also decrease the development of risky behaviors such as smoking and alcohol abuse (Modrcin-Talbott et al., 1998).

The World Health Organization (2007a) has reported that chronic diseases, such as heart disease, stroke, and type II diabetes, are by far the most important leading causes of mortality in the world, representing 60% of all deaths. Out of the 35 million people who died from a chronic disease in 2005, half were under 70 years old and half were women. Similarly, Blair and colleagues conducted a study (Blair, Kohl, & Barlow, 1993) to evaluate the relationship between sedentary living habits and all-cause mortality in adult women and demonstrated that physical inactivity is associated with higher mortality rates in women. The risk factors of chronic diseases are widespread including physical inactivity, unhealthy diet, and tobacco use. These risk factors explain the vast majority of deaths from a chronic disease at all ages, in both men and women, and in all parts of the world (WHO, 2007b).

At present, the most important health problems in Thailand are non-communicable diseases (NCD) or chronic diseases such as cardiovascular disease, diabetes mellitus, cancer, and hypertension, which were the major causes of death and disability in 2005. Cardiovascular disease is the major cause of death among women, and the prevalence rapidly increases as women age. Five major risk factors of chronic diseases are unhealthy diet (89.85%), physical inactivity (41.29%), alcohol drinking (37.44%), tobacco use (22.25%), and overweight or obesity (16.14%) (Nakapong, 2007; Wichitsunthornkul, 2007). Besides, the incidence of diabetes in children and adolescence has increased (Tuchinda, Likitmaskul, Unachak, Panamonta, Patarakijavanich & Chetthakul, 2002). In addition, recent data have suggested that more Thais are overweight and their sedentary behavior has been increasing nowadays, especially children. Mo-Suwan (2003) conducted a study in 9,488 children and adolescents between six and 18 years of age from schools in Bangkok and four

other regions in the country and revealed that adolescents were more overweight than those reported in the study carried out by the Ministry of Public Health (2002) in 2000. The 13-18-year-old group was the most obese. Such findings were consistent with the findings in a study conducted by Ampanwong (2005) which reported that the percentage of overweight girls in grades 7 to 9 (18.6%, 17.6% and 14.8%) had higher than those of overweight boys (10.1%, 13.0% and 12.7%). These adolescents reported more sedentary behaviors, such as viewing television and playing computer games, more than the younger group aged six-12 years. In particular, they reported spending leisure time to watch television about 3.3 hours/day on weekdays and 4.9 hours/day on the weekend (Mo-Suwan, 2003). Similar findings were reported in a study by Bujaroonsilp (2003) which investigated health risk behaviors among 2,040 Thai adolescent students, aged 12-21 years old, from ten different public secondary schools and four different universities in Bangkok and four other regions in the country. The results showed that approximately 97% of children and adolescents reported that the most popular leisure time activity was watching television, and 15.25% watched movies at home or at the cinema. Based on these findings, it can be concluded that adolescent girls constitute a group of population threatened by an extremely high risk of inactivity (Browne, 1992) and consequently of chronic diseases.

It is accepted that the aforementioned problems can be prevented by promoting healthy lifestyles involving physical activity and healthy diets (USDHHS, 2008). Regular physical activity is an essential part of a healthy lifestyle. Regular physical activity in adolescents or young adults enhances health and reduces the risk of developing obesity and various chronic diseases (Armstrong & Welsman, 1997; USDHHS, 2008). Globally, the objectives are to increase levels of physical activity, to increase physical fitness, and to reduce sedentary behaviors.

A meta-analysis of 127 studies which examined the benefits of increasing physical activity levels through the use of intervention programs among 131,000 subjects (children, adolescents, and adults) in various settings (community, worksite, school, home, and healthcare setting) by Dishman and Buckworth (1996) has demonstrated that physical activity could be increased by interventions. This is evidenced by the findings of studies conducted applying a quasi-experimental design or randomized controlled trial design. The major goals of physical activity intervention

programs are to increase physical activity, physical activity level, fitness measures, strength and flexibility, knowledge of and attitude toward physical activity, and/or reduce inactivity depending on the targeted population (Dishman & Buckworth, 1996; Stone, McKenzie, Welk, & Booth, 1998).

Even though physical activity can be increased by interventions, studies of physical activity interventions in children and adolescents have been conducted less often than with adults and older adults. Therefore, promotion of physical activity in adolescents needs to be conducted. The settings for physical activity intervention should be schools because most children and adolescents spend much of their time at school each day. In previous studies, school settings have been examined with numerous student populations including elementary, middle, and high schools.

In general, physical activity is different for adolescent girls is different than for adolescent boys, both at school and at home. Moreover, adolescent girls may face numerous and various barriers, which differ from boys' barriers. A detailed and accurate understanding of the factors that influence adolescent girls' physical activity can help in the development of physical activity intervention. To be more specific, most girls tend to engage in aerobic exercises, dancing, running jogging (Grieser, et al., 2006; Ministry of Public Health, 2003), or badminton, whereas most boys like to play football and basketball (Suwattananarat, Makbun, Niyomserm, & Phasittimet, 2005; Yontcharionlum & Moameng, 2006). Furthermore, adolescent girls have weaker beliefs than boys that exercise would help them be healthy, but rather believe it would make them tired, injured, and sweaty (Grieser, et al., 2006; Phuphaibul et al., 2006; Tapp, Duda, & Ehnwald, 1989). However, adolescent girls have stronger beliefs than boys that exercise would help them look better. Therefore, targeted interventions should be designed especially for girls with special attention paid to strategies and methods (Garcia, Broda, Frenn, Coviak, Pender, & Ronis, 1995; Godin & Shephard, 1986; Sallis et al., 2003; Vu, Murrie, Gonzalez, & Jobe, 2006).

Previous studies on health promotion in adolescents using Pender's health promotion model and social cognitive theory have revealed that perceived benefits, perceived barriers (Deenan, 2003; Robbins, Pender, Ronis, Kazanis, & Pis, 2004; Strauss, Rodzilsky, Burack, & Colin, 2001; Wu & Pender, 2002, 2005; Wu, Pender, & Nouredine, 2003), interpersonal influences (social support, social norms, and

modeling) (Sallis et al., 1992; Taylor, Baranowski, & Sallis, 1994), and perceived self-efficacy (Allison, Dwyer, & Makin, 1999; Deenan, 2003; Misa & Aguillon, 2000; Robbins, Pis, Pender, & Kazanis, 2004) have an influence on physical activity. Of these, self-efficacy is the strongest predictor factor of physical activity among adolescents (Allison et al., 1999; Zakarian, Hovell, Hofstetter, Sallis, & Keating, 1994). Effective physical activity interventions, therefore, should be particularly designed to increase the strongest factors influencing physical activity (Barr-Anderson et al., 2007). Empirical evidence has shown that children and adolescents who enjoy physical activity are more likely to participate in physical activity (Craig, Goldberg, & Dietz, 1996; DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham, 1998; Robbins, Pis, et al., 2004). Similarly, Thai children and adolescents have reported that their important reasons for participating in physical activity are the required physical education lessons and enjoyment (Health Education Division, 2004; National Statistical Office, 2003). In addition, Dishman and colleagues' study (2005) has demonstrated that Life-style Education for activity Program (LEAP) increased physical activity enjoyment, self-efficacy, and physical activity (Dishman et al., 2005). Additionally, self-efficacy and enjoyment partially mediated the positive effect of the LEAP intervention. Similarly, Taymoori and Lubans (2008) in an experimental study identified mediators of physical activity change in two tailored interventions for adolescent girls an intervention based on the Health Promotion Model (Pender's HPM) and on the Transtheoretical Model (TTM). Assessments were conducted before implementation of the intervention, after the intervention, and at a six-month follow-up. The results indicated that self-efficacy was a mediator in the HPM. Thus, the strategies for this intervention program focused on helping adolescents find more benefits than barriers, increasing social support, increasing positive feelings or enjoyment, and increasing self-efficacy, including goal setting and self-monitoring of physical activity.

A review of the literature on intervention programs designed to increase physical activity has revealed the following conclusions. Firstly, a systematic review of promoting activity participation among children and adolescents (57 interventions) has shown poor study design and physical activity measures of unknown reliability and validity (Salmon, Booth, Phongsawan, Murphy, & Timperto, 2007). The

measurements of physical activity used in these studies vary greatly such as self-report questions, heart rate monitors, and motion sensors including pedometers and accelerometers. There are strengths and weaknesses for all methods depending on the nature of the research questions (Buckworth & Dishman, 2000), score measurement, and the specific operation of physical activity.

Secondly, interventions targeting children and adolescents have been conducted at schools, communities, homes, or healthcare settings. However, most interventions have been conducted in schools. It is worth noting that these studies have shown inconsistent findings. In particular, the findings have indicated that physical activity increase during the school day, but physical activity is not generalized to outside the school setting (Marcus et al., 2006).

Thirdly, a systematic review of the effectiveness of interventions to increase physical activity by Kahn and colleagues (Kahn et al., 2002) has revealed that there have been inconsistencies programs outcomes due to differences in the intervention programs, strategies used, and the variety of the populations under study. Moreover, the empirical evidence of physical activity of adolescent girls came from three different studies that employed different physical activity intervention programs. The results have shown that in one intervention study conducted with girls and women using the DAMET Project, based on the social cognitive theory, the subjects' physical activity increased with statistical significance (Ransdell, Oakland, & Taylor, 2003). Also, the factors related to program success were basic interventions in theory. This program used social cognitive theory (SCT) which consists of intervention in the forms of encouraging participants to set goals for exercising, enhancing self-efficacy for physical activity, and emphasizing the importance of "fun." Finally, the physical activity sessions took place three times per week, lasting 20-30 minutes in each week, for a total of 12 weeks. In another study, a randomized controlled trial was carried out among adolescent girls in grades 6, 7, and 8 using Pender's health promotion model and the transtheoretical model consisting of tailored strategies by telephone calls or postal letters. The results showed that physical activity did not increase after the intervention, but social support did (Robbins, Greatebeck, Kazanis, & Pender, 2006). Reasons for lack of success of the intervention program included the following: the intervention period was too brief, lasting ten minutes per time for four times with the

evaluation conducted at the 12th week, weakness of self-report, and contamination of data due to the fact that both the experimental group and the control group were studying at the same school. Finally, in the last study, the Active Winners Program was implemented among the students in grade 5 who were followed up to grade 7 using social cognitive theory and Pender's health promotion model in a community-based intervention. According to the study findings, both physical activity and psychosocial variables did not increase (Pate et al., 2003). The failure of this program was due to the fact that the program did not address key social and environmental influences on physical activity, the participants did not receive sufficient exposure to the after-school and summer programs, and there were social barriers that prevented them from continuing their participation. For instance, students did not like the other students and their friends were not there. Therefore, the effective intervention programs should take into account the factors that influence adolescent girls' physical activity such as perceived barriers to physical activity and perceived benefits of physical activity so as to increase physical activity among adolescent girls by using appropriate theories and strategies.

Lastly, the findings regarding the duration of the intervention and follow-up assessments are inconsistent. Some studies did not assess baseline data or lacked follow-up data (Salmon et al., 2007). For example, Cale and Harris (2006) have reported that the most effective duration of the intervention to increase physical activity varies from weeks (e.g. 11 weeks for The Southwest Cardiovascular Curriculum Project; 12 weeks for the Family Health Project) to a year or more than a year (e.g. The Oslo Youth Study; SPARK). One quasi-experimental study revealed a significant increase in physical activity levels by step count in grade 8 girls at six weeks after the intervention (Wang, 2004), but it did not include any follow-up assessment. Therefore, it can be seen that reasons for inconsistencies in outcomes may be due to different measures and designs.

However, no studies have been conducted specifically to investigate an intervention program designed to increase physical activity in adolescent Thai girls. Thus, in order to fill the gap of knowledge on the effectiveness of intervention programs in promoting physical activity in adolescent girls, the present study aimed to try out a physical activity promotion program that was specially designed to enhance

self-efficacy, increase physical activity, and increase physical fitness in adolescent Thai girls using a quasi-experimental design. Comparisons between the experimental and control groups were conducted at 8 and 12 weeks after the implementation of the intervention.

Research Questions

This study addressed the following questions:

1. What are the effects of the physical activity promotion program on perceived self-efficacy, physical activity and physical fitness after completing the program?
2. Do perceived self-efficacy, physical activity and physical fitness scores change over time by this intervention?

Purpose of the Study

The purposes of this study was to determine the effects of the physical activity promotion program on perceived self-efficacy, physical activity, and physical fitness of adolescent girls studying in grades 7 and 8 at the eighth and 12th weeks.

Research Hypotheses

The research hypotheses of this study were as follows:

1. The adolescent girls who receive the physical activity promotion program have higher perceived self-efficacy, physical activity and physical fitness scores than the adolescent girls who do not receive the physical activity promotion program at the eighth and 12th weeks.
2. There are any differences in mean scores of perceived self-efficacy, physical activity, and physical fitness scores across the time periods.

Conceptual Framework of the Study

This study was guided by Pender's health promotion model (HPM) (Pender, 1996) and self-efficacy theory (Bandura, 1986). Pender's HPM posits that health behavior is influenced by multiple factors that are both internal and external to the individual, and, additionally, that it is appropriate to understand the personal,

cognitive, and environment factors that influence health behavior. Pender’s HPM is composed of three components: individual characteristics and experiences, behavior-specific cognition and affect, and behavioral outcome (Pender, Murdaugh, & Parsons, 2006). The first component, individual characteristics and experiences, represents unique personal characteristics and experiences that impact subsequent behaviors, including prior experiences and personal factors. The second component, behavioral-specific cognitions and affect, is of major motivational significance and constitutes a critical “core” for an intervention in motivating individuals towards health-promoting behavior such as perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related affect, and interpersonal influences (family, peers, social support, social norms, and modeling). The final component, behavioral outcome, is the health-promoting behavior such as physical activity (Figure 1.1).

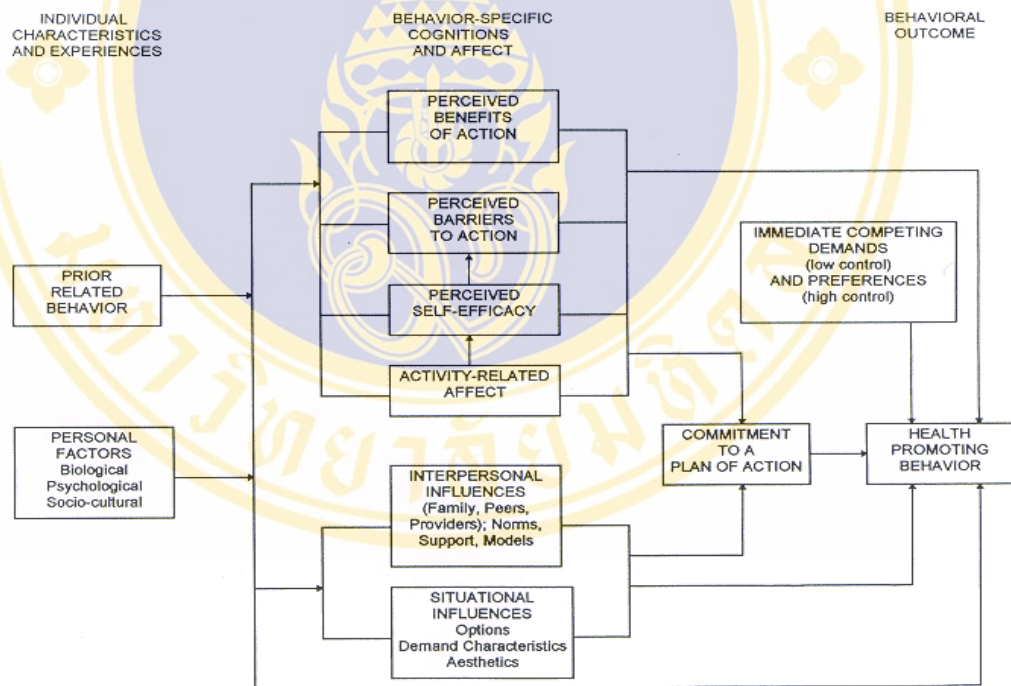


Figure 1.1. Revised Health Promotion Model (Pender, 1996)

As perceived benefits, perceived barriers, perceived self-efficacy, activity-related affect, and interpersonal influence are the factors that have an influence on physical activity, these variables were selected for this study. Self-efficacy is the strongest factor influencing physical activity; therefore, self-efficacy was the strategy used in the intervention program.

Pender's HPM includes perceived self-efficacy; therefore, self-efficacy theory was included in this study. Self-efficacy theory, one of the constructs within social cognitive theory, indicates that the stronger an individual's belief in their ability to perform a course of action, and in the positive outcomes of those actions, the more likely they will initiate and persist in a given activity (Bandura, 1997). People judge how they will be able to perform in a given situation before deciding to act. Then, they infer their capabilities from the imagined outcome. Perceived self-efficacy is a judgment of one's ability to perform a specific behavior, whereas an outcome expectation is a judgment of the likely consequences such behavior will produce. Perceived self-efficacy relates to the outcome expectation, and it affects the individual's decision in each behavior. If perceived self-efficacy is high, the outcome expectation is also high and the individual's likelihood of doing it is high. On the contrary, if perceived self-efficacy is low, the outcome expectation is also low and the individual's likelihood of not doing it is low. In order to increase outcome expectancy, individuals should set a goal and conduct self-monitoring.

Bandura (1998) delineates four ways that self-efficacy belief can be changed in relation to health behaviors. According to Bandura, individuals develop their self-efficacy by interpreting information primarily in four basic ways. Firstly, the most powerful way is through enactive mastery experiences. This is achieved by actually engaging in that behavior in differing situations with success. Outcomes interpreted as successes raise self-efficacy, in most cases, whereas those interpreted as failures lower it. Therefore, the development of efficacy beliefs through enactive experience creates the cognitive and self-regulative facility for effective performance. This development is best achieved by organizing mastery experiences in ways that are especially conducive to the acquisition of generative skills (Bandura, 1986). Secondly, self-efficacy can also be developed through vicarious experiences, or modeling. This source of information is weaker than mastery experience in helping create self-efficacy beliefs. However, in the face of little prior experience with a behavior, individuals develop their beliefs based on those around them. This can be seen in the literature regarding peer pressure or influence in engaging in unhealthy behaviors at an early age. When individuals are uncertain about their own abilities concerning a particular behavior, they become more sensitive to those around them and their

modeling of the behavior. This vicarious experience model is particularly powerful when the persons modeling the behavior are seen as having some of the same or desired attributes as the observers. The observers can use the model's behavior as an evaluative tool by which they can judge their own belief concerning the behavior. The third way is through the verbal persuasion exerted on them by others. This persuasion is used to talk individuals into believing they have the capabilities to engage in a desired behavior even if they initially believe that they do not. The last way to address self-efficacy is through physical and affective states such as anxiety, mood, and elation, which also bear upon self-efficacy. Bandura (1998) discusses this affective state as being an often-overlooked efficacy component. Because of individuals' ability to change moods, they have the ability to change their self-efficacy, and as a result change their thinking in relation to a task.

The proposed physical activity promotion program was adapted from Pender's health promotion model and self-efficacy theory. The self-efficacy strategies consisted of increasing perceived self-efficacy by enhancing the benefits of physical activity, limiting the barriers, increasing interpersonal influences such as social support from peers, enjoyment, and outcome expectation for physical activity through goal setting and records in order to increase perceived self-efficacy, physical activity, and physical fitness (Figure 1.2).

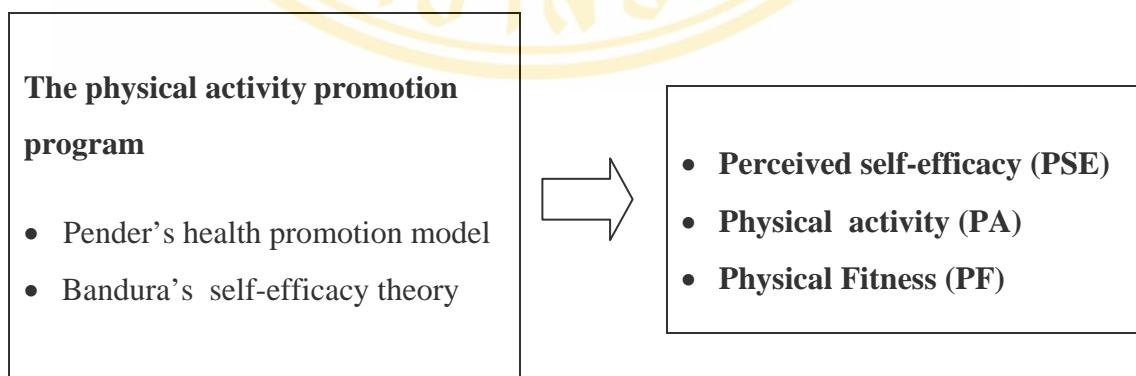


Figure 1.2. Conceptual Framework of the Study

The program to promote physical activity among adolescent girls included group discussion, action of physical activity, and goal setting and self-monitoring for

physical activity. Each session was conducted for approximately 50 minutes for eight weeks, totaling 24 sessions, including the following:

1. Provision of enactive mastery experience: This part included engagement in aerobic dances, provision of knowledge on physical activity, a discussion of participants' experiences of barriers, benefits, and social support of physical activity.

2. Provision of vicarious experience or modeling: This part included showing examples of live and symbolic models, discussion, and performing aerobic dances or exercises.

3. Provision of verbal persuasion: The researcher disseminated knowledge and verbal persuasion during discussion sessions and during participation in physical activity, and promoted social support from the peer group.

4. Provision of physical activity and motivation to act: Physiological and emotional states such as enjoyment, mood, and anxiety were dealt with by playing games, increasing enjoyment, and evaluating before, during, and after participation in this program. The researcher increased positive emotion and decreased the tension during the implementation of the physical activity promotion program by playing games and becoming involved in the physical activity as well as leader activities.

5. Goal setting and self-monitoring: During the group discussion sessions, participants were asked to set their goals which they wanted to accomplish during the forthcoming weeks and record physical activity by themselves.

Operational Definitions

Perceived self-efficacy referred to an individual's judgment or belief in his/her capability to achieve physical activity under a variety of circumstances (Bandura, 1997). In the present study, perceived self-efficacy was measured with the Perceived Self-efficacy to Physical Activity Questionnaire (PSEPAQ) (Wu & Pender, 2002) translated into Thai by Deenan (2003).

Physical activity referred to activity in daily life including occupation; housework; leisure time activities such as competitive sports; recreational activities such as swimming, bicycling, walking and exercise/exercise training; and transportation such as walking and bicycling (USDHHS, 1996). An assessment of physical activity was described in four dimensions including type or mode, intensity

(e.g. degree of vigor), duration (e.g. minutes, hours), and frequency (e.g. times per day, week, or month) of physical activity (Montoye, Kemper, Saris, & Washburn, 1996). In this study, physical activity was measured using the Physical Activity Questionnaire (PAQ) for Thai children of Kijboonchoo and colleagues (2007). The questionnaire assessed how often participants performed physical activity within the past seven days, number of minutes that participants had sedentary behavior such as watching TV, exercising (light activity and moderate activity), playing sports, doing housework, and having transportation that required physical activity.

Physical fitness referred to health-related fitness. Health-related fitness consists of four components: muscular endurance, muscular strength, flexibility, and cardiorespiratory endurance which was determined with 30 seconds of sit-ups, 30 seconds of push-ups, sit-and-reach, and run. In this study, 30 seconds of sit-ups, 30 seconds of push-ups, and sits-and-reaches were tested by a program of the Office of Sports and Recreation Development, Ministry of Tourism and Sports (2005). Running was tested when adolescent girls were asked to run or walk for 800 meters as specified by the International Committee for the Standardization of Physical Fitness Test (ICSPFT, cited in Hiranrat, 1996).

The physical activity promotion program was an eight-week physical activity program provided to adolescent girls in grades 7 and 8. The major purpose of the program was to enhance perceived self-efficacy for physical activity, physical activity, and physical fitness, resulting in adoption and continuation of physical activity. Based on Pender's health promotion model (Pender, 1996) and self-efficacy theory (Bandura, 1997), this program was conducted by the researcher through four strategies of self-efficacy: (1) enactive mastery experiences, (2) vicarious experiences or modeling (3) verbal persuasion from expert sources and peers or social persuasion, (4) and physiological and emotional states including enhancing outcome expectation by goal setting and self-monitoring of physical activity.

Scope of the Study

The present study was a quasi-experimental study which aimed to determine the effects of the physical activity promotion program on perceived self-efficacy, physical activity, and physical fitness of adolescent girls. The adolescent girls who

participated in this program were students studying in grades 7 and 8 at Chonkanyanukoon school and Chonradsadornumrung 2 school, Chonburi province in 2008.



CHAPTER II

LITERATURE REVIEW

This chapter, related literature and research are reviewed in the following six topics:

1. Physical activity, exercise, and physical fitness in adolescents
2. Prevalence of physical activity and physical fitness among adolescent girls
3. Determinants of adolescent girls' participation in physical activity
4. Measurement of physical activity and physical fitness
5. Theoretical bases and empirical research findings for the intervention
6. Studies related to intervention programs to promote physical activity

Physical activity, Exercise, and Physical Fitness in Adolescents

Adolescence is a period of transition during which a child develops into an adult. The length of the adolescence period is difficult to define and may be viewed as ranging from as early as ten to as late as 21 years of age. Adolescence has been defined as having two or three phases. Cobb (1998) differentiates between early, ten to 15 years of age, and late adolescence, 15 to 19 years of age. Crockett and Peterson (1993) differentiate between early, 11 to 14 years of age, middle, 15 to 17 years of age, and late adolescence, 18 to 21 years of age. In the United States, adolescence is generally considered to begin around the ages of 10-11, and end at 21 years of age (Sallis & Patrick, 1994). In Thailand, adolescence in girls is defined as beginning at 11 to 13 years of age. The early adolescence is defined at 13-15 years of age in girls, middle adolescence at 15-18 years of age in girls and late adolescence at 18-21 years of age in girls (Chan-am, 1999). The majority of adolescents with 12 to 14 years of age study in secondary school grades 7 to 8. Adolescence involves the process of forming behavioral patterns, and is a period of great biological, psychosocial, emotional, and cognitive changes including health behavior and lifestyle formation. It

is a phase of development characterized by experimentation with various positive (physical activity) and negative behaviors (smoking and alcohol drinking). The developmental and social transitions occur with great rapidity during late childhood and early adolescence. Social transitions include the move from elementary school to secondary school, with associated changes in peer groups and environment. In late adolescence, the roles of adulthood have to begin to be addressed in every dimension of life. During this time, individuals have to master many new skills and the ways of adult society. They have to assume increasing responsibility for conduct that plays a more decisive role in fostering various life courses. The way in which adolescents develop and exercise their personal efficacy during this transitional period can play a key role (Bandura, 2006). In addition, changes of adolescents' activities are associated with decreased physical activity (Garcia, Pender, Antonakos, & Ronis, 1998). The transition from adolescence to young adulthood, therefore, is an important time to promote physical activity to be habitual.

Definition of physical activity, exercise, and physical fitness

Physical activity, exercise, and physical fitness are terms which are often used interchangeably, but this can be confusing as they are not completely synonymous.

Physical activity refers to the use of large muscle groups, such as movements of the arms and legs. It is defined as “*any bodily movement produced by skeletal muscles that results in energy expenditure*” (Casperson, Powell, & Christenson, 1985). Physical activity is a form of behavior, whereas energy expenditure is an outcome of that behavior. Physical activity is usually described in four main dimensions including type, frequency, intensity, and duration, whereas energy expenditure is measured in kilocalories (kcal) or kilojoules (kj) per unit of time. Physical activity in daily life can be classified by the context in which it occurs including occupation, housework, transportation, or leisure time. Transportation can involve cycling or walking to school or shops. Leisure time activity can be further subdivided into categories such as competitive sports, recreational activities (e.g. swimming, cycling), and exercise/exercise training (USDHHS, 1996).

Exercise and physical activity have been used synonymously in the past, but more recently, exercise has been used to denote a subcategory of physical activity and

is defined as “*physical activity that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is the objective*” (Caspersen et al., 1985).

Table 2.1. Elements of Physical Activity and Exercise (Caspersen et al., 1985)

Physical activity	Exercise
1. Bodily movement via skeletal muscles	1. Bodily movement via skeletal muscles
2. Results in energy expenditure	2. Results in energy expenditure
3. Energy expenditure (kilocalories) varies continuously from low to high	3. Energy expenditure (kilocalories) varies continuously from low to high
4. Positively correlated with physical fitness	4. Positively correlated with physical fitness
	5. Planned, structured, and repetitive bodily movement
	6. An objective is to improve or maintain physical fitness component

Specific forms of physical activity and exercise in which young people might participate include walking, bicycling, playing actively (i.e., unstructured physical activity), participating in organized sports, dancing, doing active household chores, and working at a job that has physical demands. The places or settings in which young people can engage in physical activity and exercise include the home, school, playgrounds, public parks and recreation centers, private clubs and sports facilities, bicycling and jogging trails, summer camps, dance centers, and religious facilities (Baranowski, Bar-Or, & Blair, 1997).

Physical fitness refers to “a set of attributes that relate to the ability to perform physical activity” (Caspersen, 1989). Physical fitness can be classified into health-related and skill-related fitness. Health-related fitness consists of five components: cardiorespiratory endurance, muscular endurance, muscular strength, flexibility, and body composition and is determined by a combination of regular activity and genetically inherited ability. The amount of physical fitness ranges from low to high (Caspersen et al., 1985). On the other hand, skill-related fitness is divided into six

components: agility, balance, coordination, power, reaction time, and speed. In terms of prevention of diseases, the main emphasis of any fitness programs should be placed on the health-related fitness as skill-related fitness is crucial for success in sports and athletics, and it also contributes to wellness (Hoeger & Hoeger, 2005).

Health benefits of physical activity

Existing research evidence indicates that physical activity is beneficial to health of children and adolescents alike (USDHHS, 1996). Benefits from physical activity include both physiological and psychological benefits.

Physiological benefits of physical activity

Most studies have investigated the health effects of physical activity on adults. Empirical evidence has shown that physical activity results in some health benefits for children and adolescents as well. For instance, regular physical activity improves aerobic endurance (Aaron et al., 1993) and muscular strength. Although physical activity will not protect children from a heart attack, it could reduce their risk of future heart attacks. Physical activity, in general, has similar effects on cardiovascular disease (CVD) risk factors in childhood as it does in adulthood. Regular physical activity can reduce the risks of CVD by decreasing blood pressure and cholesterol (Ignico & Mahon, 1995). However, it is noteworthy that physical activity reduces high blood pressures, but normal blood pressures are not affected (Kaplan, Sallis, & Patterson, 1993). Moreover, physical activity appears to increase HDL-cholesterol in children. The association between physical activity and obesity is not clear, however, physical activity helps burn calories and prevent obesity. It increases physical fitness in obese children and decreases the degree of overweight among obese children (Berkey, Rockett, Gillman, & Colditz, 2003; Ekelund et al., 2002). Additionally, benefits in girls are also expected because it is believed that girls who deposit large amounts of calcium in their bones during youth will be protected from osteoporosis later in life when the calcium starts to dissolve from the bones. It appears that regular physical activity enhances the ability of the bone to deposit calcium or increase bone mass density among young people (Baranowski et al., 1997; Cook, Weitzman, Auinger, Nguyen, & Dietz, 2003).

Psychological benefits of physical activity

Even though the mechanisms of the effects of physical activity on emotion are not completely understood, several hypotheses have been proposed, including increased endorphin release during physical activity, as well as changes in serotonergic systems or other neurotransmitters from physical activity (Biddle, 2000). Psychological benefits of physical activity include decreased anxiety, decreased depression, decreased anger, and improved mental well-being. In addition, physical activity improves children's and adolescents' academic performance, improves parental relationships, increases self-esteem and self-concept, and reduces tobacco, alcohol, and marijuana use (Calfas & Taylor, 1994; Collinwood, Sunderlin, Reynolds, & Kohl, 2000; Field et al., 2001; Kirkcaldy et al., 2002; Modrcin-Talbott et al., 1998; Sallis et al., 2000; Strong et al., 2005).

The physical active enhances overall health status both physical and psychosocial. Furthermore, it improves risk factors for chronic diseases in children and adolescents.

Prevalence of Physical Activity and Physical Fitness among Adolescent Girls

Several studies in the United States indicate that there is a decline in physical activity among both girls and boys during adolescence (CDC, 1997; Goran et al., 1998; Kimm et al., 2002). Both girls and boys have similar levels of physical activity before the age of 13; however, after this age, girls are significantly less active than boys are (Kimm; Rolim, Matias, Segato, & Andrade, 2007). National studies have revealed that the prevalence of vigorous activity is higher among boys (60.2%) than girls (47.2%), that only 54% of girls aged 14 -17 years typically engage in vigorous physical activity that stimulates cardiorespiratory fitness (three or more days per week for 20 or more minutes per session), and that only 20% engage in moderate physical activity for at least 30 minutes on five or more days a week (USDHHS, 2000). Moreover, physical fitness has also declined in both adolescent girls and boys (Pate, Wang, Dowda, Farrell, & O'Neill, 2006). Findings from the 1999-2002 National Health and Nutrition Examination Survey has revealed that cardiorespiratory fitness levels among US youths from 12 to 19 years of age is lower than the standards of acceptable cardiorespiratory endurance in girls and boys. According to the U.S.

Department of Health and Human Services (USDHHS, 2008)'s Physical Activity Guidelines for Americans children and adolescents should do 60 minutes (one hour) or more of physical activity daily. Most of the 60 or more minutes a day should be either moderate- or vigorous-intensity aerobic physical activity, and should include vigorous-intensity physical activity at least three days a week. They should include muscle-strengthening physical activity on at least three days in one week. Moreover, as part of their 60 or more minutes of daily physical activity, they should include bone-strengthening physical activity on at least three days per week.

As the patterns and levels of physical activity of children, adolescents and youths are different from those of adults, other consensus panels have recommended one hour (60 minutes) (Cavill, Biddle, & Sallis, 2001; Dietary Guidelines Advisory Committee, 2000) or more hours of moderate-to-vigorous physical activity per day for children (Strong et al., 2005). Similarly, Australia's physical activity recommendations for children and adolescents aged 12-18 year olds is that children and adolescents should participate in at least 60 minutes, and up to several hours, of moderate-to vigorous-intensity physical activity every day. In addition, they should not spend more than two hours a day surfing the Internet, watching TV, or playing video games (Bauman, Schoeppe, & Phongsavan, 2007). The consensus statement from the 1993 International Consensus Conference on Physical Activity Guidelines for Adolescents emphasizes that all adolescents should be physically active every day as part of general lifestyle activities for at least 30 minutes including plays, games, sports, work, transportation, recreation, physical education, or planned exercise. Adolescents should engage in three or more sessions per week of activities that last 20 minutes or more and that require moderate to vigorous levels of exertion. Such recommendations encourage longer bouts of continuous physical activity, which reflects the changing nature of physical activity patterns as youths move into adulthood (Sallis & Patrick, 1994). Moreover, Rowland (1985) recommends that improving physical fitness in children usually requires a training program several times per week for two through three months as with strength or aerobic training. Similarly, Edouard and colleagues' review of studies has summarized that the training programs for children and teenagers, aged four to 18 years, with good health or with

disability, should include two to five sessions from 30 to 60 minutes per week, for six to 16 weeks (Edouard, Gautheron, D'Anjou, Pupier, & Devillard, 2007).

Similar patterns of decline in physical activity by age and gender differences are evident in Thailand. The national survey of Thailand reported that in 2002, 29.6% of Thai people aged six years and older performed regular physical activity and 82.2% of children (six to 14 years old) and 48.8% of the children and adolescents (15 to 24 years old) regularly performed physical activity for 30 minutes three days per week (National Statistical Office, 2003). Another survey conducted by the Office of Sports and Recreation Development, Ministry of Tourism and Sports (2005) demonstrated that the physical fitness level of Thai children and youth tends to decline in the past 20 years, especially when compared with the level reported in a survey carried out in 1984, particularly both girls and boys aged 13 to 15 years and 16 to 17 years (Ministry of Public Health, 2006). Furthermore, adolescent girls are generally significantly less active than boys (Charoneying, 2005; Deenan, 2003; National Statistical Office, 2003; Teeparatana, 1997). Thus, the Ministry of Public Health (2006) recommends that children aged 11 to 14 years should do physical activity at least 2 hours a day. The adolescents aged 15 to 17 years should do 60 minutes (one hour) of physical activity daily. However, adolescent girls should not do vigorous-intensity physical activity but instead do highly effective physical activity to health such as running, swimming, bicycling, and aerobic dance. Additionally, it has been reported that physical activity in adolescent girls needs to increase by intervention programs (Dishman & Buckworth, 1996; Stone, McKenzie, Welk, & Booth, 1998).

Determinants of Adolescent Girls' Participation in Physical Activity

Physical activity is the result of a complex multidimensional form of human behavior, which involves several factors. It is widely accepted that understanding the many factors that influence physical activity may help improve the effectiveness of a physical activity intervention program. In so doing, it is particularly important to understand what activities interest adolescent girls. The effectiveness of programs should be maximized when participants' confidence about their ability to continue physical activities as well as their personal interest are supported (Sallis, 2004).

Biddle and colleagues' systemic review of the literature concerning adolescent girls (Biddle, Whitehead, O'Donovan, & Nevill, 2005) has demonstrated that the majority of studies were conducted in the United States, and others were carried out in the United Kingdom, Canada, Estonia, Taiwan, and other European nations. There are five types of correlates of determinants of physical activity in adolescent girls: demographic and biological (e.g. gender, age, BMI, and family income), psychological (e.g. perceived self-efficacy, perceived barriers, and enjoyment), behavioral (e.g. TV/video viewing and participation in sports), social and cultural (e.g. peers and family's support), and physical environmental variables. Findings on gender and age have shown that gender and age are negatively strong determinants of demographic and biological variables. In other words, lower levels of physical activity are associated with being older and female (Biddle et al., 2005). As for psychological variables, it has been found that self-efficacy (Sallis, 1993; Sallis et al., 2000; Dishman et al., 2004), enjoyment (Dishman et al., 2005), perceived competence, and perceived bodily attractiveness have a positive relationship with physical activity. Also, perceived barriers are found to have a small to moderate relationship with physical activity. Regarding behavioral variables, it has been found that television and video viewing/Internet access are consistently negatively related to physical activity. In addition, with regard to social and cultural variables, it has been reported that family and parental support, particularly the mother's physical activity, and peer involvement and support are positively correlated to physical activity. Finally, physical environmental variables are also considered important, however, they have not been extensively and sufficiently studied. Therefore, it is difficult to draw a firm conclusion on this issue.

Barr-Anderson and colleagues (2007) conducted a study with an aim to examine the association of psychosocial variables with participation in structured physical activity among adolescent girls studying in grades 6 and 7. This study found that adolescent girls with higher self-efficacy and higher enjoyment of physical education class were more likely to participate in structured physical activity. These findings suggest that interventions to increase self-efficacy and enthusiastic participation in physical education classes results in higher physical activity levels among adolescent girls (Barr-Anderson et al., 2007).

Rolim and colleagues (2007) attempted to verify if there are differences in self-efficacy between active and non-active adolescents. The sample of their study consisted of 216 adolescents studying at a public high school in Southern Brazil. The results revealed that boys were significantly more active than girls and that boys had significantly higher self-efficacy scores than girls ($p < 0.01$). Moreover, active girls had higher self-efficacy scores than non-active girls but with no statistically significant difference. Furthermore, active girls who participated in competition teams had higher self-efficacy scores than active girls who did not participate in competition teams ($p < 0.05$). The researchers therefore concluded that competition in sports has more influences on girls' perceived self-efficacy than on boys'.

Phuphaibul and colleagues (2006) investigated levels of physical activity among adolescents in grades 7 to 9 from five regional schools in Thailand. The results of the focus group showed that most of the adolescents perceived benefits of physical activity including physical, psychological, and social benefits. Some of the specific things they mentioned were the ability to stay in shape, an improvement in their overall health, being more energetic, a decrease in stress, improved academic performance, and an improvement in their ability to make friends. According to the adolescent subjects, the disadvantages of physical activity were waste of money, waste of time, a feeling of tiredness, and excess sweating.

In summary, findings of previous studies have led to a conclusion that factors such as gender, perceived self-efficacy, perceived benefits, perceived barriers, preferences, and peer and family support, which influence physical activity among adolescent girls, can establish the effectiveness of intervention programs of physical activity.

Objective of the exercise program

A fundamental objective of exercise prescription is to bring about a change in personal health behavior to include habitual physical activity. Thus, the most appropriate exercise prescription for a particular individual is the one that is most helpful in achieving this behavioral change (ACSM, 2006).

Once the exercise prescriptive has been formulated, it is integrated into a comprehensive physical conditioning program, which is generally complemented by

an overall health improvement plan. The format for the exercise session should include a warm-up period (approximately five to ten minutes), a stimulus or conditional phase (flexibility and resistance training) (20 to 60 minutes), an optional recreational game, and a cool-down period (five to ten minutes). All training (e.g. resistance and flexibility) should be prescribed in specific terms of intensity (how difficult), duration (how long), frequency (how often), and type of activities. Flexibility training can be included as part of the warm-up or cool-down, or undertaken at a separate time. Resistance training is often performed on alternate days when endurance training is not; however, both activities can be combined into the same workout. Cardiorespiratory, flexibility, and resistance training should be integral parts of a comprehensive training program.

- Warm-up and cool-down is an important start and finish to all the forms of exercise in the sections. Warm-up is generally considered important before all forms of exercise start. Warm-up facilitates the transition from rest to exercise, as it increases blood flow to muscles, raising their temperature and improving oxygen delivery at the onset of exercise. The muscles become more compliant with warm-up, and speed of contraction and force-generating capacity may be improved as well (Rowland, 1990).

- Stimulus or conditional phase includes cardiorespiratory endurance, resistance, and flexibility programming. Depending on the individual's goals or outcomes, one, two, or all program areas can be included.

- Recreational activities include the enjoyable recreational activities during (or immediately after) the endurance phase which may enhance adherence. Game modifications should maximize the experience of successful participation; winning or losing should be of lesser importance.

- The cool-down period provides a gradual recovery from the endurance/game phase and includes exercise of diminishing intensities such as approximately five minutes of slower walking, jogging, or cycling and approximately five minutes of stretching exercise.

One example of cardiorespiratory exercise is aerobic or aerobic dance. Aerobic dance is the most common fitness activity for girls and women in the United States. It consists of a combination of stepping, walking, jogging, kicking, and arm

swinging movements performed to music. It is a fun way to exercise, and it promotes cardiorespiratory development at the same time (Hoeger & Hoeger, 2005).

Measurement of Physical Activity and Physical Fitness

Measurement of physical activity

Several techniques have been used to assess physical activity among children and adolescents. These techniques can be categorized under three groups which are criterion standards, secondary (objective) measures, and subjective measures as follows (Sirard & Pate, 2001; Vanhees et al., 2005):

1. Criterion standards

Criterion standards include direct observation, doubly labeled water (DLW), and indirect calorimetry.

1.1 Direct observation is the most practical and appropriate criterion measure of physical activity and patterns of activity. It has many advantages which include the ability to get qualitative and quantitative information regarding an individual experience. The recording of an individual's intensity, duration, frequency, and type of activity can be directly observed and recorded by a trained individual. In general, direct observation has been used in both home and school. It is especially useful for studies of young children who have not developed the cognitive ability to accurately recall detailed information. In other words, the ability of observational techniques to capture short term patterns and sudden changes in physical activity is critical for the study of young children (Sirard & Pate, 2001). However, the weakness of direct observation includes the relatively high experimenter burden and the potential reactivity of the study participants.

1.2 The doubly labeled water (DLW) technique and indirect calorimetry are considered criterion measures for physical activity research because they measure energy expenditure (EE), a physiologic consequence closely associated with physical activity. However, using these methods is impractical for validating a survey that measures usual weekly physical activity, and they are not applicable for assessment in a large group of participants (Kohl, Fulton, & Caspersen, 2000).

2. Objective techniques

There are several objective techniques, such as heart rate monitors and motion sensors with pedometers and accelerometers, which are now widely available for the measurement of physical activity. Different types of monitoring devices have different modes of action.

2.1 Heart rate monitoring is a means of estimating EE or physical activity, but it does not directly measure physical activity. It has been used in both young people and adults and relies on the linear relationship between heart rate and oxygen consumption (VO_2). Heart rate monitoring has been developed because studies have found that heart rate is a good indicator of oxygen consumption.

2.2 Motion sensors include pedometers and accelerometers. Pedometers are designed to measure the number of steps taken. These devices can estimate the energy expenditure by estimating the energy expenditure associated with walking a given distance. The advantages of pedometers are as follows: they are inexpensive, are easy to put on and wear, and can be used in free-living situations. However, pedometers do not measure the intensity, duration, frequency, and total volume of activity (Montoye et al., 1996). Additionally, pedometers generally underestimate the number of steps taken during higher intensity activities and show consistently more errors during slow walking (Sirard & Pate, 2001). On the other hand, accelerometers are more sophisticated electronic devices that measure accelerations produced by body movement. Accelerometers measure acceleration in one or more planes. For example, The Caltrac® monitor is one of the first commercially available accelerometers and has been the most frequently studied. It is a single (vertical) plane accelerometer that either provides “count” values or can estimate EE if biodata (height, body weight, age, and gender) are supplied. The Actigraphs® accelerometers, the CSA® (Computer Science and Application, Inc., Shalimar, FL) is a single plane accelerometers, or the TritracR3D® (Professional Products, Reining International, Madison, WI) is three-dimensional and may provide a more accurate assessment of physical activity. These techniques are used in children; however, the weaknesses include risks of equipment failure, loss, and high cost.

3. Subjective techniques

In children, survey methods are considered subjective techniques because they rely on responses from the child. These techniques include self-reported questionnaires, interviewer-administered questionnaires, proxy-report questionnaires, and activity diaries.

3.1 Self-reported questionnaires: Self-reported instruments are the most widely used type of physical activity measure due to the ease and low cost of implementation (Armstrong & Welsman, 1997). The greatest limitation with these types of measures is their lack of standardization. Therefore, it is important to identify the strengths and limitations of these measures as well as to continually strive to improve their quality. The benefits of self-report measures are ability to collect data from a large number of people at a low cost. However, self-reporting in younger children may lower the correlations because children have limited ability to accurately recall the intensity and duration of their physical activity (Janz, Witt, & Mahoney, 1995). The lack of strong correspondence and the described tendency for overestimation have led to the consensus that children cannot provide accurate self-reported information about their activity patterns. In addition, the nature of children's physical activity is intermittent and characterized by rapid changes from rest to vigorous physical activity, which makes these activities more difficult to recall and quantify, especially in terms of intensity and duration. Thus, self-reported physical activity is not recommended in children younger than ten years of age (Kohl & Hobbs, 1998; Kohl et al., 2000; Sallis, 1991). In order to appropriately employ self-reported instruments, the reliability and validity of self-reports of physical activity have been studied in dimensions of frequency, intensity, and duration (Durante & Ainsworth, 1996; Kriska & Caspersen, 1996; Sallis & Saelens, 2000).

3.2 Interviewer-administered questionnaires: Although providing a trained administrator may improve children's cognition and accuracy, there is still a wide range of correlations for these techniques. The results of studies evaluating interviewer-administered surveys (Simons-Mortan, Taylor & Wei Huang, 1994; Sirard & Pate, 2001) have indicated that one-day or simpler measure of usual physical activity provide greater correlations and older children are better able to complete these types of instruments (Simons-Mortan et al., 1994; Weston, Petosa, & Pate,

1997). Interviewer-administered surveys have many of the same strengths and limitations as self-reported measures.

3.3 Proxy-Reports: Using the parents or teachers as a proxy respondent for young children and adolescents is another means to assess physical activity. Empirical studies have indicated that there is little or no correlation between direct observation and either teachers' or parents' rating of the child's activity (Noland, Danner, DeWalt, McFadden, & Kotchen, 1990; Manios, Kafatos, & Markakis, 1998). With proxy reports, researcher can avoid recall errors caused by children's cognitive limitations. Proxy reports are also suitable for a study with a large population size if a valid and reliable instrument can be developed (Sirard & Pate, 2001).

3.4 Diaries: The activity diary can be used to assess both the time spent on physical activity of different intensity levels and the EE associated with physical activity. A specific MET value is assigned to each intensity level, which allows calculation of total EE and energy expenditure associated with physical activity. It is considered one of the most accurate subjective techniques (Sirard & Pate, 2001) for adults. However, this technique has limited uses in children due to the participant burden required to maintain an activity diary. While adolescents may be able to complete the diary, the accuracy of their reports should be viewed with caution.

Furthermore, an assessment of physical activity includes four dimensions: type or mode (e.g. leisure time or exercise), frequency (e.g. times per day, week, or month), intensity (e.g. degree of vigor), and duration (e.g. minutes or hours) (Ekelund, Aman, Yngve, Renman, Westerterp, & Sjöström, 2002; Montoye et al., 1996). Type or mode refers to different specific activities in which the subjects engaged. The frequency of physical activity refers to the number of sessions of physical activity per unit of time such as day, week, or month. The intensity of physical activity is commonly described as low or light, moderate, vigorous or hard, or very vigorous or strenuous (USDHHS, 1996). At least different approaches have been suggested for expressing the intensity of physical activity when heart rate monitoring is used to assess this activity. The intensity has been expressed as an absolute heart rate, as a percentage of $\dot{V}O_2$ by means of individual calibration for the relationship between heart rate and oxygen uptake. The MET (metabolic equivalents) classification can be a useful tool when calculating energy expenditure from self-reported assessment methods such as

questionnaires and activity diaries. Riddoch and Boreham (1995) have suggested the following intensity levels based on data from children and adolescents: light intensity as 2 to 4 METs, moderate intensity as 5 to 7.5 METs, and vigorous intensity as >7.5. Similarly, Pate (cited in Ekelund et al., 2002) has proposed the following MET values for various intensity levels of physical activity: < 5 METs = light intensity, 5-8 METs = moderate intensity, and > 8 METs = vigorous intensity.

The duration of activity is the length of time in each session. Generally, it is reported in minutes or percentage of time spent being active. Alternately, the amount of activity may be calculated in conjunction with intensity categories.

Measurement of physical fitness

Other proxy measure of physical activity includes measure of fitness. Measurement of physical fitness in children and adolescents is a common practice in school-based physical education. Moreover, it is a common and appropriate practice in preventive and rehabilitative exercise programs. The purposes of health-related fitness testing in such programs include collecting baseline and follow-up data that allow evaluation of progress by exercise program participants and provide data that are helpful in development of exercise prescriptions to address all fitness components. Such testing has also been used in recreational programs, public health assessments, and clinical settings. Typically, a battery of simple field tests, generally four to six tests, is administered to evaluate different components of fitness and/or health (ACSM, 2006). Table 2.2 provides a list of common field tests of physical fitness for children and adolescents, with specific reference to the five components of physical fitness. It is worth noting that some schools and surveys develop their own battery of tests and standards of performance.

The five components of physical fitness are the following:

1. Muscular strength is a component of physical fitness which is the force exerted by a muscle or muscle group in a single maximum contraction.
2. Muscular endurance is the ability of a muscle or muscle group to sustain repeated contractions. If the total number of repetitions at a given amount of resistance is measured, the result is termed absolute muscular endurance.

Out of the laboratory, tests of muscular strength and endurance usually involve such calisthenic movements as sit-up and pull-up/push-up, in which the subject is

required to perform as many repetitions as possible in a specified time period. The reliability of sit-up is 0.6 to 0.8, whereas push-up usually has reliability coefficients of a magnitude greater than 0.8 (Safrit, 1990).

Table 2.2. Field Tests for Children (adapt from ACSM, 2006)

Health fitness component	Field test
Muscular fitness (muscular strength and endurance)	Curl-up test (sit-and-reach) test Pull-up/push-up test
Flexibility	Sit-and-reach test
Cardiorespiratory fitness/endurance	1 mile run/walk
Body composition	Body mass index or skin folds

3. Muscular flexibility is the range of motion about a joint or the resistance to it. Flexibility depends on a number of specific variables, including distensibility of the joint capsule, adequate warm-up, and muscle viscosity. In addition, compliance of various other tissues such as ligaments and tendons affects the range of motion (Thygeson, 1989). The test that is mostly used outside the laboratory is sit-and-reach. Validity of sit-and-reach with laboratory tests has not been well substantiated, but the reliability has been high (Pate, 1991).

4. Cardiorespiratory (CR) endurance or cardiorespiratory fitness is related to ability to perform large muscle, dynamic, moderate-to-high intensity exercise for prolonged periods. Performance of such exercise depends on the functional state of the respiratory, cardiovascular, and skeletal muscle systems. Oxygen must be present when muscles continuously exercise for a prolonged periods. The type of exercise in which oxygen is being utilized during activity is called aerobic exercise. The assessment of CR fitness is an important part of a primary or secondary intervention program. The extent of cardiorespiratory development (improvement in VO_{2max}) depends on the intensity, duration, and frequency of the activity. A common measure of cardiorespiratory endurance in large groups of children in the field is the mile run/walk. However, these tests tend to be more valid with older children (Pate, 1991).

5. Body composition is the measure of the amount of lean body mass (e.g. muscles, bones, skin, and blood) and adipose tissue (fat mass) in the human body.

Indirect measures of body composition include weigh for height (BMI) and anthropometry or measurement of skinfold thickness (Martin & Ward, 1996 cited in Rice & Howell, 2000).

Theoretical Bases and Empirical Research Findings for the Intervention

Appropriate theoretical models are necessary for implementing a physical activity intervention program in adolescent girls. Because physical activity is a result of a complex multidimensional form of human behavior, appropriate theoretical model should involve multiple factors that are both internal and external to the individual and promote behaviors. Pender's health promotion model (Pender's HPM) (1996) can serve as a guide for exploration of the complex biopsychosocial processes that motivate individuals to engage in health behaviors directed toward the enhancement of health such as physical activity (Pender, 1996). Pender's HPM is composed of three components: individual characteristics and experiences, behavior-specific cognition and affect, and behavioral outcome (Pender et al., 2006). The first component, individual characteristics and experiences, represents unique personal characteristics and experiences that impact subsequent behaviors, including prior experiences and personal factors. The second component, which consists of six variables: perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related affect including commitment to a plan of action and immediate competing demands and preferences, interpersonal influences (family, peers, norms, social support, and modeling), and situational influences. The final component, behavioral outcome, is the health-promoting behavior such as physical activity. The components and variables are related to one another. Individual characteristics and experiences, perceived benefits, perceived barriers, perceived self-efficacy, activity-related affect (enjoyment), and interpersonal influences (social support and modeling from peers) were selected in this study.

One of the major theoretical perspectives of Pender's HPM is derived from the social cognitive theory. One integrative review of Pender's HPM (Srof & Velsor-Friedrich, 2006) explored this model in relation to adolescent health. The published studies focusing on adolescents are not numerous, as they are only approximately 13 studies in print (Frenn & Malin, 2003; Frenn et al., 2003; Garcia et al., 1995; Garcia

et al., 1998; Pender, Bar-Or, Wilk, & Mitchell, 2002; Robbins, Pender, & Kazanis; 2003; Robbins et al., 2004; Wu & Pender, 2002, 2005; Wu et al., 2003; Wu & Jwo, 2005). All of the studies focus on exercise or physical activity except for one which concentrates upon asthma. The components of Pender's model and its supporting theoretical underpinnings based on the social cognitive theory are summarized. The social cognitive theory is a model that explains the nature of behavioral change within the context of larger social structures. The nature of human agency, or the ability to control life event, is explained as a triadic reciprocal relationship between behavior, interpersonal factors (cognitive, affective, and biologic), and external factors (Bandura, 1977). Self-efficacy is a central construct under investigation in each of the reviewed studies. In addition, self-efficacy has been supported as the strongest predictor of health-promoting behavior in adolescents (Reynolds et al., 1990; Srof & Velsor-Friedrich; Wu & Pender). Deenan (2003) conducted a study with Thai Adolescents. The purpose of the study was to understand exercise behavior and evaluate the use of Pender's health promotion model for bilingual Thai Adolescents. Three hundred-eleven bilingual Thai Adolescents (average age=14 years) completed the questionnaires. The results revealed that the individual characteristics and life perspective had indirect effects on exercise through perceived benefits ($\beta = 0.29, p < 0.001$) and perceived self-efficacy ($\beta = 0.19, p < 0.01$). Moreover, seeking health had indirect effects through perceived barriers ($\beta = -0.22, p < 0.001$), perceived benefits ($\beta = 0.20, p < 0.001$), and perceived self-efficacy ($\beta = 0.22, p < 0.001$). Finally, gender had indirect effects on exercise through perceived benefits ($\beta = 0.18, p < 0.01$) and perceived self-efficacy ($\beta = 0.16, p < 0.01$). Within the behavior-specific cognitions and affect construct, immediate competing demands had a direct effect on exercise behavior ($\beta = -0.11, p < 0.05$). The final model explained 53% of the total variance. Perceived self-efficacy was the strongest predictor of exercise ($R^2 = 0.22, p < 0.001$). Thus, based on these findings, this study suggested that increasing participation in exercise or physical activity behavior among adolescents should include interventions especially designed to involve self-efficacy strategy.

Self-efficacy has been considered as an important personal determinant of human behavior (Bandura, 1977). Self-efficacy can be defined as the beliefs an individual has about his or her ability to engage in behavior that lead to expected

outcome. These beliefs influence decisions about whether a behavior will be adopted and maintained; therefore, self-efficacy is important in the promotion of physical activity.

There is an important distinction between efficacy and expectation that must be addressed. Self-efficacy expectations are defined in the social cognitive theory as beliefs individuals have in their capability to successfully execute a given behavior (Bandura, 1997). Information about self-efficacy is gleaned in four ways for developing self-efficacy. First, enactive mastery experience is provided by giving knowledge regarding physical activity of adolescents, discussion of participants' experiences of barriers, benefits, and social support of physical activity, as well as performing aerobic dances or exercises. Second, vicarious experience or modeling provided by showing examples of a live and symbolic model with discussion, and performing aerobic dance or exercise. Third, verbal persuasion is provided through discussion, encouragement, and support from the peer group exercise to perform the exercise. Lastly, physiological and emotional states such as enjoyment, mood, and anxiety are enhanced through games, increase in enjoyment, and evaluation conducted before, during, and after the participation in physical activity promotion program. In addition, enhancing outcome expectation can be done by means of goal setting and self-monitoring. Such efficacy-enhancing interventions have been found to increase physical activity among both children (Stone et al., 1998) and adults (McAuley, Courneya, Rudolph, & Lox, 1994).

When considering intervention effectiveness, it is necessary to first decide the outcome variable on which rating of effectiveness will be based. For instance, effectiveness could be gauged in terms of behavioral changes (e.g. change in amount of physical activity), physiological changes (e.g. aerobic fitness), cognitive changes (e.g. knowledge and perceived benefits) or affective changes (e.g. attitudes). In addition, Rowland (1990) points out that exercise or physical activity interventions for children and adolescents require motivational factors. One of the motivational keys to exercise is the idea of exercise being fun. Exercise programs for children have little hope of being successful unless they are enjoyable, successful, supported by peers, and involve family participation. Extrinsic motivational techniques to be used with

children and adolescents are different from those of adults. For example, for children and adolescents, material rewards such as free tee shirts can be used.

Thus, in the present study, the intervention program was designed using self-efficacy strategies. The strategies included enhancing the benefits of physical activity, limiting the barriers, increasing interpersonal influences (social support from peers, parents, and family), increasing enjoyment, and increasing outcome expectancy through goal setting and self-monitoring of physical activity.

Studies Related to Intervention Programs to Promote Physical Activity

Although Pender's health promotion model may not be widely used in intervention programs to increase physical activity behavior among adolescent girls in particular, there are several studies on social cognitive theory (self-efficacy). Most of the interventions to increase physical activity in children and adolescents were conducted at a classroom-based health education level with a focus on the provision of information and a school-based level with physical education or curriculum.

For example, Salmon and colleagues' systematic review (2007) represents a summary of the evidence of the effectiveness of interventions. They report physical activity outcomes in children aged four to 12 years and adolescents aged 13 to 19 years. Most interventions were conducted within a school setting (57 interventions), and nine were conducted in the family settings. In addition, 42 interventions involved children and 25 intervention involved adolescents. Most of the interventions (57 interventions) were conducted in the United States, with the remainders conducted in Canada, the United Kingdom, Ireland, Greece, Belgium, Finland, Spain, and Australia. The children's physical activity interventions that were most effective in the school setting included some focusing on physical education, activity breaks, and family strategies. However, it was found that many studies had methodological and reporting faults such as lack of baseline data, poor study design, physical activity measures of unknown reliability and validity, and poor reporting of sample size, year of interventions, and duration of interventions (Salmon et al., 2007).

There are two intervention approaches that make use of Pender's health promotion model and combine it with another model for adolescents (Frenn et al., 2003; Robbins et al., 2006). The first research, conducted by Frenn and colleagues

(2003), employed a quasi-experimental with pre-post design with a four-session multimedia (Internet, video, gym, and snack lab intervention) using Pender's Health Promotion model and the transtheoretical model (TTM) with middle school students. The hypotheses of study were that students in the intervention group would demonstrate significantly less dietary fat intake and greater physical activity than the control group. They also predicted differences based on sex and socioeconomic status of the students. Independent variables, reflective of the HPM, included perceived benefits of exercise, perceived barriers to exercise, dietary health promoting behavior, and access to healthful dietary and exercise resources. The findings suggested no significant differences between groups for percentage dietary fat and physical activity. Both groups demonstrated decreases in physical activity, but the level of decline was significantly less in the intervention group than in the control group. The reason for this was that the intervention was perhaps of insufficient strength to support increases in physical activity (Frenn et al., 2003).

Similarly, Robbins and colleagues (2006) conducted a study with sedentary girls using Pender's HPM and TTM. The purpose of the study was to determine the feasibility of an individually tailored computerized physical activity program in addition to nurse counseling intervention to increase participation. A pretest-posttest control group design was used with 77 racially diverse sedentary girls in grades 6, 7, and 8 from two middle schools. Each of the instructional grades was randomly assigned to either an intervention or control group. The intervention program consisted of the following: tailored feedback messages via computer about setting goal; receipt of one-page age-specific recommendations for physical activity and mailed parent tip sheet (baseline); a nurse counseling session from research staff by phone call (10 minutes) or a mailed letter focusing on previous goals (1th week and 6th week); completion of computerized questionnaires targeting perceived physical activity barriers and self-efficacy and receipt of tailored feedback messages (3th week and 9th week); and completion of computerized questionnaires via computer (12th week). The control group only received a handout listing the physical recommendations. Baseline data (pretest) were collected at the 1st week and posttest data were collected at the 12th week. The results demonstrated no differences in self-reported physical activity between the intervention and control groups at weeks 1

(baseline) and 12 (post-intervention). However, the intervention group had significantly greater social support across time than did the control group ($p = 0.019$). It is worth noting that the duration of intervention was short, only four times for 10 minute per time, to consult and develop self-efficacy of adolescent girls. Furthermore, self-report physical activity was considered a socially desirable behavior.

There are several intervention research studies that used social cognitive theory, self-efficacy theory, or combined other theories with the eventual goal of increasing self-efficacy and physical activity.

For example, as regards self-efficacy theory, Hommel (2007) conducted a quasi-experimental study to determine the effects of the “Finding Your Voice Program” based on self-efficacy theory on perceived physical activity self-efficacy among pre-adolescent girls aged ten to 13 years. Forty participants attended the program, and each completed a self-efficacy measure prior to and following completion of the program. The results revealed that the participants had higher self-efficacy scores than before attending the program because they developed self-efficacy through interpreting information primarily, encouragement and support from peer group, and actually engaging in that behavior.

Jamner and colleagues (2004) conducted quasi-experimental research with 25 tenth and eleventh graders who received a school-based intervention program at one high school and 22 tenth and eleventh graders who did not receive any intervention program at another high school. A school-based intervention program was designed to increase physical activity among sedentary adolescent girls. Participants in the intervention school enrolled in a special physical education (PE) class available only to study members. This class met five days a week for 60 minutes each day. The types of activities offered in the course were selected based on focus groups with members and included aerobic dance, basketball, and swimming. One day a week of class time was devoted to a lecture or discussion focusing on the health benefits of physical activity and strategies for becoming physically active. Strategies used to change behaviors included self-monitoring, goal setting, problem solving, and focus group. A one-mile run test was administered in usual PE classes, and aerobic dance was performed in class twice a week. All participants completed clinical and behavioral assessments at baseline and after four months. Physiological tests included

cardiovascular fitness (VO_2 peak via ergometer), body composition, and body mass index. Psychosocial assessment included physical activity recall, report of lifestyle activity, self-efficacy, perceived barriers, social support, and enjoyment related to physical activity. The results indicated that the intervention program had a significant effect on cardiovascular fitness ($p = 0.017$), lifestyle activity ($p = 0.005$), light ($p = 0.023$), moderate ($p = 0.007$), and hard ($p = 0.006$) activity (Jamner, Spruijt-Metz, Bassin, & Cooper, 2004). There were no effects of the intervention on psychosocial factors (self-efficacy, social support and enjoyment) related to exercise. However, limitations of this study included a lack of random assignment, a reliance on self-reported physical activity, and some participants who demonstrated poor school attendance and a negative attitude.

One research study (Dishman et al., 2004) evaluated the effects of the Lifestyle Education for Activity Program (LEAP), a comprehensive school-based intervention program emphasizing changes in instruction and school environment, on variables derived from social ecological theory as mediators of change in physical activity among adolescent girls in South Carolina, U.S.A. There were 1,038 girls in the control group and 1049 girls in the experimental group. The multicomponent intervention emphasized the enhancement of self-efficacy and development of behavioral skills by using curricular activities within physical education classes and health education instruction. Results revealed that the intervention had direct effects on self-efficacy and physical activity and that self-efficacy partially mediated ($F_{2, 21} = 3.51, p = 0.05$) the effect of the intervention on physical activity ($F_{2, 21} = 4.39, p = 0.02$). The effect of intervention on self-efficacy ($r_{25} = 0.07$) and self-efficacy on physical activity ($\beta_{62} = 0.08$) showed that increase in self-efficacy directly resulted in increased physical activity among adolescent girls (Dishman et al., 2004). In another study of Dishman and colleagues (2005), the LEAP intervention was applied with the purpose to increase physical activity among adolescent girls. The findings demonstrated that the intervention had positively direct effects on physical activity and factors influencing enjoyment of physical education, which subsequently explained the effect of increases in physical activity enjoyment and self-efficacy on increased physical activity. Put another way, increase in enjoyment partially mediated the positive effect of the LEAP intervention (Dishman et al., 2004).

Wang's (2004) quasi-experimental research was conducted with 46 eighth grade females in the southeastern US, with 24 students randomly assigned into the goal setting group (intervention group) and 22 students into the "do your best" group (control group). The purpose of Wang's research was to investigate the effects of goal-setting on female adolescents' motivation towards exercise as well as to measure their actual level of physical activity. A one-week baseline and six-week intervention was conducted to collect physical activity levels (step count) by using the YamaxSW-701 electric pedometer. The Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) was employed to collect the motivation scores before and after the study. Participants in the goal setting group used goal-setting strategies including provision of physical activity information, self-monitoring, feedback, resetting goals, and analysis of their own exercise behavior. The results indicated that there were significant main effects of time (seven weeks) and interaction of time by group for step counts. Also, there was a significant interaction effect of time by group in motivation (autonomy), but no main effect of time was found. These findings showed that participants were motivated by goal setting and instrument assessment (pedometer). More, they were enthusiastic and interested in participation in using pedometer.

Hortz (2005) conducted quasi-experimental research with pre- and post-test design based on social cognitive theory with students studying in grades 9-12. The purpose of the study was to evaluate social cognitive theory based intervention; this theory was designed to increase the frequency of leisure time planned as a way of exploring moderate and vigorous physical activity among high school students. The sample consisted of 143 students in the intervention group and 97 students in the control group. The control group received basic skill mastery which was achieved in the sport, while the experimental group received the same basic skill mastery and skills necessary to develop a leisure time physical activity program after school. Moreover, students were taught self-regulation skills (e.g. goal setting, strategic planning ability, and self-monitoring), all aimed at developing an ability to direct their physical activity behavior. Students also received information on strength of self-efficacy, outcome experiences, and social situation that targeted changing the students' perceptions of the outcomes resulting from physical activity and their ability to overcome barriers to physical activity. The ten lessons combined class content with

homework assignments. The program was conducted for 10 weeks before the post-test was administered. Data were collected by means of self-administered questionnaires. The study findings indicated that the experimental group had a significantly higher rate of moderate physical activity than the control group at posttest ($p = 0.025$) (Hortz, 2005). The significance of this program was participants' ability to overcome barrier to physical activity, practice skills, goal setting, strategic planning ability and self-monitoring.

In Thailand, few studies have analyzed intervention programs to increase physical activity in adolescent girls and boys using self-efficacy theory, and there are even fewer studies which utilized Pender's health promotion model. For example, Maneedang (2007) conducted a study to examine the effects of a health behavior development program applying self-efficacy theory and social support to improve dietary and exercise behavior in overweight students. The sample consisted of overweight students aged ten to 12 years from two schools. One class was selected to be the experimental group with 31 students and the other was selected to be the control group with 32 students. This program was conducted for five weeks with a four-week follow-up. Data were collected by means of self-administered questionnaires. The results revealed that the experimental group's mean scores of perceived self-efficacy and exercise behavior obtained after the program were higher than those obtained before the program and higher than those of the control group ($p < 0.05$).

Traetulakarn (1998) conducted a quasi-experimental study to determine the effectiveness of a promotion program to increase exercise applying self-efficacy theory and participatory learning to exercise for health of late adolescent first-year nursing students from Boromarajonani College of Nursing. In this study, weekly interventions were implemented five times, each lasting one hour, for six weeks. During the 7th week to 10th week, the researcher observed exercise behavior of nursing students and recorded their exercise behavior. The researcher collected data 11 weeks after the pretest. Results showed that the experimental group gained significantly better knowledge, had higher perceived self-efficacy, and showed more exercise behavior in the posttest than in the pretest and than those of the control group ($p < 0.05$).

An intervention promoting good food consumption behavior, Hongchuvech's quasi-experimental research (1997) studied the effectiveness of a health education program with application self-efficacy theory and social support from the parents and friends. Eighty-five students were simple randomly selected from 2 secondary schools. Thirty-nine students were assigned as the experimental group and 46 students were assigned as control group. The experimental group participated in an intervention program for 8 weeks. The results revealed that the experimental group had better significantly self-efficacy and food consumption behavior than before the experiment ($p < 0.05$).

Similarly, Suwannathorn's quasi-experimental research (2000) studied the effectiveness of a health education program on food consumption behavior applied self-efficacy theory and social support for 10 weeks. The samples consisted of 104 sixth grade students in Tatakeab district, Chachengsao province. Fifty two students from one school were assigned as the experimental group, who received a health education program and 52 students from the other school were the control group. The results showed that students in the experimental group had significantly higher perceived self-efficacy and food consumption behavior than in control group ($p < 0.05$).

Kuysuwan's quasi-experimental research (2000) studied the effectiveness of health education program on weigh control. The samples were obese early adolescents, ages 10 to 12, in Bangkok. Fifty obese early adolescents from Wat Parinayok school were assigned as the experimental group and 48 obese early adolescents from Wat Amarindrama as the control group. The results showed that students in the experimental group had significantly higher perceived self-efficacy and practice in weight control than before attending the program and those of the control group ($p < 0.001$).

Srisuan (2005) carried out a quasi-experimental study to determine the effects of an intervention promoting on good food consumption behavior using self-efficacy theory among grade 5 students in Ubon Rachathani province. There were 44 students in the experimental group and another 44 students in the control group. The experimental group participated in an intervention program to increase self-efficacy biweekly for six times, each lasting one hour to increase good consumption behavior.

The results showed that the mean scores of knowledge and perceived self-efficacy on good food consumption behavior of the experimental group were significantly higher than those of the control group. Also, the mean scores of knowledge and perceived self-efficacy on good food consumption behavior of the experimental group obtained before the intervention were significantly higher than those obtained after the intervention.

Most of the intervention programs in Thailand effected on perceived self-efficacy and behavior because these programs emphasized learning from live model, practice skills and motivation by verbal persuasion. However, there was no motivation in activity behavior competition or physical activity and planning to set goals.

Kijboonchoo and colleagues (1999) conducted quasi-experimental research, Nutrifit programme to improve health-related fitness among Thai schoolchildren. A Nutrifit programme, consisting of a nutrition education and physical training model, was developed by modifying an established Fitnessgram as a tool. The programme was tested among 514 schoolchildren aged 8-9 years who were enrolled in two provincial government schools (A and B) and two private schools (C and D) in the Bangkok Metropolitan Area. Health-related fitness tests—1 mile walk/run, curl-up, trunk-up, push-up, and sit and reach—using the Fitnessgram were administered in all four schools, followed by the Nutrifit programme intervention in schools B and D. The intervention included 10 nutrition and physical training education sessions during the regular physical education classes. During the seven-month programme period, though the nutritional status of children did not show a significant change, improvement in health-related fitness tests was noted in both non-intervened and intervened schools. However, it was recommended that the Nutrifit programme be incorporated into the school curriculum as a measure of nutrition and fitness aimed at health promotion and disease prevention (Kijboonchoo, Thasanasuwan, & Yamborisut, 1999). This study need for giving star labels to children for promote performance. The program might be desirable to create a sense of healthy competition.

In their study, Sallis and colleagues (1997) applied SPARK (sport, play, and active recreation for kids) with fourth and fifth grade students in order to increase physical activity and physical fitness. Seven elementary schools were assigned to one of three conditions in a quasi-experimental design consisting of experimental class,

SPARK, which had physical education specialist-led condition, trained classroom teacher-led condition, and control class. The SPARK physical education classes were designed to promote high levels of physical activity, teach movement skills, and make physical activity enjoyable. Physical education class was conducted three days a week. A typical SPARK lesson lasted 30 minutes and was composed of two parts: health-fitness activities (15 minutes) and skill-fitness activities (15 minutes). Furthermore, the self-management program was taught weekly in 30-minute classroom sessions, and the skills promoted included self-monitoring, goal setting, stimulus control, self-reinforcement, self-instruction, and problem solving. Students from these classes were compared with those in the control classes. Analyses were conducted with 955 students with complete data, and the results revealed that students in the specialist-led (40 minutes) and teacher-led (33 minutes) physical education classes spent more minutes per week being physically active than those in the control classes (18 min) ($p < 0.001$). After two years, girls in the specialist-led condition were superior to girls in the control condition on abdominal strength and endurance (sit-up) and cardiorespiratory endurance (run) ($p < 0.001$) as well. However, there were no effects on physical activity outside of school (Sallis, McKenzie, Alcaraz, Kolody, Faucette, & Hovell, 1997). This intervention program did not adequately implemented although it might have been well designed. The program increased physical activity during physical education classes but not out of school because increased children's physical activity relied mainly on external control, such as parental reinforcement or social support.

These studies demonstrate beneficial effects of physical activity or exercise programs among children and adolescents, both boys and girls. It is noteworthy that some of these studies specifically targeted adolescent girls. However, a gap of knowledge still exists because physical activity is the result of a complex multidimensional form of human behavior. The most effective programs, measurements, and duration of intervention have not yet been undertaken. Many studies did not employ motivation strategies, enjoyment, goal setting, and practicing to enhance regular physical activity behavior.

Conclusion

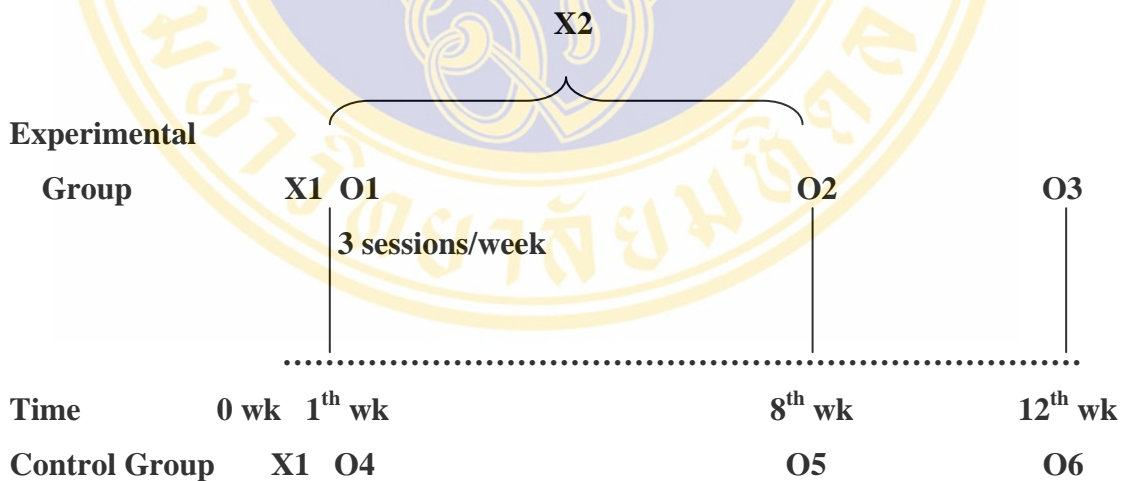
Children are in the most physically active time of life, and levels of physical activity decline during adolescents. Adolescent girls constitute one population group whose health has been adversely affected by an extremely high risk of inactivity. Decreased physical activity in adolescents occurs due to increased participation in sedentary behaviors or inactivity. Sedentary adolescents are more likely to become overweight or develop chronic diseases such as diabetes or coronary heart disease. These are important issues in Thailand, the United States, and other developed and developing countries. Therefore, the promotion of physical activity among adolescent girls should include intervention programs designed to increase the strongest factor influencing physical activity. A theory that promotes a human behavioral change should involve multiple factors including motivated individuals. The appropriate theoretical models for behavioral changes include Pender's Health Promotion Model (Pender, 1996) and self-efficacy theory (Bandura, 1986). In Pender's HPM, behavior-specific cognitions and affect (perceived benefits, perceived barriers, perceived self-efficacy, enjoyment, and interpersonal influences) is a major source of motivation for adolescent girls, and it is believed to lead to increased physical activity behavior and physical fitness. Moreover, perceived self-efficacy is one of the constructs within social cognitive theory that enhance physical activity behavior. One of the central objectives of this study was to promote physical activity behavior including physical fitness and perceived self-efficacy of adolescent girls in the 7th and 8th grades. The main strategy of the study was to increase self-efficacy, motivation, and participation in goal setting and self-monitoring.

CHAPTER III METHODOLOGY

The purpose of this study was to determine the effects of a physical activity promotion program on perceived self-efficacy, physical activity, and physical fitness of Thai adolescent girls studying in grades 7 and 8.

Research Design

A quasi-experimental research design was used to determine the effects of a physical activity promotion program on perceived self-efficacy, physical activity, and physical fitness of adolescent girls studying in grades 7 and 8. In this study, data were collected at baseline, as well as at the eighth and 12th weeks after the completion of the intervention.



Control group: (X1) Participants received general information of physical activity.

Experimental group: (X1) Participants received general information of physical activity and (X2) the physical activity promotion program.

O1, O4: Baseline data collection

O2, O5: Data collection at the eighth week

O3, O6: Data collection at the 12th week

Research Setting

The study was conducted at public schools with grades 7 and 8 aged 11-14 years. The schools were of similar size (middle size, with 500-1,499 students) and were situated in the same area in Chonburi province for both the control and the experimental groups. The distance between the school where the experimental group was studying and the school where the control group was studying was eight kilometers. The directors of both schools granted the researcher the permission to collect data at the schools and allowed the students to participate in this study.

Population and Sample

The population of this study was adolescent girls studying in grades 7 and 8 at two public schools, Chonkanyanukoon school and Chonradsadornumrung 2 school, in Chonburi province. The seventh grader had nine classrooms, 197 adolescent girls, and the eighth grader had seven classrooms, 134 adolescent girls, of Chonkanyanukoon school. Chonradsadornumrung 2 school, the seventh grader had seven classrooms, 121 adolescent girls, and the eighth grader had five classrooms, 76 adolescent girls.

Inclusion criteria

Eligible participants recruited into the study met the following inclusion criteria: 1) The adolescent girls were not participating in any athletic programs; and 2) Their parents had given a consent for them to participate in this study.

Exclusion criteria

The participants were excluded from the study if they had any illnesses or conditions that would limit physical activity.

Sample size

The approximate sample size in this study was determined based on a power analysis with the significance level of 0.05 and a desired power of 0.80. The sample size was based on the effect size of 0.35 from the meta-analysis of physical activity interventions by Dishman & Buckworth (1996) which identified 127 studies that examined the benefits of increasing physical levels in more than 131,000 participants (children, adolescents, and adults) in various settings (community, workplace, school, home, and healthcare setting). It was found that the average effect size of physical activity was moderately large, at 0.34. Another meta-analysis of 44 studies examined

the relationship between physical activity and cognition or academic performance in children (young elementary to high school), and the findings revealed that the effect size of quasi-experimental research was 0.37 (Sibley & Etnier, 2003). Thus, in this study, the effect size was set at 0.35.

As regards effect size, Cohen (1988) has demonstrated that a small effect size is equal to 0.2, a medium effect size is equal to 0.5, and a large effect size is equal to 0.8. When the effect size is equal to 0.35, the degree of freedom is equal (u) to 2 ($k-1$, k = number of dependent variables = 3) (Cohen, 1988, p. 390), the power analysis with the significance level of 0.05 and a desired power of 0.80, the sample size from Table should be at least 27 subjects per group (Cohen, 1988, p. 384) for a total sample of 54. In the United States, previous intervention studies with a one-year follow up conducted with female students in grade 8 revealed a 34.58% attrition rate (Pate, Ward, Saunder, Felton, Dishman, & Dowda, 2005). Therefore, this study recruited 50 participants per group which the assumed attrition rate of 85%.

If sample size is not read from the table, it will be computed by using the equation:

$$N = \frac{n_{0.05}}{400f^2} + 1 \quad (\text{Cohen, 1988, p. 390})$$

Where $n_{0.05}$ is the necessary sample size for the given α (significance level) = 0.05 (read from the table = 1286) (Cohen, 1988, p. 384), desired power = 0.80, $u = 2$, and f is the nontabled effect size = 0.35

Substituting in the equation:
$$N = \frac{1286}{400(0.35^2)} + 1 = 25.24$$

The sample size was near the number of 27 as reading from the table.

Instrumentations

There were two types of instrumentations. The first type was the research instrument, which was the manual of the physical activity promotion program; the second type was the data collection instruments.

The manual of the physical activity promotion program: The manual of the physical activity promotion program was developed by the researcher based on the constructs of Pender's health promotion model. Pender's health promotion model includes self-efficacy theory to increase perceived self-efficacy and action to perform physical activity. The physical activity promotion program included self-efficacy strategies to increase perceived self-efficacy by enhancing the benefits of physical activity, limiting the barriers, and increasing interpersonal influences such as social support from peers, parents, and family, enjoyment, as well as outcome expectancy of physical activity. The program made use of group discussion, action, goal setting, and self-monitoring.

The program outline was as follows:

- Knowledge of physical activity
- Playing games
- Discussion of participants' experiences of barriers, benefits, and social support of physical activity including verbal persuasion during discussion sessions and participation in physical activity
- Doing exercise and aerobic activities
- Goal setting and self-monitoring

The content of the manual consisted of knowledge of physical activity and a physical activity notebook for children to plan for goal setting and physical activity recording in the past seven days. The video for performing aerobic exercise/dance consisted of three VCDs: (1) "Thai Kids on the Move" produced by Coca-Cola group, (2) "Salsa Aerobic Dance" produced by Pfizer Co., Ltd., and (3) "Aerobic Dance" produced by Ministry of Public Health. These VCDs were used some parts of them. The manual was reviewed by five experts to ensure content validity. These experts consisted of a physician who was a specialist in physical activity, a university lecturer who was an expert in sport psychology, a specialist in exercise and sports for health in school, a nursing instructor who had experience studying physical activity in adolescents, and a nursing instructor who had experience studying physical activity. The manual was revised according to the experts' comments and suggestions (see Appendix I). The details of this program are illustrated in Appendix C.

Instruments for data collection

1. Personal Data Sheet: A personal data sheet was developed by the researcher. The questionnaire was used to collect demographic and socioeconomic data of the participants such as body weight, height, and family income.

2. The Perceived Self-efficacy to Physical Activity Questionnaire (PSEPAQ): The PSEPAQ was modified from the questionnaire called Perceived Self-efficacy to Physical Activity Scale (Wu & Pender, 2002) which was translated into Thai by Deenan (2003) to assess perception of self-efficacy to physical activity among bilingual Thai adolescents. The PSEPAQ was a unidimensional instrument composed of 14 items. The participants were required to rate each of the item with the responses ranging from 'not at all confident' (0%) to 'very confident' (100%). The internal consistency reliability of the PSEPAQ was 0.89 when applied with 977 Taiwanese secondary school students (Wu & Pender, 2002), and 0.89 and 0.90 when used with 311 bilingual Thai high school students for the English and Thai versions, respectively (Deenan, 2003).

3. The Physical Activity Questionnaire (PAQ): The PAQ for Thai children was developed by Kijboonchoo and colleagues (2007). The questionnaire assessed how often participants performed physical activity within the past seven days, number of minutes in each day that participants had sedentary behavior such as watching TV (1st item), exercising (light activity: 2nd item and moderate activity: 3rd item), playing sports (4th item), doing housework (5th item), and having transportation physical activity. The sedentary behavior and transportation physical activity were calculated to describe the characteristics of the participants who recorded each item of physical activity. PAQ was constructed and used to measure physical activity in Thai elementary and secondary school students in five regions of the country. The Thai PAQ was developed from a prototype PAQ and validated with accelerometer (Actigraph, CSA mode 7164) for seven days in 566 children. On the next day, they completed the self-administered PAQ for the validation process. Then the PAQ was completed again in the next one to three days for the reliability analysis. There were two questionnaires of the developed physical activity for elementary and secondary school children which were used for the validity and reliability using Pearson's Correlation. The result of the validation of secondary school children questionnaire

was 0.260 and that of the cross-validation was 0.33. The results also showed that the intra-class correlation for test-retest repeatability was 0.74 (Kijboonchoo et al., 2007).

The score calculation of each item of physical activity was as follows: the number of days performed each activity in the last seven days \times the number of minutes in each day that the activity was done.

For instance, if an adolescent girl played badminton two days a week for 30 minutes each day and played table tennis three days a week for 20 minutes each day, the calculation of physical activity per week would be the sum of this activity:

$$\text{Badminton} = 2 \text{ days} \times 30 \text{ minutes} = 60 \text{ minutes}$$

$$\text{Table tennis} = 3 \text{ days} \times 20 \text{ minutes} = 60 \text{ minutes}$$

$$\text{Total time for sports} = 120 \text{ minutes/week}$$

4. Physical fitness test: A battery of simple field tests was used. There were four fitness assessments: sit-up, push-up, and sit-and-reach (Office of Sports and Recreation Development, Ministry of Tourism and Sports, 2005) and 800 meters run/walk of International Committee for the Standardization of Physical Fitness Test (ICSPFT) (Cited in Hiranrat, 1996).

Sit-up and push-up were recorded in terms of the number of times (repetitions) in 30 seconds. Sit and reach was recorded twice and the better one (cms) was used. Run was tested by running or walking 800 meters. The outcomes were recorded in minutes and seconds.

In this study, the instruments were tested to ensure their reliability with 30 Thai adolescent girls whose characteristics were similar to those of the participants in the main study. Cronbach's alpha coefficient of PSEPAQ and PAQ were 0.86 and 0.74, respectively. Inter-rater reliability by two observers of sit-up was 1.0, that of push-up was 0.99, and that of the test-retest of sit-and-reach was 0.97. The mean score of run was 4.95 minutes.

Protection of Human Right

The study proposal was submitted to the Human Subject Committee, Mahidol University, for approval prior to data collection. The permission letter for data collection from the Faculty of Graduate Studies was sent to the Director of two public schools which were the research settings. The researcher explained the purpose and

process of the study to the classroom teachers. Then, the adolescent girls who were not participating in any athletic program and were eligible as study participants were informed of the purpose, procedure, and benefits of the study. Once the participants agreed to take part in the study, the researcher provided a written information sheet and the informed consent forms for the parents and the would-be participants to sign and return to the researcher. After that, the eligible girls were selected as the study participants. For the experimental group, the participants were informed that the process of data collection would take around 50 minutes in each session, for three times, and it involved answering two questionnaires and completing a physical fitness test for assessment at three time points. On the other hand, the participants in the control group were informed that the process of data collection took around 50 minutes to respond to two questionnaires and complete a physical fitness test (30 seconds of sit-ups, 30 seconds of push-ups, sit-and-reach, and 800 meters run/walk) for assessment at three time points. The participants in the control group received only general information of physical activity in the first week. The participants were assured that they could terminate their participation at any time and that their decision to discontinue participating in the study would not affect their relationship between the participants and the researcher or teachers or their study at the schools in any way.

Pilot Study

The pilot study, conducted to try out the physical activity promotion program, was carried out in a public school which was not a research setting of this study. The school had similar characteristics to the schools selected as the settings of the main study, and the school administrators granted permission for the researcher to collect data at the school. The purpose of the pilot study was to identify potential problems with the design, to test the intervention program, to try out the data collection instruments (Polit & Beck, 2004), and to train the research assistant, who was a graduate student in sports sciences. The research assistant was trained to lead the group during group discussion sessions, collect the data, and be the leader in aerobic dances as well as games. Moreover, there were other four research assistants who were undergraduate students in sports sciences who helped carry out and record the physical fitness tests (sit-up, push-up, sit-and-reach, and 800 meters run/walk).

Data Collection

The researcher contacted and recruited two public schools, Chonkanyanukoon and Chonradsadornumrung 2 school, that were willing to participate in the study. After obtaining permission to conduct the study from the Committee on Human Rights Protection, Mahidol University, simple random assignment was used to assign the schools into the experimental group and the control group, with one school in each group. Chonkanyanukoon school was the experimental group and the control group was Chonradsadornumrung 2 school. Then the students in grades 7 and 8 at both schools were randomly selected, with only one classroom in each grade. The selected students who were adolescent girls were willing to be participants in this study. Baseline data were collected from both the experimental and control groups were collected using the questionnaires. After that, all study participants were tested to determine their physical fitness.

Experimental group

When the first session began, the participants received a lecture of the physical activity promotion program, a physical activity booklet for adolescents which consisted of information regarding physical activity and notebook for set goals and record (see Appendix A), The physical activity promotion program was provided three times per week, with each session lasting 50 minutes, for a period of eight weeks (24 sessions). The participants discussed the progress with social support—researcher, research assistant and peers—or barriers in performing physical activity. Then, the researcher enhanced the participants' efficacy by giving support and encouragement to maintain their perceived self-efficacy to participate in physical activity. A booklet and notebook regarding physical activity for adolescents were provided as information and self-study materials. The participants monitored their physical activity by using the notebook for self-recording of their physical activity every week for a total of eight weeks.

The intervention the experimental group received consisted of a one-week baseline, eight-week intervention, and four-week follow up for data collection. The schedule of the physical activity promotion program is presented in Table 3.1 below, and the details of the manual are included in Appendix C.

Objective	Theory	(Week) Session /Duration (min)	Activities
- Developing perceived self-efficacy from symbolic models and developing physical activity behavior	- Enjoyment, interpersonal influence (peers, parents, family) - Enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affect	(3 rd week) 7/50 8/50* 9/50**	- Developing perceived self-efficacy activity by presenting the symbolic model. - Conducting a discussion of benefit, barriers, and guideline to increase physical activity and showing the symbolic model. - The researcher summarized this activity. - The participants exercised by doing the Salsa aerobics for ten minutes with a volunteer leader. * Developing the perceived self-efficacy activity by playing games, practicing exercises, and giving encouragement. * The participants exercised by following the research assistant. ** The participants exercised by doing the aerobic dance following the researcher for 25 minutes.
- Developing perceived self-efficacy, outcome expectations on physical activity, and physical activity	- Enjoyment, interpersonal influence -Enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affect	(4 th week) 10/50 11/50* 12/50*	- Developing perceived self-efficacy activity by playing games. - Developing outcome expectations for physical activity skills by provision of verbal persuasion and support. - Clarification of questions. - Evaluation of physical activity from self-records and emotional responses. - The researcher summarized this activity and encouraged the participants to set goals for physical activity to do in the following week. * The participants in each group discussed and planned to practice the exercise for the contest and exercised as desired.
- Developing perceived self-efficacy, and continuously	- Enjoyment, - Interpersonal influence (peers) - Enactive	(5 th week) 13/50	- Developing perceived self-efficacy activity to achieve success in physical activity by evaluating physical activity from self-records and emotional responses. - Clarification of questions.

Objective	Theory	(Week) Session /Duration (min)	Activities
being involved in physical activity	mastery experience, verbal persuasion, and physiological and affect	14/50* 15/50*	<ul style="list-style-type: none"> - Provision of verbal persuasion, support, and encouragement. - Revision of previously set goals and monitoring. - The researcher, research assistant, and participants exercised following a volunteer leader. <p>* The participants exercised by following the research assistant.</p>
Encouraging participation in physical activity	<ul style="list-style-type: none"> - Enjoyment, -Interpersonal influence (peers) - Enactive mastery experience, verbal persuasion, and physiological and affect 	(6 th week) 16/50 17/50* 18/50*	<ul style="list-style-type: none"> - Developing perceived self-efficacy activity by playing games. - Evaluation of physical activity from self-records and emotional responses, provision of verbal persuasion and support as well as encouragement, and discussion of problems. - The participants exercised by following the leaders from groups 2 and 3 for ten minutes in each group. <p>* The participants exercised by doing aerobic dances for 25 minutes (VCD3).</p>
- Encourage to continuously participating in physical activity	<ul style="list-style-type: none"> - Enjoyment, -Interpersonal influence - Enactive mastery experience, - Verbal persuasion, goal setting, and self-monitoring 	(7 th week) 19/50 20/50* 21/50**	<ul style="list-style-type: none"> - Evaluation of physical activity from self-records and provision of verbal persuasion and support as well as encouragement. - Each group practiced the exercise for the “Exercise Leader Academy” contest. <p>* The participants practiced exercises for the “Exercise Leader Academy” contest.</p> <p>**Each group (three groups) participated in the “Exercise Leader Academy” contest.</p>
- Continuously participating in physical activity	<ul style="list-style-type: none"> - Enjoyment - Enactive mastery experience 	(8 th week) 22/50 23/50* 24/50**	<ul style="list-style-type: none"> - Announcing the winners of the “Exercise Leader Academy” contest and giving rewards and certificates to the winners. <p>* Post-test (Perceived Self-Efficacy and Physical Activity Questionnaires)</p> <p>** Post-test (Physical fitness of 30 seconds of sit-</p>

Objective	Theory	(Week) Session /Duration (min)	Activities
			ups, 30 seconds of push-ups, sit- and-reach, and 800 meters run/walk)
		9 th -11 th week	- The participants exercised as desired.
-Follow-up		12 th week	- Follow-up: Test - Perceived Self-Efficacy and Physical Activity Questionnaires. - Physical fitness of 30 seconds of sit-ups, 30 seconds of push-ups, sit-and-reach, and 800 meters run/walk.

Control group

The participants in the control group were informed that the process of data collection would take place once. During the first session, the participants received a lecture that disseminated general information of physical activity with the use of a slide and video. They also received the physical activity booklet for adolescents in the control group (see Appendix B). However, the participants in the control group were not asked to change their usual daily lifestyle in any way. Data collected from this group consisted of one-week baseline, eight-week assessment, and four-week follow up as well.

The procedure for intervention and data collection was shown in Figure 3.1.

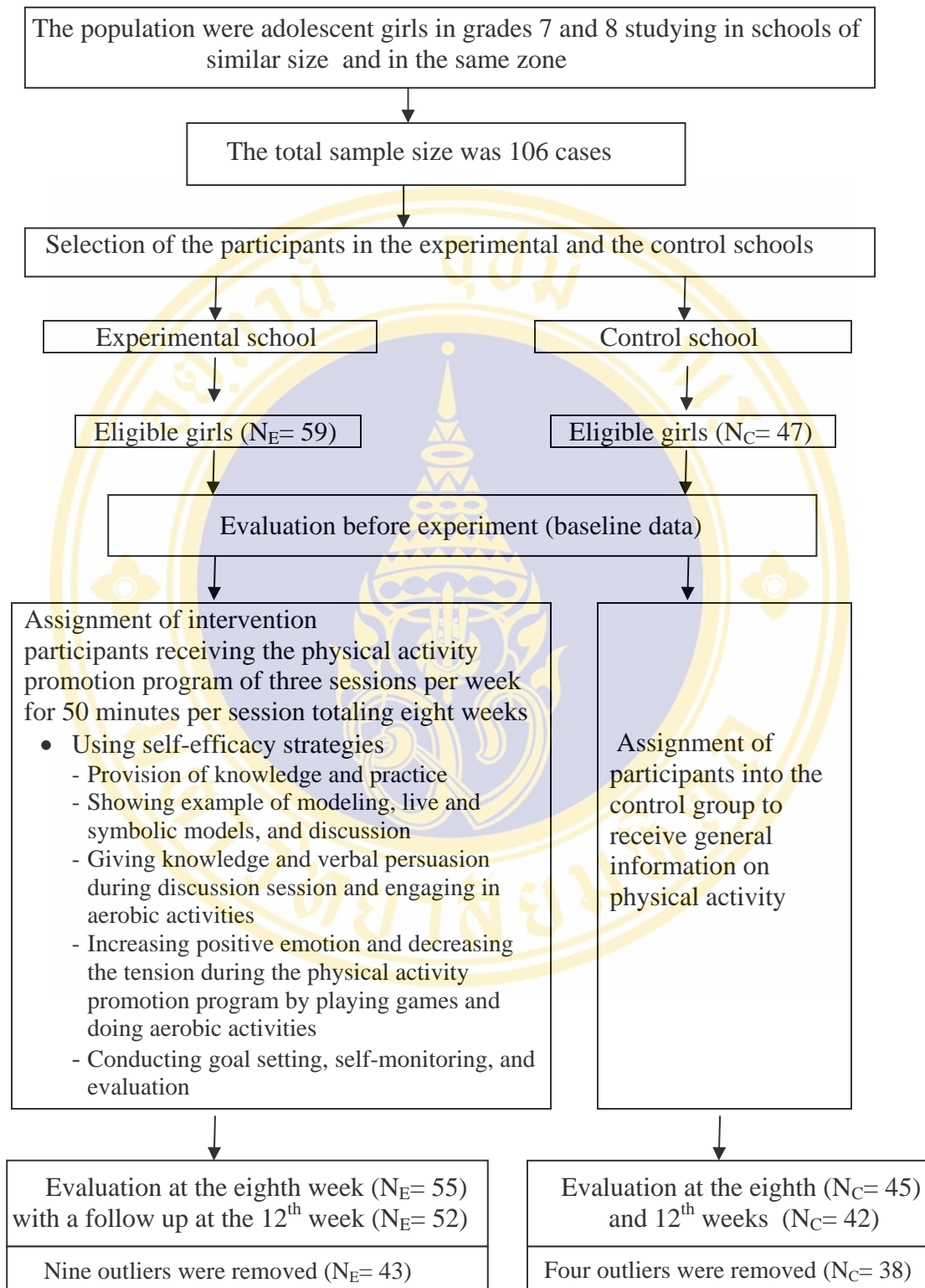


Figure 3.1. The Diagram of the Research Procedure

Data Analysis

Data collected were entered into a statistical package software program. The statistical methods used in data analysis were as follows:

1. The five physical activity (PA) component variables: inactive, SQRT light activity, SQRT moderate activity, SQRT sports, and SQRT housework were analyzed using factor scores to combine into PA variable. Finally, inactive component variable was removed because matrix of loading was -0.074, 0.150 and -0.168 at baseline, eighth week, and 12th week, respectively (see Appendix F). Also, four physical fitness (PF) component variables: sit-up, push-up, sit-and-reach, and run were analyzed using factor scores to combine into PF variable (see Appendix F).

2. The demographic data of the participants and dependent variables—perceived self-efficacy (PSE), physical activity (PA), and physical fitness (PF)—were analyzed by means of descriptive statistics of percentages, mean, median, and standard deviations.

3. Chi-square test, *t*-test and Mann-Whitney test were conducted to examine the differences in the demographic data, and dependent variables—PSE, PA, four PA components, PF, and four PF components—between the participants in the experimental and the control groups.

4. Comparisons of mean scores of all dependent variables between the experimental and control groups at each time point and overtime.

4.1 The repeated measures analysis of variance (ANOVA) was employed to examine the differences in four PA components, PF, sit-up, sit and reach, and run components between the experimental and the control groups during the different time points and over time. Moreover, the repeated measures analysis of covariance (ANCOVA) were employed to examine the differences in PSE, PA, and push-up component between the experimental and the control groups during the different time points and over time.

4.2 The univariate ANCOVA were employed to examine the differences in PSE, PA, and push-up component between the experimental and the control groups at each time (the eighth and 12th weeks). Also, *t*-test was employed to examine the differences in four PA components, PF, sit-up component, sit and reach components, and run component at each time (the eighth and 12th weeks).

CHAPTER IV

RESULTS

The purpose of this quasi-experimental study was to investigate the effects of a physical activity promotion program on perceived self-efficacy (PSE), physical activity (PA), and physical fitness (PF) in adolescent girls. The results of data analysis are presented as follows:

Characteristics of the Sample

The seventh and eighth graders were randomly selected from two schools. There were altogether 59 participants in the experimental group, 29 seventh graders and 30 eighth graders, and 47 participants in the control group, 24 seventh graders and 23 eighth graders, who agreed to participate in the study. Seven participants in the experimental group and five from the control group dropped out during the study. The reasons for their dropout were absenteeism and resignation from school. Therefore, at the 12th week of the physical activity program, there were 52 participants in the experimental group and 42 participants in the control group. Before the main data analyses were carried out, the data were screened to ensure completion and accuracy. Missing data, outlier, normality, and homoscedasticity were tested. Nine outliers were removed from the data of the experimental group and four from the control group. Therefore, data that were used in the analysis were collected from 43 participants in the experimental group and 38 students in the control group. Finally, there were 19 participants who were seventh graders, and 24 participants who were eighth graders in the experimental group, whereas in the control group, there were 19 participants who were seventh graders and 19 participants who were eighth graders. The attrition rate was 23.58%. After the outliers were removed, skewness and kurtosis value of light activity, moderate activity, sports, and housework in the experimental group were 2.642/7.804, 2.087/5.615, 1.657/1.668, and 1.076/.435, respectively, while skewness and kurtosis value of light activity, moderate activity, sports, and housework in the

control group were 1.937/4.153, 2.101/6.059, 1.527/3.312, and 1.001/.679, respectively. All of them had positive skewness; therefore, transformations of component variables by square root (SQRT) were performed (Tabachnick & Fidell, 2001). The distribution of transformed SQRT light activity, transformed SQRT moderate activity, transformed SQRT sports, and transformed SQRT housework were then normal (see Appendix G). The physical activity (PA) consists of four component variables: SQRT light activity, SQRT moderate activity, SQRT sports, and SQRT housework. Physical fitness (PF) consisted of four component variables: sit-up, push-up, sit-and-reach, and run (see Appendix F).

Demographic Characteristics of the Sample

A comparison of the means of the demographic characteristics of the participants in the experimental and control groups was conducted using independent *t*-test on a ratio scale of age, body weight, height, BMI, menarche, and inactive variables. No significant difference was found among these six variables of the experimental and control groups ($p > 0.05$) (see Table 4.1).

Table 4.1. Comparison Difference of the Demographic Characteristics in the Experimental and Control Groups

Dependent Variables	Experimental Group (n=43)		Control Group (n=38)		<i>t</i> ^(a)	df	p-value
	Mean	SD	Mean	SD			
Age (yr)	3.12	0.66	13.10	0.81	0.110	71	0.456
Body weight (kg)	44.68	8.05	45.31	6.92	-0.376	79	0.354
Height (m)	1.54	0.06	1.55	0.05	-0.537	79	0.593
BMI (kg/m ²)	18.60	2.94	18.76	2.55	-0.153	79	0.879
Menarche (yr)	10.30	4.26	10.53	3.76	-0.249	79	0.804
	Median	IQR	Median	IQR	<i>Z</i> ^(b)	p-value	
Inactive (min/wk)	260	44.45	840	37.09			-1.409

(a) By *t*-test, significance at $p < 0.05$

(b) By Mann-Whitney U, significance at $p < 0.05$

When considering the participants' inactive activities, it was found that the experimental group spent 164 minutes per day on inactive activities such as watching TV or playing video games, while the control group spent 129 minutes per day on inactive activities. At the eighth and the 12th weeks, the experimental and control groups spent 144.05/127.32 minutes per day and 111.37/120.43 minutes per day on inactive activities, respectively (see Appendix G).

As regards the participants' demographic characteristics, the participants in both groups studied in the seventh and eighth grades (46.9% and 53.1%, respectively). With regard to family income, close to half of the participants in both groups (48.1%) had a family income of 5,001-10,000 baht per month. Moreover, nearly half of the participants (49.4%) had parents who worked as laborers to earn their living. In addition, more than half of the participants (54.3%) perceived that their body shape was good, and more than one-fourth of the participants in both groups (27.2%) perceived that they were overweight. Also, the perceived physical activity of the majority of the participants in both groups was moderate activity. Finally, as for transportation, approximately 92% of the participants came to school by car or by bus. Chi-Square test revealed no significant difference in grade, family income, parental career, perceived body shape, perceived physical activity, and transportation ($p = 0.0382, 0.158, 0.604, 0.162, 0.601, \text{ and } 0.136$, respectively) (see Table 4.2).

Table 4.2. Comparison of the Numbers and Percentage of Demographic Characteristics in the Experimental and Control Groups

Items	Experimental Group (n=43)		Control Group (n=38)		χ^2	df	p-value
	n	%	n	%			
Grade					0.659	1	0.382
Seventh	19	44.2	19	50.0			
Eighth	24	55.8	19	50.0			
Family Income (per month)					6.610	4	0.158
≤5000	2	4.7	8	21.0			
5,001-10,000	20	46.5	19	50.0			
10,001-20,000	12	27.9	7	18.4			
20,001-30,000	4	9.3	2	5.3			
≥30,001	5	11.6	2	5.3			
Parental career					1.850	3	0.604
Labor	19	44.2	21	55.3			
Private business	16	37.2	10	26.3			
Agriculture	1	2.3	2	5.3			
Others	7	16.3	5	13.1			
Perceived body Shape					3.645	2	0.162
Thin	5	11.6	10	26.3			
Good shape	27	62.8	17	44.7			
Overweight	11	25.6	11	29.0			
Perceived physical activity					1.000	1	0.601
Light	9	20.9	8	21.1			
Moderate	34	79.1	30	78.9			
Transportation					3.993	1	0.136
Walk/Bicycle	3	60.7	4	10.5			
Bus/Car	40	39.3	34	89.5			

Comparisons of Study Variables between Groups at Baseline

The mean scores of dependent variables in the experiment and control groups were compared with the *t*-test. The results showed that besides perceived self-efficacy (PSE), physical activity (PA) and push-up had no significant difference at baseline (see Tables 4.3 and 4.4). Therefore, the repeated measures ANOVA was used to test the hypotheses of those variables. In spite of the significant differences in mean PSE, PA, and push-ups scores at baseline, the scores may have influenced the outcomes measured at the eighth and 12th week of comparisons. Therefore, the repeated measures analysis of covariance (repeated measures ANCOVA) was performed to reduce the error variance in the outcome measure. The effect was the reduction of error variance and therefore an increase in the power of the analysis (Munro, 2001). The PSE, PA, and push-up scores at baseline were controlled for covariate testing.

Table 4.3. Comparisons of PSE and PA Variables between the Experimental and Control Groups at Baseline

Variables	n	Mean	SD	t	df	p-value
Perceived self-efficacy (PSE)						
Experimental group	43	580.23	140.82	-2.469*	79	0.008
Control group	38	666.05	171.85			
Physical activity(PA)						
Experimental group	43	75.42	30.54	-1.757*	79	0.046
Control group	38	86.31	24.41			
SQRT Light activity						
Experimental group	43	9.93	8.62	-0.607	79	0.273
Control group	38	10.98	6.63			
SQRT Moderate activity						
Experimental group	43	20.15	11.13	-1.647	79	0.052
Control group	38	24.14	10.63			
SQRT Sports						
Experimental group	43	16.36	9.18	-1.542	79	0.063
Control group	38	19.63	9.88			
SQRT Housework						
Experimental group	43	28.95	10.94	-1.105	79	0.136
Control group	38	31.55	10.03			

*Significance at $p < 0.05$

Table 4.4. Comparisons of PF Variables between the Experimental and Control Groups at Baseline

Variables	n	Mean	SD	t	df	p-value
Physical fitness (PF)						
Experimental group	43	47.48	8.70	-1.237	79	0.110
Control group	38	50.27	11.21			
Sit-up (time)						
Experimental group	43	20.23	6.50	-0.082	79	0.462
Control group	38	20.37	8.36			
Push-up (time)						
Experimental group	43	14.51	2.34	-2.105*	79	0.019
Control group	38	15.74	2.89			
Sit-and-reach (cm)						
Experimental group	43	7.06	5.65	-1.254	79	0.106
Control group	38	8.72	6.20			
800 meters Run (min)						
Experimental group	43	5.67	0.82	1.264	79	0.105
Control group	38	5.44	0.79			

*Significance at $p < 0.05$

Assumption Testing of Repeated Measures ANOVA

After data were transformed, the assumption for the repeated measures ANOVA was tested before further analysis was conducted. The following assumptions were examined to ensure the validity of statistical calculations (Munro, 2001; Tabachnick & Fidell, 2001).

1. Normality distribution of dependent variables was tested. This assumption implies that the data must not be classified as having skewness or kurtosis. All dependent variables were accepted as a normal distribution. In addition, the Shapiro-Wilks statistics of all dependent variables besides SQR light activity, SQR sports, and sit-up component variables showed no significance, indicating that the normality was assumed. No dependent variables violated an assumption of normal distribution (see Appendix G).

2. As regards homogeneity of variance, Box's test of equality of covariance matrices yielded the p values of 0.250, 0.185, 0.113, 0.326, 0.888, 0.698, 0.495, 0.748, of PSE, PA, SQR light activity, SQR moderate activity, SQR sports, SQR

housework, sit-up, and push-up, respectively, thus reflecting no significant differences. They indicated equal levels across the between-subject factor of variance-covariance matrices. For the PF, sit-and-reach, and run variables, Box's test of equality of covariance matrices showed the p values of 0.002, 0.014, and 0.001, respectively, thus suggesting significance in Mauchly's test of sphericity but no significance in Levene's test of equality of error variance. This means that homogeneity of variance did not violate the assumption. All dependent variables were accepted as having homogeneity of variance.

3. Compound symmetry was tested. The SQRTE moderate activity ($p = 0.236$), sit-and-reach ($p = 0.153$), and run ($p = 0.143$) component variables had no significance effect on Mauchly's test of sphericity. The assumption of compound symmetry had been met; therefore, the univariate results were reported. For PSE ($p = 0.001$), PA ($p = 0.001$), SQRTE light activity ($p = 0.011$), SQRTE sports ($p = 0.027$), SQRTE housework ($p = 0.028$), PF ($p = 0.001$), sit-up ($p = 0.029$), push-up ($p = 0.001$), component variables had significance effects on Mauchly's test of sphericity. It violated the assumption of compound symmetry; therefore, the univariate results with epsilon correction were reported.

Hypotheses Testing

The study findings answered the two hypotheses.

Hypothesis 1: The adolescent girls who receive the physical activity promotion program have higher perceived self-efficacy, physical activity, and physical fitness scores than the adolescent girls who do not receive the physical activity promotion program at the eighth and 12th weeks.

Hypothesis 2: There are significant differences in mean scores of perceived self-efficacy, physical activity, and physical fitness across the time periods.

Data were analyzed as two hypotheses. The results showed as follows:

1. Comparisons of mean scores of perceived self-efficacy (PSE) between the experimental and control groups at each time point and overtime

The mean score of PSE of the experimental group was 580.23, 651.86, and 571.16 at baseline, eighth week, and 12th week, respectively. The mean score of PSE of the control group was 666.05, 592.89, and 566.32 at baseline, eighth week, and 12th week, respectively (see Figure 4.1). Independent *t*-test showed a significant difference between the experimental group and the control group at baseline ($t = -2.469$, $df = 79$, $p = 0.008$) (see Figure 4.1, Table 4.3).

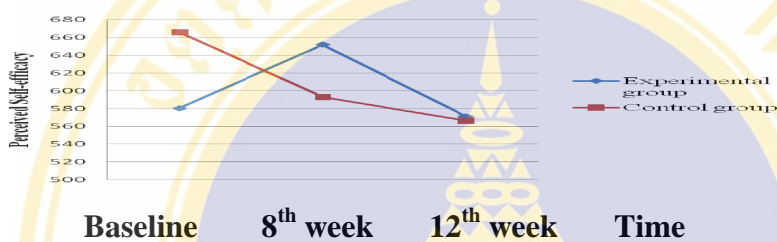


Figure 4.1. Comparison of the Mean PSE Scores over Time

After controlling for PSE scores at baseline, covariates repeated measures ANOVA was performed. The results revealed that the mean score of PSE of the experimental group at the eighth week and the 12th weeks were not significantly higher than those of the control group ($F = 13.700$; $df = 1, 78$; $p < 0.001$) (see Table 4.5, Figure 4.2). When the univariate ANCOVA of PSE were employed to analyze at the eighth and the 12th weeks, the mean scores of PSE of the experimental group were significantly higher than those of the control group at the eighth ($F = 20.896$; $df = 1, 78$; $p < 0.001$) and the 12th weeks ($F = 5.288$; $df = 1, 78$; $p = 0.024$) (see Table 4.6). At a different time points, the PSE mean scores were significantly different between the eighth and the 12th week ($F = 4.649$; $df = 1, 78$; $p = 0.034$) (see Table 4.5). Pairwise comparisons showed significant differences between the eighth week and the 12th week ($p < 0.001$) (see Tables 4.9). An interactional effect between groups and times had no significant differences ($F = 2.805$; $df = 1, 78$; $p = 0.098$) (see Table 4.5).

However, the PSE mean score of the experimental group increased ($\bar{x} = 651.86$) at the eighth week and was higher than that of the control group ($\bar{x} = 592.89$) (see Figure 4.1). At the 12th week, the PA mean score of the experimental group decreased

($\bar{x} = 571.16$), but it was still higher than that of the control group ($\bar{x} = 566.32$) (see Figure 4.2).

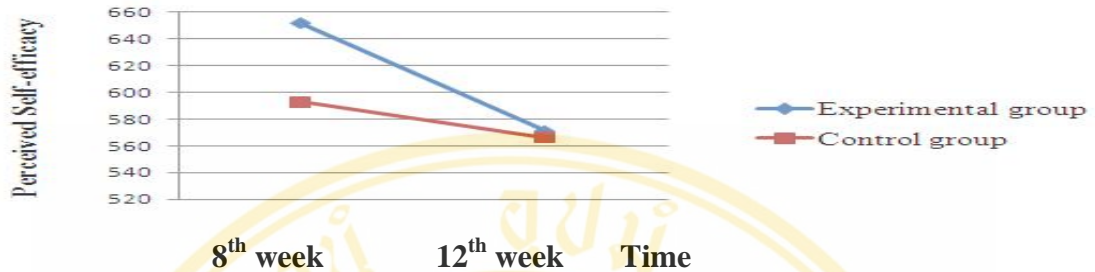


Figure 4.2. Comparison of the Mean PSE Scores over Time after Controlling for PSE at baseline

Table 4.5. Repeated Measures ANCOVA of PSE

Source of Variation	SS	df	MS	F	p-value
Between subjects	2406993.104	79			
Groups	359605.456	1	359605.456	13.700*	<0.001
Within group (error)	2047387.648	78	26248.560		
Within subjects	587784.328	80			
Time	31980.632	1	31980.632	4.649*	0.034
Group x time	19293.274	1	19293.274	2.805	0.098
Time x within group(error)	536510.422	78	6878.339		
Total	2994777.432	159			

*Significance at $p < 0.05$

Table 4.6 Analysis of Covariance of PSE at the Eighth and 12th Weeks

Source of Variation	SS	df	MS	F	p-value
At the eighth week					
PSE1 (covariate)	995758.080	1	995758.080	76.290*	<0.001
Between groups	272743.820	1	272743.820	20.896*	<0.001
(error)	1018074.659	78	13052.239		
At the 12th week					
PSE1 (covariate)	1297302.660	1	1297302.660	64.624*	<0.001
Between groups	106154.907	1	106154.907	5.288*	0.024
(error)	1565823.411	78	20074.659		

*Significance at $p < 0.05$

At the eighth week, R squared = 0.511 (adjusted R squared = 0.499)

At the 12th week, R squared = 0.453 (adjusted R squared = 0.439)

2. Comparisons of mean scores of physical activity (PA) and components of PA between the experimental and control groups at each time point and overtime

After factor scores were analyzed for PA, there were four components of PA—SQRT light activity, SQRT moderate activity, SQRT sports, and SQRT housework (see Appendix F).

Physical activity

The mean score of PA of the experimental group was 75.42, 85.72, and 68.19 at baseline, the eighth week, and the 12th week, respectively. The mean score of PA of the control group was 86.31, 74.75, and 67.47 at baseline, the eighth week, and the 12th week, respectively (see Figure 4.3). The mean score of PA of the experimental group was lower than that of the control group at baseline. Independent *t*-test showed a significant difference between the PA scores of the experimental group and the control group at baseline ($t = -1.757$, $df = 79$, $p = 0.046$) (see Table 4.3).

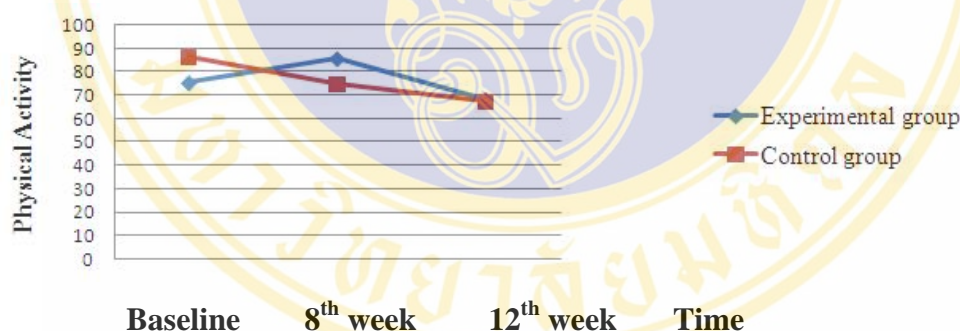


Figure 4.3. Comparison of the Mean PA Scores over Time

After controlling for PA scores at baseline, covariates repeated measures ANOVA was performed (see Figure 4.4). The results revealed that the mean score of PA of the experimental group at the eighth and 12th weeks were not significantly higher than those of the control group ($F = 3.850$; $df = 1, 78$; $p = 0.053$) (see Table 4.7). At a different time point, there was no significant difference of PA mean scores between the eighth and 12th weeks ($F = 0.027$; $df = 1, 78$; $p = 0.869$) (see Tables 4.7 and 4.9). However, an interaction between groups and times had a significant effect on PA mean score ($F = 6.944$; $df = 1, 78$; $p = 0.010$) (see Table 4.7).

The univariate ANCOVA of PA were employed to analyze at the eighth and 12th weeks. However, the mean score of PA of the experimental group was significantly different from that of the control group at the eighth week ($F = 8.584$; $df = 1, 77$; $p = 0.004$), but no significant difference was found at the 12th week ($F = 0.636$; $df = 1, 77$; $p = 0.428$) (see Table 4.8).

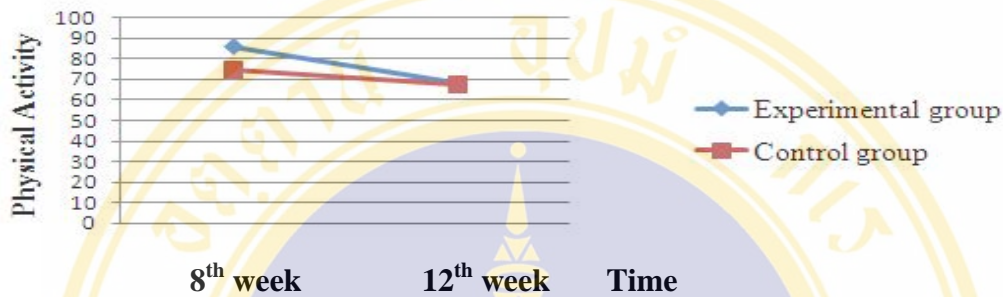


Figure 4.4. Comparison of the Mean PA Scores over Time after Controlling for PA at baseline

Table 4.7. Repeated Measures ANCOVA of PA

Sources of Variation	SS	df	MS	F	p-value
Between subjects	112.162	79			
Group	5.276	1	5.276	3.850	0.053
Within group (error)	106.886	78	1.370		
Within subject	19.507	80			
Time	0.006	1	0.006	0.027	0.869
Group x time	1.594	1	1.594	6.944*	0.010
Time x within group (error)	17.907	78	0.230		
Total	131.669	159			

*Significance at $p < 0.05$

However, the PA mean score of the experimental group increased ($\bar{x} = 85.72$) at the eighth week and was higher than that of the control group ($\bar{x} = 74.75$). At the 12th week, the PA mean score of the experimental group decreased ($\bar{x} = 68.19$), but it was still higher than that of the control group (67.47) (see Figure 4.4).

Table 4.8. Analysis of Covariance of PA at the Eighth and 12th Weeks

Source of Variation	SS	df	MS	F	p-value
At the eighth week					
PA 1 (covariate)	18.817	1	18.817	25.299*	<0.001
Between groups (error)	6.385	1	6.385	8.584*	0.004
	57.273	77	0.744		
At the 12th week					
PA 1 (covariate)	12.030	1	12.030	13.742*	<0.001
Between groups (error)	0.557	1	0.557	0.636	0.428
	67.408	77	0.875		

*Significance at $p < 0.05$

At the eighth week, R squared = 0.284 (adjusted R squared = 0.256)

At the 12th week, R squared = 0.157 (adjusted R squared = 0.125)

**Table 4.9. Comparisons of PSE and PA Variables Scores over Time with
Pairwise Comparison Analysis**

	p-value	
	Baseline	8 weeks
Perceived self-efficacy (PSE) #		
8 weeks	-	-
12 weeks	-	<0.001
Physical activity (PA) #		
8 weeks	-	-
12 weeks	-	0.869
SQRT Light Activity		
8 weeks	0.127	-
12 weeks	0.367	0.012
SQRT Moderate Activity		
8 weeks	0.397	-
12 weeks	<0.001	<0.001
SQRT Sports		
8 weeks	0.765	-
12 weeks	0.030	0.002
SQRT Housework		
8 weeks	0.422	-
12 weeks	0.012	0.029

*Significance at $p < 0.05$

By repeated measures ANCOVA, significance at $p < 0.05$

Four PA components—SQRT light activity, SQRT moderate activity, SQRT sports and SQRT housework—were calculated using repeated measures ANOVA. The findings are as follows:

SQRT Light Activity

The analysis of the mean SQRT light activity scores of the experimental and control groups using *t*-test revealed that there was no significant difference at baseline ($t = -0.607$, $df = 79$, $p = 0.273$) (see Table 4.3). The SQRT light activity mean score of the experimental group increased ($\bar{x} = 13.856$) at the eighth week, and it was higher than that of the control group ($\bar{x} = 9.835$). At the 12th week, the SQRT light activity mean score of the experimental group ($\bar{x} = 8.967$) was lower than that of the control group ($\bar{x} = 9.845$) (see Figure 4.5).

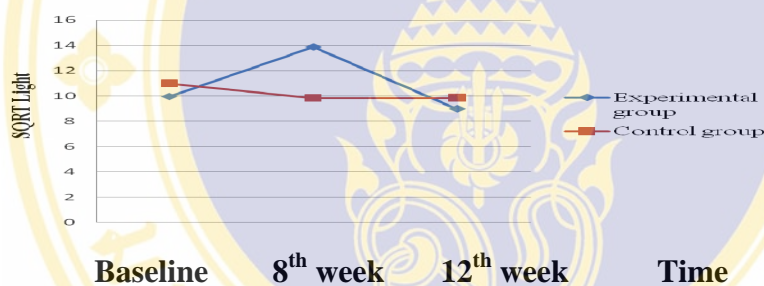


Figure 4.5. Comparison of the SQRT Light Activity Mean Scores over Time

The repeated measures ANOVA of SQRT light activity was analyzed. The result showed that the mean SQRT light activity score of the experimental group at the eighth week and the 12th weeks were not significantly higher than those of the control group ($F = 0.287$; $df = 1, 79$; $p = 0.593$) (see Table 4.10). Furthermore, SQRT light activity mean scores were significantly different at least for one pair of three time points. Also, pairwise comparisons showed significant difference between the eight and 12th weeks ($p=0.012$) (see Table 4.9). However, significant differences were not found between baseline and the eighth week ($p = 0.127$), or between baseline and the 12th week ($p = 0.367$) (see Table 4.9). Moreover, an interaction effect between groups and times were significantly shown ($F = 4.063$; $df = 2, 158$; $p = 0.022$) (see Table 4.10). Besides, the independent *t*-test showed a significant difference between the experimental group and the control group at the eighth week ($t = 2.496$, $df = 79$, $p = 0.007$). It is worth noting that at the 12th week, there was no significant difference

between the experimental and control groups ($t = -0.463$, $df = 79$, $p = 0.322$) (see Appendix H).

Table 4.10. Repeated Measures ANOVA of SQR Light Activity

Sources of Variation	SS	df	MS	F	p-value
Between subjects	8143.606	80	132.227		
Group	29.517	1	29.517	0.287	0.593
Within group (error)	8114.089	79	102.710		
Within subject	7076.679	162			
Time	241.522	2	129.464	2.935	0.060
Group x time	334.347	2	79.221	4.063*	0.022
Time x within group (error)	6500.810	158	44.110		
Total	15220.285	242			

*Significance at $p < 0.05$

However, the mean SQR light activity score of the experimental group at the eighth week ($\bar{x} = 13.856$) was significantly higher than that at baseline ($\bar{x} = 9.938$), but it was significantly lower than that at the 12th week ($\bar{x} = 8.967$) ($p = 0.005$). The SQR light activity mean score of the control group decreased, and the mean score obtained at baseline was higher than those obtained at the eighth and 12th weeks (see Figure 4.5).

SQR Moderate Activity

The analysis of the mean SQR moderate activity scores of the experimental and control groups using t -test revealed that there was no significant difference at baseline ($t = -1.647$, $df = 79$, $p = 0.052$) (see Table 4.3).

The SQR moderate activity mean score of the experimental group increased ($\bar{x} = 22.539$) at the eighth week, and it was higher than that of the control group ($\bar{x} = 19.308$). At the 12th week, the SQR moderate activity mean score of the experimental group ($\bar{x} = 15.853$) was lower than that of the control group ($\bar{x} = 17.298$). It is noteworthy that the SQR moderate activity mean score of the control group decreased from baseline both at the eighth and 12th weeks (see Figure 4.6).

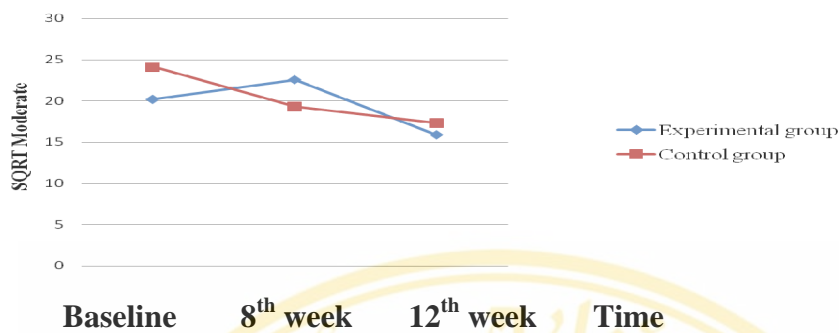


Figure 4.6. Comparison of the SQR Moderate Activity Mean Scores over Time

The repeated measures ANOVA of SQR moderate activity was analyzed. The result showed that the SQR moderate activity mean score of the experimental group at the eighth week and the 12th weeks were not significantly lower than those of the control group ($F = 0.163$; $df = 1, 79$; $p = 0.687$) (see Table 4.11). The SQR moderate activity mean scores were significantly different for two pairs at three time points. Pairwise comparisons showed significant differences between baseline and the 12th week ($p < 0.001$) and between the eighth week and the 12th week ($p < 0.001$). However, no significant differences were found between baseline and the eighth week ($p = 0.397$) (see Table 4.9). An interaction effect between groups and times was significantly shown ($F = 3.503$; $df = 2, 158$; $p = 0.032$) (see Table 4.11).

The mean score of SQR moderate activity of the experimental group at the eighth week was not significantly higher than that obtained at baseline ($p = 0.25$). At the 12th week, the mean score of SQR moderate activity was significantly lower than that obtained at baseline and the eighth week ($p = 0.044$ and 0.002). The SQR moderate activity mean score of the control group decreased from the baseline both at the eighth and the 12th weeks (see Figure 4.6).

Table 4.11. Repeated Measures ANOVA of SQRТ Moderate Activity, SQRТ Sports and SQRТ Housework.

Sources of Variation	SS	df	MS	F	p-value
SQRТ Moderate Activity					
Between subjects	15760.802	80			
Group	32.541	1	32.541	0.163	0.687
Within group (error)	15728.261	79	199.092		
Within subject	14118.838	162			
Time	1385.496	2	692.748	8.977*	<0.001
Group x time	540.654	2	270.327	3.503*	0.032
Time x within group(error)	12192.687	158	77.169		
Total	29879.639	242			
SQRТ Sports					
Between subjects	18492.366	80			
Group	11.900	1	11.900	0.051	0.822
Within group (error)	18480.466	79	233.930		
Within subject	9178.516	162			
Time	483.546	2	254.187	4.521*	0.014
Group x time	245.556	2	129.082	2.296	0.107
Time x within group (error)	8449.414	158	56.223		
Total	27670.882	242			
SQRТ Housework					
Between subjects	17586.857	80			
Group	33.570	1	33.570	0.151	0.699
Within group (error)	17553.287	79	222.194		
Within subject	11891.923	162			
Time	545.600	2	2860.414	3.915*	0.024
Group x time	336.640	2	176.720	2.416	0.095
Time x within group (error)	11009.683	158	73.159		
Total	29478.78	242			

*Significance at $p < 0.05$

SQRT Sports

The analysis of the mean SQRT sports scores of the experimental and control groups using *t*-test revealed that there was no significant difference at baseline ($t = -1.542$, $df = 79$, $p = 0.063$) (see Table 4.3). The SQRT sports mean score of the experimental group increased ($\bar{x} = 19.007$), and in the eighth week it higher than that of the control group ($\bar{x} = 17.713$), although no statistically significant different was found. Also, at the 12th week the SQRT sports mean score of the experimental group ($\bar{x} = 15.52$) was not significantly higher than that of the control group ($\bar{x} = 14.877$) (see Figure 4.7)

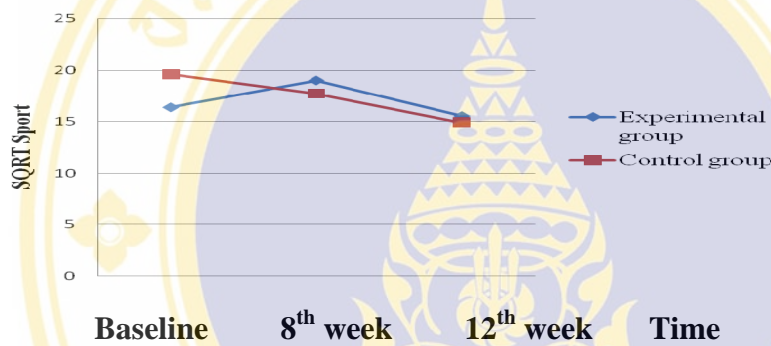


Figure 4.7. Comparison of the SQRT Sports Mean Scores over Time

The repeated measures ANOVA of SQRT sports was analyzed. The result showed that the mean score of SQRT sports of the experimental group at the eighth and the 12th weeks were not significantly lower than those of the control group ($F = 0.051$; $df = 1,79$; $p = 0.822$) (see Table 4.11). There were significant differences in SQRT sports mean scores in at least one pair of the three time points ($F = 4.521$; $df = 2,158$; $p = 0.014$) (see Table 4.11). Pairwise comparisons showed a significant difference between baseline and the 12th week ($p = 0.030$) and the eighth week and the 12th week ($p = 0.002$) (see Table 4.9). Finally, an interaction effect between groups and times were not shown ($F = 2.296$; $df = 2, 158$; $p = 0.107$)(see Table 4.11).

The mean score of SQRT sports of the experimental group at the eighth week ($\bar{x} = 19.007$) was higher than that obtained at baseline ($\bar{x} = 16.368$), but there was no significant difference ($p = 0.117$). At the 12th week, the SQRT sports mean score of the experimental group ($\bar{x} = 15.52$) was significantly lower than that obtained at the

eighth week ($\bar{x} = 19.007$) ($p = 0.018$). It is noteworthy that the SQRТ sports mean score of the control group decreased overtime (see Figure 4.7).

SQRТ Housework

The analysis of the mean SQRТ housework scores of the experimental and control groups using t -test revealed that there was no significant difference at baseline ($t = -1.105$, $df = 79$, $p = 0.136$) (see Table 4.3).

The mean SQRТ housework score of the experimental group at the eighth and the 12th weeks were not significantly higher than those of the control group ($F = 0.151$; $df = 1, 79$; $p = 0.699$) (see Tables 4.11). Pairwise comparisons showed a significant difference between baseline and the 12th week ($p = 0.012$), and between the eighth and the 12th week ($p = 0.029$) (see Table 4.9). In addition, no significant difference was found when analyzing interaction effects between groups and times ($F = 2.416$; $df = 2, 158$; $p = 0.095$) (see Tables 4.11).

The SQRТ housework mean score of the experimental group slightly increased ($\bar{x} = 30.317$) at the eighth week, but it decreased ($\bar{x} = 27.854$) at the 12th week. On the other hand, the SQRТ housework mean scores of the control group at the eighth and 12th weeks decreased from that at baseline (see Figure 4.8).

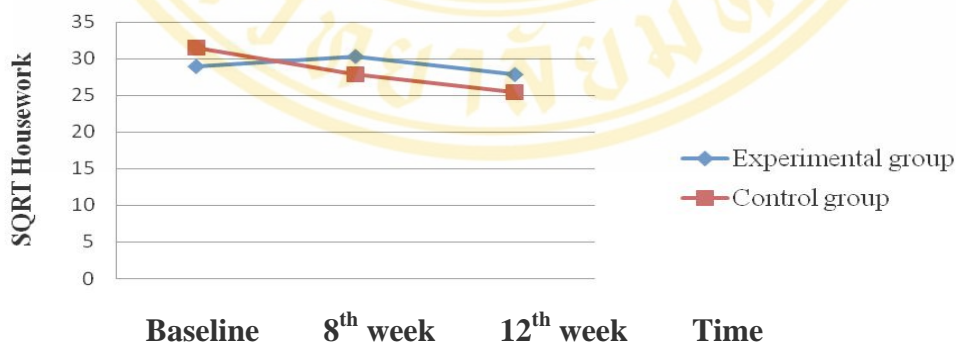


Figure 4.8. Comparison of the SQRТ Housework Mean Scores over Time

3. Comparisons of mean scores of physical fitness (PF) and components of PF (Sit-up, Push-up, Sit-and-reach, and Run) between the experimental and control groups at each time point and overtime

Physical fitness (PF)

At baseline, the mean score of physical fitness of the experimental group was lower than that of the control group, equal to 47.48 for the experimental group and 50.27 for the control group. The independent *t*-test showed no significant difference between the mean scores of the experimental group and the control group ($t = -1.237$, $df = 79$, $p = 0.110$) (see Table 4.4). The physical fitness mean score of both the experimental and control groups increased at the eighth and 12th weeks, equal to 51.04 and 51.95 for the experimental group and 52.48 and 53.32 for the control group. Also, the repeated measures ANOVA of physical fitness was analyzed. The results revealed that mean scores of physical fitness of the experimental group at the eighth and 12th weeks were not significantly lower than those of the control group ($F = 0.013$; $df = 1, 79$, $p = 0.908$). Likewise, significant differences were not found between the experimental and control groups over the three time points ($F = 0.008$; $df = 2, 158$; $p = 0.968$) (see Tables 4.12 and 4.13). In addition, the interaction effect between groups and times in relation to physical fitness was not found to be significant ($F = 2.102$; $df = 2, 158$; $p = 0.143$) (see Table 4.12). Finally, the independent *t*-test showed no significant difference between the experimental group and the control group at the eighth week ($t = -0.720$, $df = 79$, $p = 0.237$) and the 12th week ($t = -0.628$, $df = 79$, $p = 0.266$) (see Appendix H).

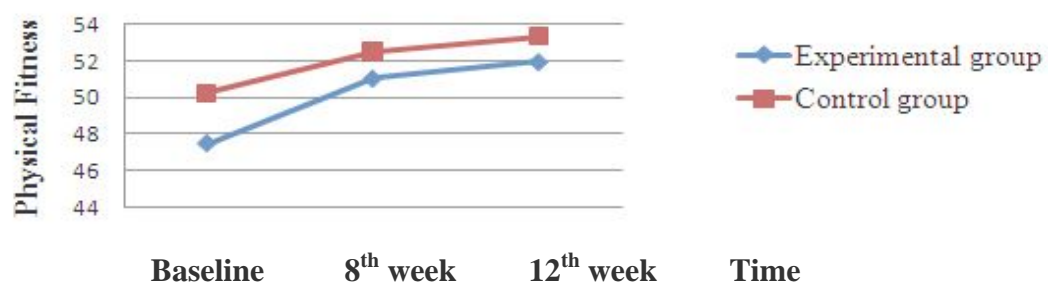


Figure 4.9. Comparison of the PF Mean Scores over Time

Table 4.12. Repeated Measures ANOVA of PF

Sources of Variation	SS	df	MS	F	p-value
Between subjects	85.917	80			
Group	0.015	1	0.015	0.013	0.908
Within group (error)	85.902	79	1.087		
Within subject	154.099	162			
Time	0.015	2	0.011	0.008	0.968
Group x time	3.994	2	2.954	2.102	0.143
Time x within group (error)	150.090	158	0.950		
Total	240.016	242			

Table 4.13. Comparison of PF Scores over Time with Pairwise Comparison Analysis

		p-value	
		Baseline	8 weeks
Physical fitness (PF)			
	8 weeks	0.913	-
	12 weeks	0.955	0.911
Sit-up			
	8 weeks	<0.001	-
	12 weeks	<0.001	0.005
Push-up #			
	8 weeks	-	-
	12 weeks	-	<0.001
Sit-and-reach			
	8 weeks	0.012	-
	12 weeks	0.045	<0.001
Run			
	8 weeks	0.036	-
	12 weeks	<0.001	0.306

*Significance at $p < 0.05$

By repeated ANCOVA, significance at $p < 0.05$

Mean scores for each of the four physical fitness components: sit-up, push-up, sit-and-reach, and run, were calculated using repeated measures ANOVA.

Sit-up

The mean score of sit-up of the experimental group at the eighth and the 12th weeks were not significantly lower than those of the control group ($F = 0.013$; $df = 1, 79$; $p = 0.911$). The mean scores of sit-up were significantly different over the three time points ($F = 19.661$; $df = 2, 158$; $p < 0.001$) (see Tables 4.13 and 4.14). Finally, no interaction between groups and times was found ($F = 0.707$; $df = 2, 158$; $p = 0.488$) (see Table 4.14).

Table 4.14. Repeated Measures ANOVA of Sit-up

Sources of Variation	SS	df	MS	F	p-value
Between subjects	10758.218	80			
Group	1.714	1	1.714	0.013	0.911
Within group (error)	10756.504	79	136.162		
Within subject	4169.557	162			
Time	290.767	2	145.384	19.661*	0.001
Group x time	10.454	2	5.487	0.707	0.488
Time x within group (error)	1168.336	158	7.762		
Total	14927.775	242			

*Significance at $p < 0.05$

The sit-up mean score of both the experimental and control groups increased from baseline both at the eighth and the 12th weeks. The sit-up mean score of the experimental group increased at the eighth week ($\bar{x} = 21.47$), but it was slightly lower than that of the control group ($\bar{x} = 22.16$) (see Figure 4.10). However, the sit-up mean score of the experimental group ($\bar{x} = 23.14$) was slightly higher than that of the control group ($\bar{x} = 22.82$) at the 12th week (see Figure 4.10).

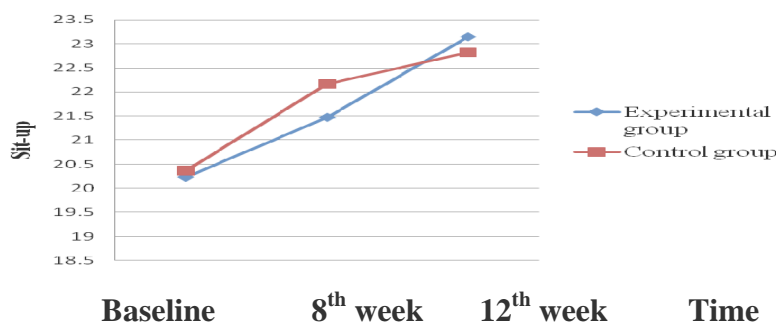


Figure 4.10. Comparison of the Sit-up Mean Scores over Time

Push-up

The push-up mean score of the experimental group was lower than that of the control group at baseline. The mean score of the experimental group was 14.51, while that of the control group was 15.74. Independent *t*-test showed a significant difference between the mean scores of the experimental group and the control group ($t = -2.105$, $df = 79$, $p = 0.019$) (see Table 4.4).

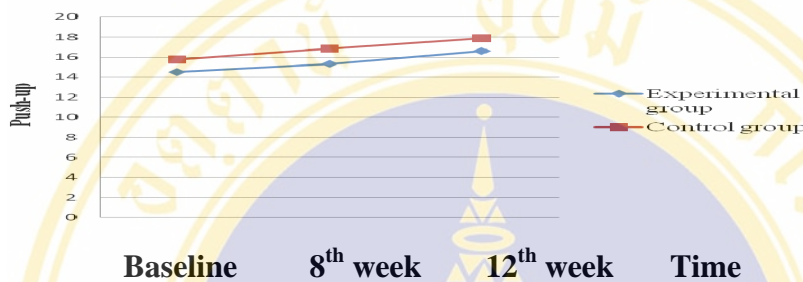


Figure 4.11. Comparison of the Push-up Mean Scores over Time

After controlling for push-up scores at baseline, covariates repeated measures ANOVA was performed (see Figure 4.12). The results revealed that the mean score of push-up at the eighth week and the 12th weeks of the experimental group were not significantly lower than those of the control group ($F = 2.155$; $df = 1, 78$; $p = 0.146$). Also, interaction effects between groups and times were not found to have significant differences ($F = 0.294$; $df = 1, 77$; $p = 0.589$) (see Table 4.15). However, pairwise comparisons showed a significant difference between the eighth week and the 12th week ($p < 0.001$) (see Table 4.13). The univariate ANCOVA of push-up were employed, significant differences were not found between the mean scores of the experimental and the control groups at the eighth week ($F = 3.375$; $df = 1, 78$; $p = 0.070$) and 12th weeks ($F = 0.939$; $df = 1, 78$; $p = 0.335$) (see Tables 4.16).

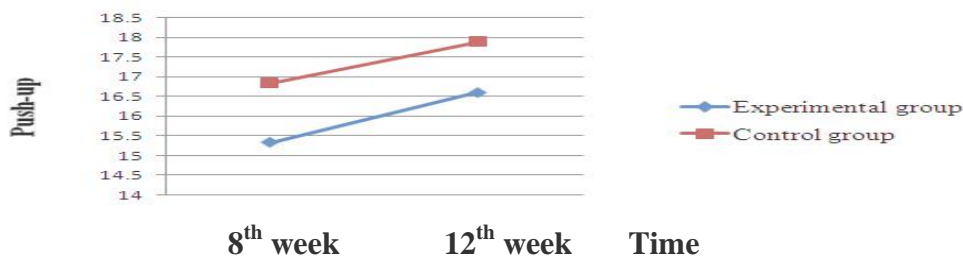


Figure 4.12. Comparison of the Mean Push-up Scores over Time after Controlling for Push-up at Baseline

Table 4.15. Repeated Measures ANCOVA of Push-up

Source of Variation	SS	df	MS	F	p-value
Between subjects	914.725	79			
Group	24.590	1	24.590	2.155	0.146
Within group (error)	890.135	78	11.412		
Within subject	198.812	79			
Time	0.299	1	0.299	0.118	0.732
Group x time	0.746	1	0.746	0.294	0.589
Time x within group (error)	197.767	77	2.535		
Total	1113.537	157			

Table 4.16. Analysis of Covariance of Push-up at the Eighth and 12th Weeks

Source of Variation	SS	df	MS	F	p-value
At the eighth week					
Push-up 1 (covariate)	118.753	1	118.753	23.645*	<0.001
Between groups	16.951	1	16.951	3.375	0.070
(error)	391.742	78	5.022		
At the 12th week					
Push-up 1 (covariate)	141.697	1	141.697	15.876*	<0.001
Between groups	8.385	1	8.385	0.939	0.335
(error)	696.161	78	8.925		

*Significance at $p < 0.05$

At the eighth week, R squared = 0.297 (adjusted R squared = 0.279)

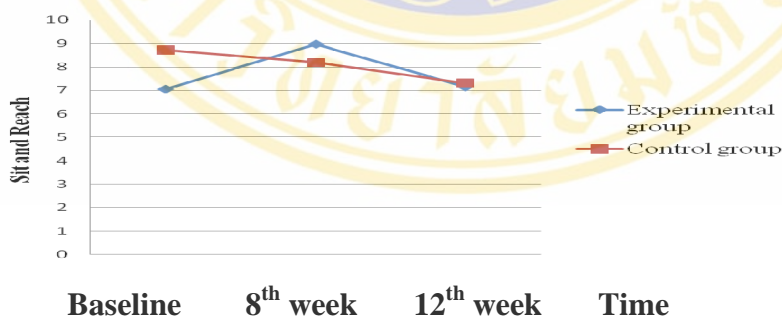
At the 12th week, R squared = 0.201 (adjusted R squared = 0.181)

Sit-and-reach

The sit-and-reach mean score of the experimental group at the eighth week and the 12th weeks were not significantly lower than those of the control group ($F = 0.075$; $df = 1, 79$; $p = 0.785$). Also, sit-and-reach mean scores differed significantly over three time points. Pairwise comparisons showed a significant difference in every paired time point ($F = 9.976$; $df = 2, 158$; $p < 0.001$) (see Tables 4.13 and 4.17). An interaction effect between groups and times was significantly different as well ($F = 8.341$; $df = 2, 158$; $p < 0.001$) (see Table 4.17).

Table 4.17. Repeated Measures ANOVA of Sit-and-reach and Run

Sources of Variation	SS	df	MS	F	<i>p-value</i>
Sit-and-reach					
Between subjects	7457.109	80			
Group	7.059	1	7.059	0.075	0.785
Within group (error)	7450.050	79	94.304		
Within subject	710.997	162			
Time	72.886	2	36.443	9.976*	<0.001
Group x time	60.941	2	30.470	8.341*	<0.001
Time x within group(error)	577.170	158	3.653		
Total	8168.106	242			
Run					
Between subjects	86.949	80			
Group	0.008	1	0.008	0.007	0.932
Within group (error)	86.941	79	1.101		
Within subject	99.884	162			
Time	6.496	2	3.284	5.636*	0.004
Group x time	2.325	2	1.162	2.017	0.137
Time x within group (error)	91.063	158	0.576		
Total	186.833	242			

*Significance at $p < 0.05$ **Figure 4.13. Comparison of the Sit-and-reach Mean Scores over Time**

Moreover, the sit-and-reach mean score of the experimental group increased ($\bar{x}=8.97$) at the eighth week and it was higher than that of the control group ($\bar{x} = 8.19$). However, a significant difference was not found at the eighth week. At the 12th week, the sit-and-reach mean score of the experimental group ($\bar{x} = 7.16$) was lower than that of the control group ($\bar{x} = 7.31$) but it did not differ significantly (see Figure 4.13).

Run

The run mean score of the experimental group at the eighth week and the 12th weeks were not significantly lower than those of the control group ($F = 0.007$; $df = 1, 79$; $p = 0.932$). There were significant differences in the run mean score in at least one pair at three times points ($F = 5.636$; $df = 2, 158$; $p = 0.004$) (see Table 4.17). Pairwise comparisons showed significant differences between the scores at baseline and the eighth week ($p = 0.036$) and at baseline and the 12th week ($p < 0.001$). However, there were no significant differences between the run mean scores at the eighth and the 12th weeks ($p = 0.306$) (see Table 4.13). An interaction effect between groups and times showed no significant differences ($F = 2.017$; $df = 2, 158$; $p = 0.137$) (see Table 4.17). Moreover, the run mean scores of the experimental and control groups decreased overtime (see Figure 4.14).

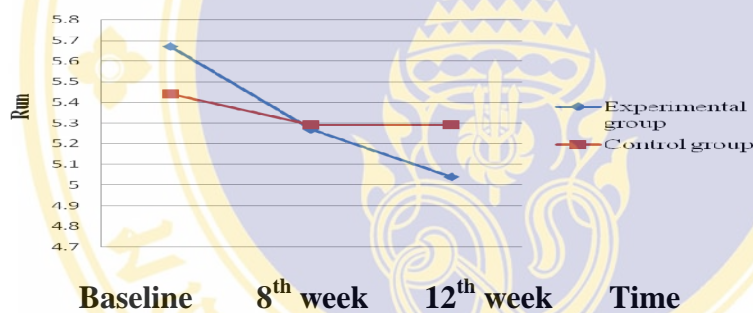


Figure 4.14. Comparison of the Run Mean Scores over Time

Summary

Data in this study were collected from 43 participants in the experimental group and 38 participants in the control group. Hypothesis testing was carried out using repeated measures ANCOVA for the perceived self-efficacy, physical activity, and push-up component variables. The repeated measures ANOVA was used to analyze light activity, moderate activity, sports, housework, physical fitness, sit-up, sit-and-reach, and run component variables. All variables met the assumption underlying the statistical testing after variables were transformed. The demographic characteristics of the participants in the experimental and control groups were not significantly different at baseline. The experimental group's PSE scores were significantly higher than those of the control group at the eighth ($p < 0.001$) and the 12th weeks ($p = 0.024$). However, the PSE scores of both the experimental and control

group at the 12th week were lower than at baseline. At the eighth week, the experimental group's PA and light activity component scores were significantly higher than those of the control group ($p = 0.007$). However, all dependent variables of the experimental and control groups were not significantly different at the 12th week. Also, the mean scores of physical fitness and four components were not significant differences between the experimental and control groups at the eighth and the 12th weeks.



CHAPTER V

DISCUSSION

This chapter presents a discussion of the research findings. It examines characteristics of the sample; explores the efficacy of a physical activity promotion program on changing perceived self-efficacy (PSE), physical activity (PA), and physical fitness (PF) including four components of PA and of PF; discusses the theoretical aspects; and finally, considers instrumentation issues, data analysis procedures, and limitation of the study.

Characteristics of the Sample

Approximately 47% of participants in this study were studying in grade 7 and 53% were studying in grade 8. More than half of the participants in the experimental group, who received the physical activity promotion program, and the control group, who did not receive the physical activity promotion program, perceived that they had a good body shape (54.3%). That was congruent with the BMI of both groups as the findings showed that the BMI mean scores was about 18.7. In addition, almost all, or 91%, of the participants in both the experimental group and the control group went to school by bus or car. Approximately 79% of both groups perceived that they had moderate physical activity. The experimental group spent 164 minutes per day on inactive activities such as watching TV or playing video games, while the control group spent 129 minutes per day on inactive activities. Such findings were consistent with the findings of Deenan and colleagues' study conducted with students in the seventh to 12th grades in the eastern region of Thailand which revealed that students spent 163 minutes per day on TV (Deenan, Tanee, & Puengwongsamran, 2006). According to WHO's recommendation, children and adolescents should not spend more than 2 hours (120 minutes) per day using electronic media for entertainment (e.g. TV, computer games, and internet) (USDHHS, 2008). This finding showed that the

amount of time spent watching television in participants should decrease in both groups.

As regards parents' occupation, close to half of the participants in the experimental group (44.2%) and a little more than half in the control group (55.3%) had parents who earned their living as laborers. Moreover, nearly half of the participants (48.1%) lived in the countryside and had income families earning about 5,001-10,000 baht per month. It is worth noting that the control setting was about eight kilometers away from the experimental setting, and no significant differences were found between groups when it came to demographic characteristics.

Effects of the Physical Activity Promotion Program

This section discusses the effects of the physical activity promotion program on the dependent variables of perceived self-efficacy (PSE), physical activity (PA) behavior including SQR light activity, SQR moderate activity, SQR sports, and SQR housework components, and physical fitness (PF) including sit-up, push-up, sit-and-reach, and run components.

PSE

The PSE mean scores of the experimental group increased at the eighth week ($\bar{x} = 651.86$) from baseline and then decreased at the 12th week ($\bar{x} = 571.16$). However, the PSE mean scores of the control group decreased on the overall ($\bar{x} = 592.89$ and $\bar{x} = 566.32$) when compared with the baseline. When the PSE mean score at baseline was controlled to be covariant, at different time points, the PSE mean score were significantly different. However, the interaction effect of groups and times on the PSE mean score was not significant. The experimental group's PSE mean score at the eighth week was significantly higher than that of the control group ($p < 0.001$). These findings showed that the physical activity promotion program could increase PSE scores of the experimental group at the eighth week when compared to the control group. Put another way, the adolescent girls who received the physical activity promotion program had higher perceived self-efficacy scores than the adolescent girls who did not receive the physical activity promotion program at the eighth week. However, at the 12th week, PSE mean score of the experimental group was

significantly lower than that at the eighth week. Therefore, all hypotheses regarding PSE were partially supported.

The participants in the experimental group received general information regarding physical activity and the physical activity promotion program. The physical activity promotion program was developed based on Pender's health promotion model and self-efficacy theory. It could be explained that the participants in the experimental group developed their self-efficacy through interpreting information primarily from four major sources (Bandura, 1986, 1997) of the physical activity promotion program. In particular, it is believed that enactive mastery experience is the most powerful means to change self-efficacy beliefs (Bandura, 1986). Participants in the experimental group shared and discussed benefits of physical activity, considered strategies to overcome barriers, and participated in aerobic dance or exercise as they desired. This is regarded as actual engagement in the activity. The researcher had introduced the live model of all problems, the barriers of physical activity, and methods of solving problems of the live model. In the present study, the majority of the participants learned from observing the model and receiving motivating words and emotional stimulation from close friends or close persons. Generally, using a live model that shares similar characteristics with the observers makes the observers realize that their behavior can be changed. Moreover, verbal persuasion with positive feedback from the researcher, research assistant, and peers was given, which could strengthen the participants' efficacy beliefs. Bandura (1977) points out that in order for perceived self-efficacy to be developed, training is needed to ensure there is sufficient skill for the achievement together with sufficient motivation to make individuals perceive that they have the ability to do such things. Then, individuals can utilize the skills received from training. Participants' practice of goal setting and self-monitoring skills can enhance participants' perceived self-efficacy and increase their physical activity. Besides, the period of attending the program for eight weeks, three times per week, was adequate to stimulate changes and enable the experimental group to develop their perceived self-efficacy. Therefore, self-efficacy of the participants in the experimental group was enhanced by the end of the program at the eighth week. These findings were congruent with the findings of Traetulakarn (1998) who conducted quasi-

experimental research with the application of the self-efficacy theory to increase exercise behavior of late adolescent girls which showed that perceived self-efficacy scores of the experimental group were significantly higher than those of the control group. Similarly, Hommel (2007) conducted a study based on the self-efficacy theory to explore perceived physical activity self-efficacy among pre-adolescent girls and found that the participants had higher self-efficacy scores than before attending the program. In addition, the findings of the present study yield support to findings of previous studies showing that application of the self-efficacy theory and a combination of the self-efficacy theory with another theory program can enhance PSE of adolescents (Dishman et al., 2004; Hertz, 2005; Maneedang, 2007; Suwannathorn, 2000). These studies revealed that perceived self-efficacy of the experimental group increased than the control group due to the self-efficacy of participants in the experimental group were manipulated through ensuring that the individual was receiving positive feedback from each of the four sources of efficacy expectations (Bandura, 1997, 1986).

At the 12th week follow-up, the PSE mean scores of the experimental and control group decreased from the baseline. However, the PSE mean score of the experimental group was higher than that of the control group with significant differences ($p < 0.001$). Therefore, it could be concluded that an increase in PSE gained from this program cannot be maintained for a period of 12 weeks. In contrast, it was lower than at the eighth week. The reason for this is that the participants did not receive any information regarding physical activity after the termination of the intervention program, which means that their self-efficacy belief was not boosted from researcher, research assistants and social support from peers and family. Such findings were consistent with the findings of a previous study carried out by Lubans and Sylva (2006) based on Bandura's social cognitive theory and self-efficacy theory. In Lubans and Sylva's study, the subjects were 78 students aged 16-17 years in health and fitness. The sample was randomly assigned into the experimental and control groups for a ten-week period. Forty students in the experiment group, they participated in the structured health and exercise program, while the 30 students in the control group took part in unstructured physical activity. At week 10, perceived self-efficacy and

physical activity scores of the experimental group increased significantly when compared with those of the control group, but there were no significant differences between both groups at the three-month follow-up (Lubans & Sylva, 2006). One possible explanation for Lubans and Sylva's study is that the week in which the follow-up took place did not a normal school week, as the students had finished class and were preparing for examination. In contrast, Kuysuwan's quasi-experimental research (2000) found that students, aged ten to 12 years, in the experimental group had significantly higher perceived self-efficacy and practice in weight control than those of the control group at the fourth and eighth weeks follow up ($p < 0.001$). The reason of this is that students' parents in the experimental group participated in the program for four weeks. After ending the program, their parents had still encouraged and supported the students. The students had reinforcement from their parents; therefore, perceived self-efficacy and weight control behavior of students in the experimental group were sustained.

Furthermore, the participants in both groups had to study hard, working on their homework assignments and preparing to take the mid-term examination during the tenth to 12th weeks; therefore, they did not encourage and support one another to enhance perceived self-efficacy and perform physical activity. According to the social cognitive theory (Bandura, 1986), it is delineated that the nature of human agency, or the ability to control life event, is a triadic reciprocal relationship among behavior, interpersonal factors (cognitive, affective, and biologic), and external environment (Bandura, 1986). When the situation changed, perceived self-efficacy to perform physical activity changed as well. Therefore, perceived self-efficacy of participants in the experimental group decreased in this study after the termination of the intervention.

Physical activity (PA)

The PA mean score of the experimental group increased at the eighth week and then it decreased at the 12th week, whereas the PA mean score of the control group decreased at the eighth week but slightly increased at the 12th week. When PA score at baseline was controlled to be covariant, the PA mean score of the experimental group at the eighth week increased significantly when compared with that of the

control group ($p = 0.004$). The PA mean score of the experimental group was higher than that of the control group, but they did not differ significantly at the 12th week ($p = 0.428$). The PA mean scores did not differ significantly over three time points ($p = 0.869$). However, an interaction effect between group and time were shown ($p = 0.010$). This showed that the physical activity promotion program affected PA of participants in the experimental group at the eighth week. All hypotheses regarding PA were partially supported.

One plausible explanation for such findings is that the present study employed the self-efficacy strategy. This method enhanced perceived self-efficacy and physical activity. Perceived self-efficacy is an important influence on physical activity in adolescents (Dwyer & Makin, 1999; Pate et al., 1995; Robbins, Pender, et al., 2004; Trost, Pate, Saunders, Ward, Dowda, & Felton, 1997; Wu & Pender, 2002). When the participants had increased perceived self-efficacy after completing the program, their physical activity increased. This finding was congruent with an intervention study using the Lifetime Activity Program (LAP) conducted by Lubans and Sylva (2007) which found that the intervention program had a significant effect on self-efficacy and the changes in self-efficacy were related to changes in physical activity. In addition, perceived self-efficacy plays an important role in helping individuals overcome barriers to physical activity (Hagger, Chatzisarantis, & Biddle, 2001) and maintain physical activity. Discussion of benefits of action acts as reinforcement of positive consequences of physical activity (Bandura, 1977). When individuals realize benefits or positive outcomes of those physical activity, they tend to adopt these behaviors. On the other hand, barriers to action have a negative effect upon intention and may be imagined or real. Perception of barriers is identified as a significant predictor of physical activity. If perceived barriers are low, the probability of action is supposed to be greater (Pender et al., 2006). Thus, individuals with fewer perceived barriers are more likely to participate in physical activity. Furthermore, self-efficacy strategies including games, aerobic dance, and competition were employed in this study to enhance enjoyment, and participants were guided to plan on how to perform physical activity following goal setting and self-monitoring in the booklets. Goal setting was typically easy to carry out every week during the period of eight weeks of the study.

Participants also discussed what they needed to do to achieve the goal they set in one to two weeks.

Another possible explanation for this finding is that the participants were motivated or encouraged from peers and researcher and research assistant during receiving the program and their parent at home. Moreover, most participants had high satisfaction and enjoyment with this program. The participants who indicated that physical activity was enjoyable were more likely to participate in physical activity (Craig et al., 1996; DiLorenzo et al., 1998; Robbins, Pis, et al., 2004).

The findings from this study yields strong support to the increase in PA of the participants in the experiment group after completing the program at the eighth week compared with the control group. This finding is also consistent with the application of self-efficacy theory in combination with another theory program enhanced adolescents' physical activity (Hortz, 2005; Maneedang, 2007), increased girls' physical activity (Hommel, 2007; Ransdell, Oakland, & Taylor, 2003; Traetulakarn, 1998; Wang, 2004), and changed food consumption behavior of adolescent students (Kuysuwan, 2000; Suwannathorn, 2000) because these program using self-efficacy theory to develop self-efficacy through four major ways.

At the 12th week follow-up, the PA mean scores of both the experimental and control groups decreased, but with no significant differences ($p = 0.428$). Therefore, it could be concluded that the increased PA gained from this program at the eighth week could not be maintained to 12 weeks, and it decreased. The reason for this is that PSE had an influence on PA. Therefore, when PSE of the participants decreased, their PA might decrease. Another possible explanation for this finding is that during the follow-up period, the participants in both groups had to prepare to take their mid-term examination. Participants in the experimental group paid attention to study; therefore, they did not encourage and support together for physical activity. Moreover, they did not plan to set goals in physical activity including did not practice in exercise contest. This finding was congruent with previous studies that physical activity decreased after an initial increase and when the intervention program is terminated (Dzewaltowski, Estabrooks, & Glasgow, 2004; Reily & McDowell, 2003; Timperio, Salmon, & Ball, 2004). The reason for this is that after attending the program, they did not receive any

information or activity and some participants moved to another school or had new social support resources or friends. Also, the self-report assessment might assess only an overall report or a favorable impression. In addition, Lubans and Sylva (2006) explain in their study that when the three-month follow-up, the final assessment, took place in the summer, it was a time when students were often more active.

Thus physical activity scores of the experimental group increased significantly when compared with those of the control group at week 10, but there were no significant differences between both group at the three-month follow-up.

Although the experimental group's PA mean score at the eighth week increased significantly when compared with the mean score obtained before attending the program and when compared to the mean score of the control group ($p = 0.004$), there was only one PA component, light activity, that had a similar pattern with PA. For the other three PA components—moderate activity, sports, and housework—the mean scores of the experimental group were higher than those of the control group but they did not differ significantly at the eighth week.

The light activity mean score of the experimental group increased significantly when compared with that of the control group at the eighth week ($p = 0.007$). The light activity mean score of the experimental group increased at the eighth week, but after that it decreased at the 12th week. On the other hand, the control group's mean scores obtained at the eighth and 12th week decreased from the baseline.

Light activity consisted of plays and games on which participants in the experimental group spent 24.48, 37.12, and 22.79 minutes per day, while the control group spent 13.36, 18.39, and 22.59 minutes per day on these activities at baseline, the eighth week, and the 12th week, respectively (see Appendix G).

Moderate activity consisted of activities of exercise such as jumping, running and cycling on which the participants in the experimental group spent 75.35, 87.14, and 56.74 minutes per day, while the control group spent 99, 66.93, and 58.5 minutes per day at baseline, the eighth week, and the 12th week, respectively (see Appendix G).

Sports consisted of different types of sports such as badminton, volleyball, table tennis, and basketball on which the participants in the experimental group spent 50, 70, and 51.77 minutes per day, while the control group spent 68.6, 63.83, and

46.40 minutes per day at baseline, the eighth week, and the 12th week, respectively (see Appendix G).

The experimental group spent 136.51, 153.61, and 127.48 minutes per day on housework, while the control group spent 156.94, 129.82, and 104.14 minutes per day at baseline, the eighth week, and the 12th weeks, respectively (see Appendix G).

As the participants in the experimental group attended the program, they had a chance to learn about physical activity and its definition including daily activities that were transportation, play, games, exercise, sports, and housework. Therefore, they planned to perform such physical activity in their goal setting and recorded what they performed every week for eight weeks. When they had developed strong perceived self-efficacy and perceived benefits of PA and came up with strategies to overcome barriers to these activities, they tried to perform these activities. Thus, in the eighth week, their scores of light activity, moderate activity, sports, and housework were higher than those obtained before attending the program and also higher than those of the control group. However, there was only the light activity mean score of the experimental was significantly different with that of the control group. The reason for this is that the participants felt tired when they performed exercise or sports; therefore, they liked to perform light activities.

As regards the inactive activities or sedentary activities such as watching TV and playing video games, the experimental group spent 144 and 127 minutes per day on these activities, whereas the control group spent 111 and 120 minutes per day at the eighth and 12th weeks. However, no significant differences were found.

Physical fitness (PF)

The mean score of PF of the experimental group was lower than that of the control group at baseline, but they did not differ significantly. Also, the mean scores of PF of the experimental group were lower than those of the control group, but they did not differ significantly, at the eighth and 12th weeks. Significant differences were not found between the experimental and control groups over the three time points ($p = 0.968$). The interaction effect of groups and times on PF scores was not significant on the overall ($p = 0.143$). As a result, all hypotheses regarding PF were not

supported. This pattern was similar to the pattern of the four PF components: sit-up, push-up, sit-and-reach, and run.

Similarly, when considering the four PF components, it was found that there were no differences between the experimental and control groups at the eighth and the 12th week. At the eighth and 12th week, the sit-up and push-up mean scores of both the experimental and control groups increased when compared with the baseline. In contrast, the run mean scores of both the experimental and control groups decreased when compared with the baseline.

As for the experimental group, there were significant differences of sit-up, push-up, and sit-and-reach mean scores between at baseline and the eighth week, at baseline and the 12th week, and at the eighth and 12th weeks. However, there were significant differences in the run mean scores at baseline and the 12th weeks. This pattern was similar to that of the control group.

Although after attending the program at the eighth week, the experimental group's mean scores of PSE and PA were significantly higher than those of the control group and higher than those obtained before attending the program, the mean scores of PF did not differ. An explanation for this that the program in this study did not specifically focus on flexibility, muscle strength, and cardiorespiratory endurance, but the activity stressed to motivate and enhance aerobic dance skills and games. There was no vigorous training, and the aerobic dance lasted ten to 25 minutes per session and not all sessions had aerobic dance. Participants in the experimental group performed physical activity as their desire in some sessions such as volleyball, basketball and trakraw. Similarly, Morrow and Freedson's study (1994) revealed that physical fitness improved if increased in physical activity is sufficient. The evidence indicated that only high intensity (over 6 MET) improved physical fitness. Furthermore, the reason for this is the genetic and maturational status may influence physical fitness and the relationship between fitness and physical activity is generally low among children (Armstrong & Welsman, 1997) and adolescents (Katzmarzyk et al., 1998). The relationship between physical activity and physical fitness in children and early adolescents is less clear. Some studies reported that moderate to vigorous physical activity is positively related to physical fitness among adolescents,

independently of age (Ekelund, Poortvliet, Nilsson, Yngve, Holmberg, & Sjöström, 2001; Katzmarzyk, Malina, Song, Bouchard, 1998). However, the relationship between physical active and physical fitness is better in adults than in children and adolescents (Malina, 2001). For example, Huang and Malina (2002) examined the relationship between physical activity and health-related physical fitness among Taiwanese adolescents 12-14 years of age. The subjects were randomly selected from the seventh, eighth and ninth graders in two junior high schools in Taiwan. Physical activity was estimated as total daily energy expenditure and energy expenditure in moderate-to-vigorous physical activity. Health-related physical fitness was assessed as the one-mile run (cardiorespiratory endurance), sit-up (abdominal strength and endurance), sit-and-reach (lower back flexibility). The results revealed that physical activity was significantly and positively correlated with one-mile run performance and the sit-and-reach. Overall, the strength of the relationships between estimated energy expenditure and specific fitness items in the total sample vary from low to moderate, with only 1% to 12% of the variance in fitness variables being explained by estimated energy expenditure. Besides, the lack of agreement between physical activity and physical fitness in early adolescents might be due to the variety of methods used to measure both physical fitness and physical activity (Martinez-Vizcaino & Sánchez-López, 2008). The last reason for this finding is participants' attitude. Some participants stated that they disliked the PF tests and had tiredness after ending tests. This result was congruent with the findings reported by Amitrapai (2007) who conducted a quasi-experimental study to determine the effect of an exercise program on weight control and health-related fitness among students in grades 5 and 6 in Nakhonpathom province. The experimental and control groups consisted of 20 overweight students. The experimental group participated in the exercise program an hour a day, five days a week, for eight weeks. The results revealed that the run mean score of the experimental group was significantly lower than that of the control group ($p < 0.05$). However, weight control, sit-up, push-up, and sit-and-reach scores of the experimental and control groups were not significantly different. In addition, the findings of this study were similar to those of Sallis and colleagues (1997) who implemented the SPARK (sport, play, and active recreation for kids) program and

found significant differences between the sit-up and run scores of girls in the experimental group and those of girls in the control group at two years follow up ($p < 0.001$).

In summary, the physical activity promotion program had effects on PSE, PA, and light activity components of adolescent girls studying in grades 7 and 8 at the eighth week. The experimental group's PSE, PA, and light activity component scores were significantly higher than those of the control group at the eighth week. Similar studies were carried out by Hartz (2005), Kuysuwan (2000), Maneedang (2007), Traetulakarn (1998), and Wang (2004). However, it is worth noting that although the mean scores of three PA components of the experimental group were higher than those of the control group, they did not differ significantly. Furthermore, these effects could not be maintained at the 12th week, which was congruent with studies of Dzewaltowski and colleagues (2004), Reily and McDowell (2003), and Lubans and Sylva (2006). Furthermore, the PF and four PF components scores were not significantly different between the experimental and control groups at the eighth and 12th weeks. Also, at the eighth and 12th weeks, the mean scores of PF and four PF components of both groups were better than baseline. These findings yielded full support to the findings of Robbins and colleagues (2006) and Kijboonchoo and colleagues (1999) and partial support to the study findings of Amitrapai (2007), Huang and Malina (2002), Jamner and colleagues (2004), and Sallils and colleagues (1997).

Response of the Participants to the Physical Activity Promotion Program

The participants in the experimental group showed a positive response to the physical activity promotion program. In general, most participants in both classes, seventh and eighth graders, were enthusiastic in the participation in the program. Before attending the program, all participants were assessed with the questionnaires and four physical fitness tests with facility timetable from a physical education teacher. According to the results of the focus group conducted before the main study took place, most of the participants in both groups (81.2%) liked to exercise, accounting for 38.3% of the experimental group and 35.8% of the control group. The participants in both groups expected that physical activity would make them have better health and become taller after participating in the program. They received

knowledge regarding physical activity, types or dimensions, principles, benefits, and guidelines on how to perform physical activity during the first session. As for the experimental group, the participants additionally received the physical activity promotion program which included playing games to develop self-efficacy and enjoyment.

During the first two weeks, some participants were too shy to perform aerobic dance, but after two to three sessions they were willing to do it with their friends. Because of various activities used in the program such as games, aerobic dance with the research assistant, VCDs, participant-selected exercise, discussion with a live model, as well as dance recitals for the contest, the participants felt that the program was enjoyable and not boring. They wanted to spend more time in some sessions, particularly games and self-selected exercises. Furthermore, the participants set goals to perform their activities and recorded what they did to accomplish the goal in the booklet. Some participants recorded the guideline to overcome their barriers and the benefits of goal setting. However, there were some participants who did not plan anything for some weeks when the midterm examination was approaching. The reason for this was they were too busy with homework assignments, but some were also forgetful or lazy.

Furthermore, the participants were willing to share their experiences and discuss their activities after school and at home including their sources of social support such as their father, sibling, etc. Finally, the participants felt enthusiastic to engage in the competition called "Exercise Leader Academy;" therefore, they practiced aerobic dance for one week before the competition. Additionally, some participants played basketball or Trakraw during the recesses, lunch breaks, and after school. However, some of them said that they disliked the run test because it was exhausting. In contrast, other participants stated that they wanted to take the test to get some idea about their own physical fitness. After the program had been completed, at the 12th week, the participants reported most benefits of the program, including being healthy, having a good body shape, becoming taller, and having more confidence, respectively. They wanted to continue their participation in the physical activity program but they had to study hard to prepare for the final examination. The accounts

from the participants reflected that all participants were satisfied with the physical activity promotion program.

Theoretical Aspects

The physical activity promotion program of this study was guided by Pender's Health Promotion Model (HPM) (Pender, 1996) and the self-efficacy theory (Bandura, 1986). Pender's HPM is appropriate to use when trying to understand the personal, cognitive, and environmental factors that influence health behavior. The strategy of this program was to enhance self-efficacy of the participants in the experimental group which affected their physical activity and physical fitness. The program was designed through four major sources in developing self-efficacy—enactive mastery experience, vicarious experience or modeling, verbal persuasion, and physiological and affect. The processes of the program consisted of enhancing perceived self-efficacy and perceived benefits; limiting and overcoming barriers; promoting interpersonal influences from social support of peers, teachers, the researcher and research assistant, as well as parents and siblings at home; and developing enjoyment during the participation. In addition, goal setting was used to enable the participants to develop the confidence to carry out the activities and eventually achieve the goal they set for every week.

Based on the findings of this study, it could be concluded that the physical activity promotion program based on Health Promotion Model (HPM) (Pender, 1996) and self-efficacy theory (Bandura, 1986) could enhance perceived self-efficacy and physical activity in Thai adolescent girls. However, significant differences were not found in their physical fitness at the eighth and 12th weeks.

Instrumentation issues

This study relied on self-reported perceived self-efficacy and physical activity data. The physical fitness test included a battery of simple field tests. There were four fitness tests: sit-up, push-up, sit-and-reach, and run.

The physical activity questionnaire (PAQ) (Kijboonchoo et al., 2007) was a self-report instrument which was one measurement technique of physical activity for children and adolescents. It can measure type, frequency, and mode of physical

activity. However, limitations of this measurement include the ability of children to accurately recall the details about their physical activity patterns. Nevertheless, validity and reliability of physical activity recall generally increases with age. The participants in this study were early adolescents with the mean age of 13 years, so a self-report questionnaire could be employed. Put another way, it could provide an overestimation of physical activity when compared to other objective measures (pedometers or CSA accelerometer) (Simons-Morton et al., 1994; Welk, Corbin, & Dale, 2000). In this study, the participants recorded some activities with repeated items such as run, bicycle in the 3rd item (moderate activity) and run, bicycle in the 4th item (sports). In addition, in this study, physical activity level could not be calculated into energy expenditure (Metabolic Equivalent Intensity: MET) for each type of physical activity (Ainsworth et al., 2003) because MET was developed for adults and some specific activities in Thailand (Trakraw). Therefore, it was calculated into time, minutes per week, for each activity as recommended by Kijboonchoo and colleagues. As for physical fitness, a number of formal fitness tests were available, but in this study a battery of four tests were used. It is noteworthy that all participants' physical fitness was measured in one session, so they might be too exhausted. Some participants felt weak on that day, but they wanted to complete the test. Moreover, as some studies used different physical fitness tests, these issues should be further examined to lead to accurate instrument development.

Data Analysis Procedures

In this study, the independent sample *t*-test was used to compare the experimental and control groups at baseline. Then, a repeated measures ANOVA was used to analyze the data. A repeated measures ANOVA reduces the error term; it increases the power of the analysis (Munro, 2001).

When the PSE, PA, and push-up mean scores of the experimental and control groups showed differences at baseline, statistical control of these variables was performed (ANCOVA). When using ANCOVA, the variation from this variable was measured and extracted from the within (or error) variation. The effect was the reduction of error variance and therefore an increase in the power of the analysis.

With ANCOVA, the control of the extraneous variation provided a more accurate estimate of the real difference among groups (Munro, 2001).

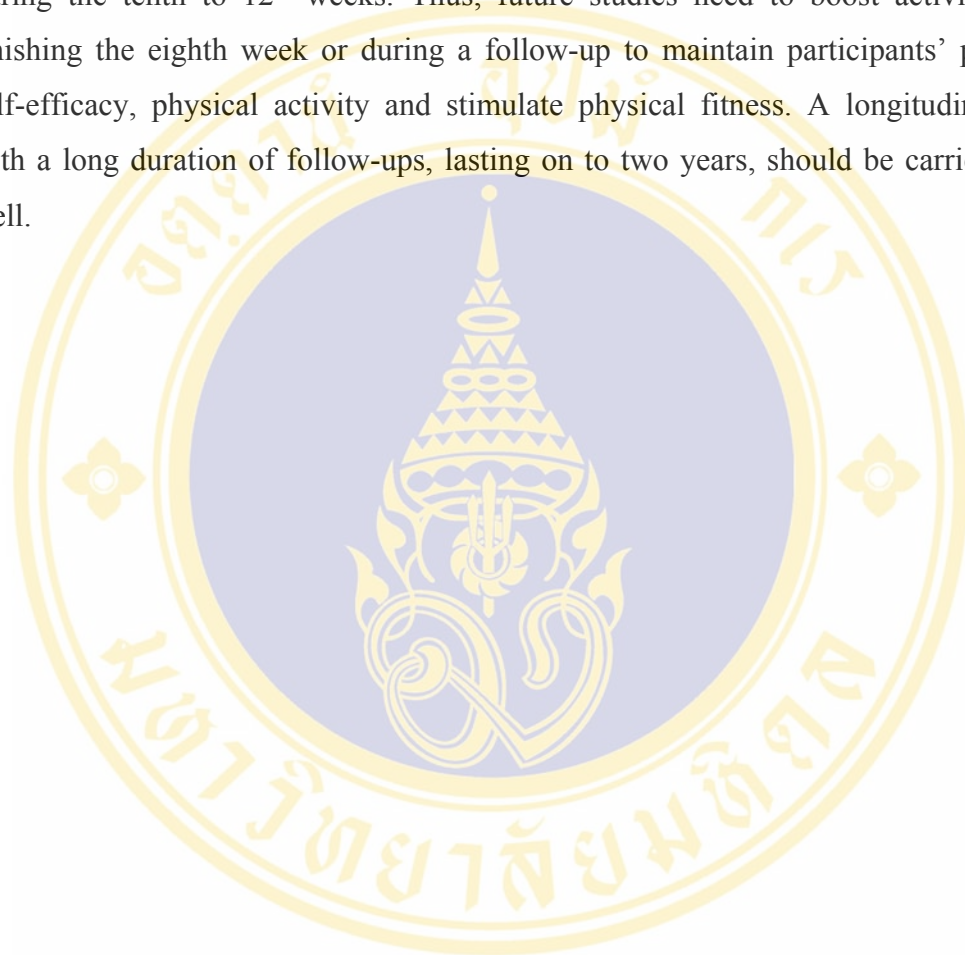
Generalization

The design of this study involved threats to internal validity; therefore, generalizability of the findings was lessened. This research was conducted in schools, and this was consistent with various studies of physical activity promotion interventions in children and adolescents (Dishman & Buckworth, 1996; Kahn et al., 2002; Marcus et al., 2006; Salmon et al., 2007; Stone et al., 1998). The majority of the participants in this study shared similar demographic characteristics, and they went to public schools which had a similar physical education curriculum and which were situated in a similar setting. However, baseline differences in dependent variables were inevitable. Thus, the dependent variables were controlled by the covariate ANOVA. In summary, the findings of this study are generalizable to adolescent girls who are studying at both public and private school in Thailand to increase perceived self-efficacy and physical activity of adolescent girls. This intervention program consist of enjoyment, encouragement, participation and competition in physical activity. However, this program should run continuously after attending the eighth weeks to maintain perceived self-efficacy and physical activity. Also, this program would have limited application for students who are interested in study but not interested in physical activity. The school directors or executives had not awareness and concern of physical activity promotion in school.

The Limitation of the Study

These findings showed that the physical activity promotion program based on Pender's Health Promotion Model (HPM) (Pender, 1996) and the self-efficacy theory (Bandura, 1986) effect on perceived self-efficacy and physical activity of participants. This program could increase perceived self-efficacy and physical activity including light activity in participants. Although, physical fitness of participants in both group were not differ, four components of physical fitness—sit-up, push-up, sit and reach, run—were better than from baseline. Additionally, participants in the experimental

group were interested and active in participating activities, aerobic dance, game play, exercise competition, and goal setting in physical activity including social support from peers. However, this study was conduct for the eighth and at the 12th week follow- up which is limited a time due to preparing to take the mid-term examination during the tenth to 12th weeks. Thus, future studies need to boost activities after finishing the eighth week or during a follow-up to maintain participants' perceived self-efficacy, physical activity and stimulate physical fitness. A longitudinal study with a long duration of follow-ups, lasting on to two years, should be carried out as well.



CHAPTER VI

CONCLUSION

This chapter consists of two sections. The first section is a summary of the study. The second section focuses on the implications and applications of research findings and recommendations.

Summary of the Study

This quasi-experimental research aimed to test the effects of a physical activity promotion program on perceived self-efficacy (PSE), physical activity (PA) behavior, and physical fitness (PF) of Thai adolescent girls. The assessments were conducted with both the experimental group and the control group at baseline, the eighth week, and the 12th week. The theoretical frameworks for this study were Pender's Health Promotion Model (HPM) and Self-efficacy theory (Bandura, 1986).

The study was conducted at two public schools, Chonkanyanukoon school and Chonradsadornumrung 2 school, in Chonburi province. Chonkanyanukoon school was used as the experimental group with the adolescent girls who were recruited to take part in the study receiving both general information of physical activity and a physical activity promotion program. Chonradsadornumrung 2 school was selected as the control group with the adolescent girls receiving only general information of physical activity. The participants were recruited into the study based on the following selection criteria: no participation in any athletic programs, no history of illness, and with parental consent. There were 59 participants who were assigned into the experimental group and 47 participants in the control group. Seven participants in the experimental group and five in the control group withdrew from the study. Also, nine participants in the experimental group and four in the control group were removed before data analysis commenced due to having outlier. The attrition rate was 23.58%. Finally, there were 43 participants in the experimental group and 38 participants in the control group, which were considered an adequate sample size for data analysis.

The participants in the experimental group participated in the program for eight weeks, three sessions per week, and 50 minutes per session. The activities included in the eight-week program included giving knowledge regarding physical activity, playing games, discussion of benefits and barriers, showing the live and symbolic model, offering encouragement and support, goal setting and self-monitoring, exercise, and exercise contest. The control group performed exercises and physical activity as usual. Two questionnaires on PSE and PA behavior, as well as four assessments of sit-up, push-up, sit-and-reach, and run were carried out at baseline, the eighth week, and the 12th week of the study.

The results showed that the PSE, PA behavior, and light activity of the experimental group increased significantly more than those of the control group at the eighth week. Although three components of PA behavior did not show significant differences between the experimental group and the control group, the mean scores of the experimental group were higher than those of the control group at the eighth week. However, all dependent variables were not significantly different at the 12th week. Also, PF and its four components were not significantly different between the eighth and the 12th weeks. Therefore, this program had short term effects on perceived self-efficacy and physical activity but that were not maintained over time. Besides, although scores of PF and four components of both groups at the eighth and 12th weeks were better than those at baseline, they did not significantly differ.

Implications and Recommendations

Implications for nursing education and practice

The physical activity promotion program for adolescent girls in school should be developed for nursing practice training in school health course of nurse in order to enhance perceived self-efficacy and physical activity. In nursing education should teach nursing students or nurses to promote, encourage and support physical activity in adolescent girls. Furthermore, they should be the role model in promoting physical activity. This program was designed to be easily implemented in the class of a school setting. It be composed of the Health Promotion Model (Pender, 1996) which can motivate individuals to engage in health behaviors directed toward the enhancement of

health such as physical activity. The self-efficacy theory (Bandura, 1986) which explains the nature of behavioral changes should also be utilized. Pender's Health Promotion Model consists of enhancing perceived benefits, limiting perceptions of barriers, increasing enjoyment of physical activity, and motivation from aerobic dance competition, including interpersonal influences such as social support from peers, teachers, the researcher, and parents and siblings at home. On the other hand, the self-efficacy theory was designed through four major sources in developing self-efficacy—enactive mastery experience, vicarious experience or modeling, verbal persuasion, and physiological and affect, including skills in performing an aerobic dance. In addition, goal settings and self-monitoring which the participants planned to do and were able to achieve every week during running the program contributed to the positive outcomes of the program.

It provided education, general information regarding physical activity for adolescents, and strategies to enhance perceived self-efficacy and physical activity. The participants in the present study perceived the benefits of physical activity from dissemination of knowledge and group discussions with a live model. They discussed and shared their experience, barriers of physical activity, and methods of solving problems including performing aerobic dance and exercise. Furthermore, they set and reviewed their goals, identified strategies to overcome barriers in their booklets, and performed physical activity so as to reach their goals. Thus, this program can be developed and implemented as a physical education program in school because it allows students to choose to perform exercises as their desire and including in one part of physical education course.

However, it is worth noting that even though the program had an effect on perceived self-efficacy and physical activity of the participants immediately after attending the program, their behavioral change could not be sustained. Instead, it decreased after the eighth week. Such findings led to a conclusion that the program should include continuous activities to better enhance and maintain perceived self-efficacy and physical activity behavior of the program. Furthermore, the program should be designed to increase physical fitness of the participants as well.

Implications for national health policy

As physical activity is one of the most significant problems of the 21st Century (USDHHS, 2000), promotion of physical activity among children and adolescents is focused. Several physical activity guidelines for children and adolescents have recommended one hour or 60 minutes or more hours per day of physical activity (Ministry of Public Health, 2007; Strong et al., 2005; USDHHS, 2008). Also, physical fitness is another concern since both physical activity and physical fitness levels of Thai children and youth tend to decrease. Although, this program did not affect on physical fitness, there were scores better than those at baseline. The findings of this study have showed the effectiveness of the physical activity promotion program among adolescent girls in school. Given these findings, the following points should be taken into account when considering the national health policy:

1. School nurses or physical education teachers should be equipped with knowledge and skill to implement the physical activity promotion program among adolescent girls into physical education course. Additional physical activity or exercise for students should also be added into other subjects besides physical education and encourage by providing exercise contest. For instance, dancing contest or activity should be organized in the classroom. The teachers should encourage students especially girl students to increase activity in the morning before the first period study (five to ten minutes per day), during recess (five to ten minutes per day), after school, and during the summer break to instill the habit of physical activity in them.

2. The school directors should have awareness, concern of physical activity promotion in school, and provide and support in the form of sport instruments or materials, budgets, and environment including provision of health personnel in school to enhance and promote the physical activity of students. Finally, the results of research study regarding physical activity among adolescents in the schools should be presented to the Ministry of Education in order to promote, encourage and concern about physical activity among students.

Recommendations for Future Research

1. The intervention period in the present study was considered short. Therefore, the program should be run continuously. A booster can be used after finishing the eighth week or during a follow-up such as giving goal setting in physical activity every week, to maintain participants' physical behavior and stimulate physical fitness. A longitudinal study with a long duration of follow-ups, lasting one to two years, should be carried out as well.

2. Measures of physical activity should include both subjective techniques such as self-reports and objective techniques such as pedometers or accelerometers to confirm accuracy of physical activity of the program participants.

3. The program for physical activity promotion among adolescent girls in school should be developed and especially designed to increase adequate physical fitness and to help overweight girls reduce and control their body weight. The program should also be implemented with adolescent girls in the community and should promote social support for these girls such as mothers or peers in the community.

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APPENDIX A

THE BOOKLET FOR EXPERIMENTAL GROUP



ตารางบันทึกการออกกำลังกาย

สัปดาห์ที่ 1 วันที่ ถึง เดือน..... พ.ศ. 255....

วัน/ สัปดาห์	กิจกรรม	เป้าหมาย เวลาที่ใช้นาที/วัน	ทำได้ เวลาที่ใช้นาที/วัน
จันทร์	ตัวอย่าง ขี่จักรยาน วิ่งปอง	20 15	20 -
อังคาร			
พุธ			
พฤหัสบดี			

APPENDIX B

THE BOOKLET FOR CONTROL GROUP



APPENDIX C
THE MANUAL OF THE PHYSICAL ACTIVITY PROGRAM (THAI version)

โปรแกรมส่งเสริมการออกกำลังกายในหญิงวัยรุ่น

วัตถุประสงค์	วิธีดำเนินการ	กิจกรรม	อุปกรณ์	การประเมิน
<p>สัปดาห์ที่ 1 (ครั้งที่ 1-3)</p> <ul style="list-style-type: none"> - มีความรู้ความเข้าใจเกี่ยวกับการเคลื่อนไหวออกแรงและการเคลื่อนไหวออกแรงและการเคลื่อนไหวออกแรงและ สำคัญต่อสุขภาพหลายด้าน พัฒนาความเชื่อมั่นในตนเอง จากประสบการณ์ที่ประสบความสำเร็จด้วยตนเองและ การออกกำลังกายด้วยตนเอง วัตถุประสงค์เฉพาะ <p>1. รู้ชนิดและประเภทของการเคลื่อนไหวออกแรงและ</p> <p>2. รู้หลักและความสำคัญของการเคลื่อนไหวออกแรงและการ</p>	<p>ครั้งที่ 1</p> <ol style="list-style-type: none"> 1. ผู้วิจัยแจ้งวัตถุประสงค์การจัดโปรแกรมส่งเสริมการออกกำลังกาย พร้อมทั้งประโยชน์ที่นักเรียนจะได้รับ 2. ผู้วิจัยและผู้ช่วยวิจัยสร้างความคุ้นเคยระหว่างนักเรียนด้วยกัน จากนั้นแบ่งกลุ่มนักเรียนเป็น 2 กลุ่ม ตามความสมัครใจ (10 นาที) 3. กิจกรรมเข้าสู่การเสริมสร้างความรู้เกี่ยวกับหลักการเคลื่อนไหวออกแรงและออกกำลังกาย โดยให้นักเรียนแต่ละกลุ่มเล่าประสบการณ์ ความรู้สึกของตนเองเกี่ยวกับการออกกำลังกาย เช่น ชอบออกกำลังกายแบบไหนหรือไม่ชอบ หรือรู้สึกว่าการออกกำลังกายน้อยไปหรือไม่ เพราะอะไร โดยใช้แบบสำรวจ (20 นาที) 4. ผู้วิจัยบรรยายภาพนิ่ง (Powerpoint) การเคลื่อนไหวออกแรงและออกกำลังกายสำหรับวัยรุ่นในหัวเรื่อง (20 นาที) <ul style="list-style-type: none"> - ชนิดและประเภทของการเคลื่อนไหวออกแรงและการออกกำลังกาย - ระยะเวลาการเคลื่อนไหวออกแรงและการออกกำลังกาย - หลักและความสำคัญของการออกกำลังกาย - ประโยชน์ของการออกกำลังกาย - เคลื่อนไหวออกแรง ออกกำลังกายอย่างไร จึงจะเหมาะสำหรับเด็กและวัยรุ่น 	<ul style="list-style-type: none"> - เกมสี - อภิปราย - บรรยาย - ทักทาย - กำลังกาย 	<ul style="list-style-type: none"> - ภาพนิ่ง (Powerpoint) การออกกำลังกาย - สำหรับวัยรุ่น - คู่มือการออกกำลังกาย และแบบบันทึกการออกกำลังกาย - ด้วยตนเอง - วิดีทัศน์การออกกำลังกาย - กำลังกาย Thai Kids on the move (ชุดที่ 1 และ 2) - กระดาษเขียนจดหมาย - ปากกา 	<ul style="list-style-type: none"> - สังเกตความสนใจ - สังเกตการมีส่วนร่วม - การแสดงความคิดเห็นในการเข้าร่วมทำกิจกรรม - การซักถาม - การสอบถามความเข้าใจ

สัปดาห์ที่ 1) ครั้งที่ 2**กิจกรรมจดหมายเปิดซอง (ความคาดหวังในกิจกรรมการออกกกำลังกาย)****วัตถุประสงค์**

เพื่อให้ให้นักเรียนแต่ละคนได้แสดงความคาดหวังต่อการเข้าร่วมกิจกรรมการออกกกำลังกาย

ขนาดของกลุ่ม 25-27 คน แบ่งเป็น 2 กลุ่มๆละ 13-14 คน

ระยะเวลา 15 นาที

อุปกรณ์ กระดาษเขียนจดหมาย ปากกา

ขั้นตอน

ผู้วิจัยและผู้ช่วยวิจัยแบ่งนักเรียนออกเป็น 2 กลุ่ม กลุ่มของผู้วิจัยและผู้ช่วยวิจัย จากนั้นให้นักเรียนนั่งเป็นวงกลม และเขียนความรู้สึกคาดหวังในการเข้าร่วมกิจกรรมส่งเสริมการออกกกำลังกาย โดยเขียนใส่กระดาษเขียนจดหมายแล้วพับใส่ซอง เมื่อเสร็จแล้วยกมือเพื่อให้ทราบว่าเป็นเสร็จแล้วและรอเปิดอ่าน เมื่อทุกคนเขียนเสร็จแล้ว นักเรียนที่เสร็จคนแรกเปิดจดหมายอ่านให้ทุกคนฟัง และอธิบายเพิ่มเติมจากข้อความที่เขียนในจดหมาย ทำเช่นนี้จนครบทุกคนจากนั้นผู้วิจัยและผู้ช่วยวิจัย ให้นักเรียนในกลุ่มสรุปความรู้สึกคาดหวังในการเข้าร่วมกิจกรรมส่งเสริมการออกกออกกำลังกายในครั้งนี้ว่าเหมือนกันหรือต่างกันอย่างไร

ส่วนที่ 3: การวัดการเคลื่อนไหวร่างกาย (PAQ)

กิจกรรมเกี่ยวกับการเคลื่อนไหวร่างกาย

ใน 7 วันที่ผ่านมา ให้ตอบกิจกรรมต่าง ๆ ที่ทำ โดยใส่จำนวนวันที่ทำกิจกรรมนั้น ๆ และความนานที่ทำเป็นกี่ชั่วโมง ก็บันทึกต่อวัน

กิจกรรม	จำนวนวันที่ทำกิจกรรม ใน 7 วันที่ผ่านมา	ใช้เวลานานวันละเท่าไร	
1. เกมการเล่นที่มีจะนั่งเป็นส่วนใหญ่ (เช่น นั่งดูทีวี นั่งเล่นเกม ประดิษฐ์ของเล่น ปีนดินน้ำมัน เล่นดนตรี เล่นหมากรุกกระดาน ต่อจิ๊กซอว์ ตกปลา)วันชม.นาที
2. เกมกิจกรรมการเล่นที่มีการเคลื่อนไหวเป็นส่วนใหญ่ (เช่น เล่นกระต่ายขาเดียว วิ่งเปรี๊ยะ ตีจ๊อบ เล่นเตย กระโดดกบ โกว้อดินตรี ชักเย่อ จูกินทาง อีกาฝึกไข่ ช้อนแอม เล่นว่าว โยนบอล)วันชม.นาที
3. กิจกรรมกายบริหารและการออกกำลังกาย <ul style="list-style-type: none"> ● กายบริหารที่มีกระโดดเป็นส่วนใหญ่ เช่น โดดเชือก โดดตบ สกอตจัม ● กายบริหารที่มีการวิ่งเป็นส่วนใหญ่ เช่น วิ่งเล่น วิ่งซิกแซก วิ่งเตาะขา วิ่งก้มเตะ วิ่งข้ามสิ่งกีดขวาง ● กายบริหารที่มีการยืนเป็นส่วนใหญ่ เช่น ยืนขาเดียว ยืนเตาะขา ยืนกางแขน ยืนกระโดดสูง ยืนกระโดดไกล ● กายบริหารที่มีการเปลี่ยนท่าทางหลายท่าร่วมกันเช่น ม้วนหน้า ม้วนหลัง สะพานโค้ง ทกทบ ทกสูง วิดพื้น ดันพื้น โหนบาร์ ไตราว ● ปั่นจักรยาน ● อื่น ๆ ระบุ..... ● อื่น ๆ ระบุ..... วันชม.นาที
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การทดสอบสมรรถภาพทางกาย (Physical Fitness)

ลุกนั่ง 30 วินาที (Sit-ups 30 sec)

วัตถุประสงค์

วัดความแข็งแรงและความอดทนของกล้ามเนื้อหน้าท้อง

อุปกรณ์

นาฬิกาจับเวลา เเบาะรองพื้น

วิธีดำเนินการทดสอบ

1. ให้นักเรียนที่เข้ารับการทดสอบจับคู่กัน โดยผู้เข้ารับการทดสอบก่อนจะนอนหงายลงบน เเบาะพร้อมกับงอเข่าตั้งเป็นมุมฉาก มือทั้งสองข้างสอดวางที่ต้นคอโดยปลายนิ้วต้องสัมผัสบริเวณต้นคอ นักเรียนที่ไม่ได้รับการทดสอบคุกเข่าอยู่ระหว่างเท้าผู้รับการทดสอบ จับหลังเท้าของผู้เข้ารับการทดสอบติดกับเบาะ
2. ผู้ทำการทดสอบให้สัญญาณ “เริ่ม” พร้อมทั้งจับเวลา
3. ผู้เข้ารับการทดสอบลุกขึ้นสู่ว่านั่งพร้อมกับก้มศีรษะลงในระหว่างหัวเข่าทั้งสองข้าง ขณะเดียวกันให้กลับสู่ท่านอน โดยให้ท้ายทอยสัมผัสกับพื้นเบาะ แล้วกลับสู่ท่านั่งอย่างต่อเนื่องด้วยความรวดเร็ว
4. ไม่อนุญาตให้ผู้เข้ารับการทดสอบใช้ข้อศอกยันพื้นช่วยในขณะลุกขึ้นนั่ง และมือทั้งสองข้างจะต้องจับกันตลอดระยะเวลาของการทดสอบ
5. ผู้เข้ารับการทดสอบจะต้องทำให้ได้มากที่สุดครั้งที่สุดในเวลา 30 วินาที แต่จะนับเฉพาะจำนวนครั้งที่ทำได้ถูกต้องเท่านั้น
6. ผู้ทำการทดสอบจับเวลาจนครบ 30 วินาที พร้อมทั้งให้สัญญาณ “หยุด” บันทึกจำนวนครั้งที่ทำได้ลงในใบบันทึก

การอ่านผลและการแปลค่า

บันทึกผลการทดสอบที่ทำได้อย่างถูกต้องเป็นจำนวนครั้ง ภายใน 30 วินาที นำผลที่ได้ไปเปรียบเทียบกับเกณฑ์

APPENDIX E

หนังสือยินยอมคนให้ทำการวิจัย (Informed Consent Form)

โครงการวิจัย เรื่อง ผลของ โปรแกรมส่งเสริมการออกกำลังกายในหญิงวัยรุ่น

วันที่ให้คำยินยอม วันที่ เดือน พ.ศ.

ข้าพเจ้า (นาย/นาง/นางสาว) ซึ่งเป็น ผู้ปกครอง/
 ผู้อุปการะโดยชอบด้วยกฎหมายของ ด.ช./ด.ญ ขอทำหนังสือนี้ไว้ต่อหัวหน้า
 โครงการเพื่อเป็นหลักฐานแสดงว่า

ข้อ 1. ก่อนลงนามในใบยินยอมคนให้ทำการวิจัยนี้ ข้าพเจ้าได้รับการอธิบายจากผู้วิจัย คือ
 นางสาวนฤมล ชีระรังสิกุล ให้ทราบถึงวัตถุประสงค์ของการวิจัย วิธีการวิจัย ความเสี่ยงหรือความ
 ไม่สุขสบายที่อาจเกิดขึ้นจากการวิจัย รวมทั้งประโยชน์ที่จะเกิดขึ้นจากการวิจัยอย่างละเอียด โดยไม่
 มีสิ่งใดปิดบังซ่อนเร้น และมีความเข้าใจดีแล้ว

ข้อ 2. ข้าพเจ้ายินดีที่จะเข้าร่วมโครงการวิจัยและยินยอมให้เด็กเข้าร่วมโครงการวิจัยโดยสมัครใจ
 และเต็มใจโดยมิได้บังคับ ชูเชิญ หรือหลอกลวงจากผู้วิจัยแต่ประการใด

ข้อ 3. ข้าพเจ้าได้รับทราบจากผู้วิจัยแล้วว่าข้าพเจ้ามีสิทธิที่จะบอกเลิกการเข้าร่วมในโครงการ
 วิจัยนี้เมื่อใดก็ได้ และการบอกเลิกการเข้าร่วมวิจัยนี้จะไม่มีผลกระทบทางลบต่อการเรียนของเด็ก
 หรือการดำเนินชีวิตตามปกติที่ข้าพเจ้าจะพึงมีต่อไป

ข้อ 4. ข้าพเจ้าได้รับการรับรองจากผู้วิจัยว่าจะเก็บข้อมูลเฉพาะเกี่ยวกับตัวข้าพเจ้า และเด็กเป็น
 ความลับ และจะเปิดเผยผลของการวิจัยเฉพาะในรูปที่เป็นสรุปผลการวิจัยเท่านั้น

ข้อ 5. ข้าพเจ้าได้รับทราบจากผู้วิจัยแล้วว่าหากเกิดอันตรายใดๆ อันเนื่องจากการวิจัยดังกล่าว
 ข้าพเจ้าและเด็กจะได้รับการดูแลอย่างที่เหมาะสม โดยไม่คิดมูลค่าตามมาตรฐานวิชาชีพ

ข้อ 6. ข้าพเจ้าได้อ่านและทำความเข้าใจข้อมูลทั้งหมดในเอกสารคำแนะนำสำหรับผู้เข้าร่วม
 วิจัยนี้ แล้วและข้าพเจ้าได้ซักถามปัญหาที่ข้องใจเป็นที่พอใจแล้ว

ข้าพเจ้าได้อ่านข้อความข้างต้นแล้วและมีความเข้าใจดีทุกประการ จึงได้ลงนามในใบยินยอมนี้
 ด้วยความเต็มใจ

ลงชื่อ ผู้ปกครอง/ผู้อุปการะ
 (.....) โดยชอบด้วยกฎหมาย

ลงชื่อ ผู้วิจัย
 (.....)

ลงชื่อ พยาน
 (.....)

หนังสือยินยอมคนให้ทำการวิจัย (Informed Consent)

โครงการวิจัย เรื่อง ผลของโปรแกรมส่งเสริมการออกกำลังกายในหญิงวัยรุ่น

วันที่ให้คำยินยอม วันที่ เดือน พ.ศ.

ข้าพเจ้า (ค.ช./ค.ญ./นาย/นาง/นางสาว) ขอทำหนังสือนี้ไว้

ต่อหัวหน้าโครงการเพื่อเป็นหลักฐานแสดงว่า

ข้อ 1. ก่อนลงนามในใบยินยอมคนให้ทำการวิจัยนี้ ข้าพเจ้าได้รับการอธิบายจากผู้วิจัย คือ นางสาวนฤมล ธีระรังสิกุล ให้ทราบถึงวัตถุประสงค์ของการวิจัย วิธีการวิจัย ความเสี่ยงหรือความไม่สุขสบายที่อาจเกิดขึ้นจากการวิจัย รวมทั้งประโยชน์ที่จะเกิดขึ้นจากการวิจัยอย่างละเอียดโดยไม่มีสิ่งใดปิดบังซ่อนเร้น และมีความเข้าใจดีแล้ว

ข้อ 2. ข้าพเจ้ายินดีที่จะเข้าร่วมโครงการวิจัยนี้โดยสมัครใจและเต็มใจโดยมิได้บังคับ บังคับ ทุ้อทุตี หรือ หลอกลวงจากผู้วิจัยแต่ประการใด

ข้อ 3. ข้าพเจ้าได้รับทราบจากผู้วิจัยแล้วว่าข้าพเจ้ามีสิทธิที่จะบอกเลิกการเข้าร่วมในโครงการวิจัยนี้เมื่อใดก็ได้ และการบอกเลิกการเข้าร่วมวิจัยนี้จะไม่มีผลกระทบทางลบต่อการทำงานหรือการดำเนินชีวิตตามปกติที่ข้าพเจ้าจะพึงมีต่อไป

ข้อ 4. ข้าพเจ้าได้รับการรับรองจากผู้วิจัยว่าจะเก็บข้อมูลเฉพาะเกี่ยวกับตัวข้าพเจ้าเป็นความลับ และจะเปิดเผยผลของการวิจัยเฉพาะในรูปที่เป็นสรุปผลการวิจัยเท่านั้น

ข้อ 5. ข้าพเจ้าได้รับทราบจากผู้วิจัยแล้วว่าหากเกิดอันตรายใดๆอันเนื่องจากการวิจัยดังกล่าว ข้าพเจ้าจะได้รับการดูแลอย่างที่เหมาะสม โดยไม่คิดมูลค่าตามมาตรฐานวิชาชีพ

ข้อ 6. ข้าพเจ้าได้อ่านและทำความเข้าใจข้อมูลทั้งหมดในเอกสารคำแนะนำสำหรับผู้เข้าร่วมวิจัยนี้ แล้วและข้าพเจ้าได้ซักถามปัญหาที่ข้องใจเป็นที่พอใจแล้ว

ข้าพเจ้าได้อ่านข้อความข้างต้นแล้วและมีความเข้าใจดีทุกประการ จึงได้ลงนามในใบยินยอมนี้ด้วยความเต็มใจ

ลงชื่อ ผู้ยินยอม


(.....)

ลงชื่อ ผู้วิจัย

(.....)

ลงชื่อ พยาน

(.....)



No. MU 2007-208

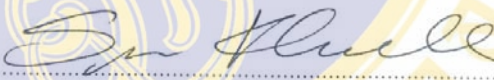
**Documentary Proof of Ethical Clearance
The Committee on Human Rights Related to
Human Experimentation
Mahidol University, Bangkok**


Title of Project. The Effectiveness of the Physical Activity Promotion Program on Physical Activity in Thai Adolescent Girls
(Thesis for Ph.D.)

Principle Investigator. Miss Narumon Teerarungsikul

Name of Institution. Faculty of Nursing

Approved by the Committee on Human Rights Related to Human Experimentation

Signature of Chairman. 
(Professor Dr.Srisin Khusmith)

Signature of Head of the Institute. 
(Professor Dr.Pornchai Matangkasombut)

Date of Approval. 3 0 OCT 2007

Date of Expiration. 2 9 OCT 2008

บันทึกข้อความ

ส่วนราชการ คณะพยาบาลศาสตร์ มหาวิทยาลัยบูรพา

ที่ ศร 0528.04/

วันที่ 31 ตุลาคม 2550

เรื่อง ขออนุญาตใช้วิธีดี เด็กไทยสดใส ร่วมใจออกกำลังกาย ชุดที่ 3 เพื่อการศึกษา

เรียน ผู้จัดการฝ่ายสร้างสรรค์สังคม

ดิฉัน นางสาวณมล ธีระรังสิกุล ผู้ช่วยศาสตราจารย์ ระดับ 8 ประจำภาควิชาการพยาบาลแม่และเด็ก คณะพยาบาลศาสตร์ มหาวิทยาลัยบูรพา ชลบุรี ขณะนี้กำลังศึกษาปริญญาเอก ในหลักสูตรปริญญาเอกร่วมๆ (นานาชาติ) ณ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล และภาควิชาการพยาบาลศาสตร์ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล ในระหว่างนี้อยู่ระหว่างการทำวิทยานิพนธ์เรื่อง ผลของโปรแกรมส่งเสริมการออกกำลังกายในหญิงวัยรุ่น (The effectiveness of the physical activity promotion program on physical activity in Thai adolescents) ในเด็กนักเรียนหญิงชั้นมัธยมศึกษาปีที่ 1 และ 2 ณ โรงเรียนแห่งหนึ่งของจังหวัดชลบุรี ในภาคการเรียนที่ 2/2550 ซึ่งเป็นการศึกษาทั้งทดลอง มีการเตรียมโปรแกรมการออกกำลังกายโดยการกระตุ้นให้นักเรียนได้เห็นความสำคัญในการออกกำลังกาย ให้รับรู้ความสามารถของตนเอง มีความสนุกสนาน และการใช้ตัวแบบซึ่งอยู่ในวัยเดียวกันเป็นแบบอย่าง ซึ่งวิธีดี เด็กไทยสดใส ร่วมใจออกกำลังกาย ชุดที่ 3 นั้นนับว่าเป็นชุดที่มีประโยชน์ เนื้อหาของเพลงถูกต้องตามหลักวิชาการ และมีความสนุกสนาน ดิฉันจึงขออนุญาตนำมาเป็นส่วนหนึ่งในชุดโปรแกรมการสอนแก่เด็กนักเรียน โดยให้นักเรียนออกกำลังกายตามวิธีดี จำนวน 3 ครั้ง จากนั้นให้นักเรียนคิดทำออกกำลังกายเอง

จึงเรียนมาเพื่อโปรดพิจารณา และขออนุญาตนำมาวิธีดีมาใช้เพื่อการศึกษาด้วย จักเป็นพระคุณยิ่ง

นางณมล ธีระรังสิกุล
 ผู้ช่วยศาสตราจารย์
 15/11/07



(นางสาวณมล ธีระรังสิกุล)
 ผู้ช่วยศาสตราจารย์ ระดับ 8

APPENDIX F

The results of Factor scores for Physical Activity (PA) 5 components (Inactive, SQRT Light activity, SQRT Moderate activity, SQRT Sport, and SQRT Housework)

5 components		
	Component Matrix	Cumulative
Baseline	KMO = 0.638	
Inactive	-0.074	
SQRT Light activity	0.683	42%
SQRT Moderate activity	0.860	
SQRT Sport	0.790	
SQRT Housework	0.609	
8 weeks	KMO = 0.738	
Inactive	0.150	
SQRT Light activity	0.725	47%
SQRT Moderate activity	0.833	
SQRT Sport	0.766	
SQRT Housework	0.723	
12 weeks	KMO = 0.716	
Inactive	-0.168	
SQRT Light activity	0.728	48%
SQRT Moderate activity	0.849	
SQRT Sport	0.802	
SQRT Housework	0.695	

The results of Factor scores for Physical Activity (PA) 4 components (SQRT Light, SQRT Moderate, SQRT Sport, and SQRT Housework)

4 components		
	Component Matrix	Cumulative
Baseline		
	KMO = 0.666	
SQRT Light activity	0.685	
SQRT Moderate activity	0.864	
SQRT Sport	0.713	52 %
SQRT Housework	0.611	
8 weeks		
	KMO = 0.754	
SQRT Light activity	0.716	
SQRT Moderate activity	0.834	58 %
SQRT Sport	0.768	
SQRT Housework	0.733	
12 weeks		
	KMO = 0.728	
SQRT Light activity	0.730	
SQRT Moderate activity	0.856	60 %
SQRT Sport	0.798	
SQRT Housework	0.698	

The results of Factor scores for Physical Fitness (PF) (4 components)

4 components		
	Component Matrix	Cumulative
Baseline	KMO = 0.506	
Sit-up	-2.950	
Push-up	0.778	39%
Sit and reach	0.434	
Run	0.813	
8 weeks	KMO = 0.493	
Sit-up	0.370	
Push-up	0.807	37%
Sit and reach	0.054	
Run	-0.833	
12 weeks	KMO = 0.570	
Sit-up	0.630	
Push-up	0.717	37%
Sit and reach	0.026	
Run	-0.766	

APPENDIX G

Distribution of Dependent Variables of the Experimental and Control Groups

43 Experimental cases

Dependent Variables	Mean	Median	Mode	Skewness	Kurtosis	Shapiro-Wilk	
						Statistic	p-value
Perceived Self-efficacy							
Base line	580.23	570	550	0.063	-0.257	0.980	0.650
8 weeks	651.86	660	660	0.106	-0.827	0.973	0.388
12 weeks	571.16	610	700	-0.568	0.451	0.958	0.122
Physical Activity Behavior							
Base line	75.42	67.93	24.18	0.537	-0.086	0.970	0.312
8 weeks	85.72	83.03	20.40	0.203	-0.856	0.968	0.266
12 weeks	68.19	65.05	6.32	0.748	0.842	0.959	0.128
Inactive							
Base line	1148.95	1260.0	1260	0.283	-0.646	0.943	0.033
8 weeks	1008.37	840.0	1260	4.198	2.817	0.586	0.001
12 weeks	891.25	3600.0	1260	0.983	8.779	0.892	0.001
Light activity							
Base line	171.39	60.00	0	2.642	7.804	0.666	0.001
8 weeks	259.88	150.00	120	1.932	3.297	0.748	0.001
12 weeks	159.53	60.00	0	2.552	8.183	0.674	0.001
Moderate activity							
Base line	527.48	360.0	90	2.087	5.615	0.792	0.001
8 weeks	610.90	450.0	360	1.681	0.835	0.832	0.001
12 weeks	397.20	260.0	0	3.387	13.534	0.674	0.001
Sports							
Base line	350.27	210.0	60	1.657	1.668	0.744	0.001
8 weeks	490.58	300.0	240	2.328	6.785	0.746	0.001
12 weeks	362.44	210.0	0	1.871	2.884	0.604	0.001
Housework							
Base line	955.58	740.0	420	1.076	0.435	0.891	0.001
8 weeks	1075.30	870.0	420	2.444	8.779	0.790	0.001
12 weeks	892.40	740.0	510	1.118	1.272	0.911	0.003

Dependent Variables	Mean	Median	Mode	Skewness	Kurtosis	Shapiro-Wilk	
						Statistic	p-value
SQRT Light activity							
Base line	9.93	7.74	0.00	0.944	0.883	0.908	0.002
8 weeks	13.85	12.24	10.95	0.775	0.554	0.936	0.019
12 weeks	8.96	7.74	0.00	0.904	0.305	0.878	0.000
SQRT Moderate activity							
Base line	20.15	18.97	9.49	0.686	0.568	0.964	0.199
8 weeks	22.53	21.21	18.97	0.521	0.533	0.971	0.351
12 weeks	15.85	16.12	0.00	1.221	2.573	0.906	0.002
SQRT Sports							
Base line	16.36	14.49	7.75	0.925	0.217	0.903	0.002
8 weeks	19.00	17.32	0.00	0.821	0.934	0.949	0.056
12 weeks	15.85	14.49	0.00	0.736	0.156	0.932	0.014
SQRT Housework							
Base line	28.95	27.20	20.49	0.165	0.210	0.968	0.264
8 weeks	30.31	29.49	20.49	0.840	1.765	0.961	0.154
12 weeks	27.85	27.20	22.58	0.061	0.183	0.986	0.876
Physical Fitness							
Base line	47.48	49.11	25.43	-0.895	0.313	0.929	0.011
8 weeks	51.04	52.42	33.13	-0.841	0.223	0.964	0.016
12 weeks	51.95	52.40	32.08	-0.026	0.111	0.987	0.905
Sit-up							
Base line	20.23	23	24	-0.973	0.330	0.905	0.002
8 weeks	21.47	23	25	-1.123	1.861	0.919	0.005
12 weeks	23.14	24	26	-1.397	2.188	0.900	0.001
Push-up							
Base line	14.51	14.00	14	0.741	1.468	0.953	0.079
8 weeks	15.33	15.00	14	-0.042	-0.769	0.939	0.024
12 weeks	16.60	16.00	14	0.418	-0.266	0.965	0.213
Sit & reach							
Base line	7.06	7.00	8	-0.432	0.447	0.974	0.431
8 weeks	8.97	9.50	7.10	-0.566	0.622	0.969	0.282
12 weeks	7.16	7.50	6	-0.418	0.140	0.971	0.349
Run							
Base line	5.67	5.55	5.51	0.277	-0.118	0.951	0.066
8 weeks	5.27	5.15	7.38	0.327	-0.133	0.942	0.030
12 weeks	5.04	5.09	6.08	-0.321	-0.358	0.961	0.156

38 Control case

Dependent Variables	Mean	Median	Mode	Skewness	Kurtosis	Shapiro-Wilk	
						Statistic p-value	
Perceived Self-efficacy							
1	666.05	665.0	630	-0.538	1.418	0.967	0.314
2	592.89	585.00	560	-0.236	0.298	0.968	0.337
3	566.32	565.0	600	-0.164	-0.440	0.975	0.555
Physical Activity Behavior							
Base line	86.31	83.87	46.57	0.550	-0.165	0.963	0.235
8 weeks	74.75	70.68	31.19	1.111	1.391	0.922	0.012
12 weeks	67.47	62.49	19.17	0.468	-0.236	0.967	0.320
Inactive							
Base line	905.52	840.00	1050	0.486	-0.413	0.956	0.144
8 weeks	779.60	555.0	840	1.024	0.178	0.874	0.001
12 weeks	843.02	630.0	840	0.882	-0.566	0.849	0.001
Light activity							
Base line	163.52	120.0	180	1.937	4.153	0.789	0.001
8 weeks	128.78	120.0	120	2.071	5.579	0.792	0.001
12 weeks	158.18	105.0	0	1.815	2.888	0.761	0.001
Moderate activity							
Base line	693.02	535.0	120	2.101	6.059	0.815	0.001
8 weeks	468.52	395.0	0	1.222	1.275	0.888	0.001
12 weeks	409.73	330.0	0	1.531	3.082	0.855	0.001
Sports							
Base line	480.60	390.0	0	1.527	3.312	0.881	0.001
8 weeks	446.84	235.0	60	2.043	4.084	0.742	0.001
12 weeks	324.86	210.0	0	1.790	2.994	0.784	0.001
Housework							
Base line	1093.50	955.0	600	1.001	0.679	0.926	0.015
8 weeks	5908.70	697.5	360	2.526	9.161	0.769	0.001
12 weeks	729.73	545.0	540	0.893	-0.057	0.908	0.004
SQRT Light activity							
Base line	10.98	10.95	13.42	0.23	0.330	0.094	0.058
8 weeks	9.83	10.95	10.95	0.01	-0.020	0.920	0.010
12 weeks	9.84	10.22	0	0.40	-0.310	0.922	0.012
SQRT Moderate activity							
Base line	24.14	23.13	10.95	0.599	1.251	0.971	0.422
8 weeks	19.30	19.87	0	-0.086	-0.065	0.974	0.506
12 weeks	17.29	18.16	0	0.148	-0.383	0.971	0.419

Dependent Variables	Mean	Median	Mode	Skewness	Kurtosis	Shapiro-Wilk	
						Statistic	p-value
SQRT Sports							
Base line	19.63	19.73	0	-0.024	0.266	0.981	0.744
8 weeks	17.71	15.32	7.75	0.812	0.484	0.941	0.044
12 weeks	14.87	14.49	0	0.439	-0.142	0.952	0.108
SQRTHousework							
Base line	31.55	30.90	24.49	0.352	-0.397	0.982	0.796
8 weeks	27.89	26.41	18.97	0.988	2.011	0.940	0.043
12 weeks	25.45	23.34	23.24	0.258	-0.558	0.968	0.333
Physical Fitness							
Base line	50.27	47.93	28.10	0.336	-0.495	0.974	0.501
8 weeks	52.48	52.28	33.57	0.204	-0.649	0.972	0.456
12 weeks	53.32	52.73	29.33	-0.130	-0.318	0.979	0.693
Sit-up							
Base line	20.37	21.0	16	-0.299	-0.618	0.968	0.350
8 weeks	22.16	23.0	17	-0.435	-0.106	0.963	0.230
12 weeks	22.82	24	20	-0.294	-0.945	0.978	0.187
Push-up							
Base line	15.74	16.0	17	-0.537	-0.071	0.962	0.219
8 weeks	16.84	17.0	17	0.181	0.284	0.965	0.247
12 weeks	17.89	17.50	15	0.239	-0.789	0.970	0.402
Sit & reach							
Base line	8.723	9.2	9.30	0.183	0.026	0.970	0.405
8 weeks	8.192	7.1	4.30	0.335	0.176	0.978	0.643
12 weeks	7.315	7.0	2.00	0.139	0.543	0.960	0.194
Run							
Base line	5.446	5.41	4.57	0.723	0.094	0.918	0.009
8 weeks	5.290	5.44	5.44	-0.499	-0.391	0.905	0.004
12 weeks	5.297	5.29	5.18	-1.723	6.614	0.849	0.000

APPENDIX H

Comparison the Mean Dependent Variables at 3 Time Point with Independent *t*-test

Variables	N	Baseline		8 week			12 week			
		Mean (SD)	<i>t</i>	<i>p</i> - value	Mean (SD)	<i>t</i>	<i>p</i> - value	Mean (SD)	<i>t</i>	<i>p</i> - value
Perceived Self- efficacy										
Experimental group	43	580.23 (140.820)	-2.469	0.008	651.86 (133.700)	1.659	0.050	571.16 (172.160)	0.301	0.454
Control group	38	666.05 (171.850)			592.89 (184.750)			566.32 (209.103)		
Physical activity										
Experimental group	43	75.42 (30.540)	-1.757	0.046	85.72 (32.120)	1.568	0.065	68.19 (32.80)	0.101	0.459
Control group	38	86.31 (24.410)			74.75 (30.610)			67.47 (30.72)		
SQRT Light activity										
Experimental group	43	9.938 (8.622)	-0.607	0.273	13.85 (8.336)	2.496	0.007	8.96 (8.999)	-0.463	0.322
Control group	38	10.98 (6.631)			9.83 (5.737)			9.84 (7.930)		

Variables	N	Baseline		8 week		12 week	
		Mean (SD)	t	Mean (SD)	t	Mean (SD)	t
SQRT Moderate activity							
Experimental group	43	20.15 (11.134)	-1.647	22.53 (10.262)	1.437	15.85 (12.221)	-0.564
Control group	38	24.14 (10.631)	0.052	19.30 (9.914)	0.077	17.29 (10.652)	0.287
SQRT Sport							
Experimental group	43	16.36 (9.180)	-1.542	19.00 (11.505)	0.501	15.52 (11.155)	0.268
Control group	38	19.63 (9.880)	0.063	17.71 (11.690)	0.309	14.87 (10.311)	0.399
SQRT Housework							
Experimental group	43	28.95 (10.941)	-1.105	30.31 (12.645)	0.896	27.85 (10.924)	1.063
Control group	38	31.55 (10.039)	0.136	27.89 (11.589)	0.186	25.45 (9.164)	0.145
Inactive							
Experimental group	43	1148.95 (715.110)	1.662	1008.37 (1308.570)	0.954	891.25 (795.920)	0.282
Control group	38	905.52 (586.020)	0.051	779.60 (731.750)	0.171	843.02 (733.540)	0.389

Variables	N	Baseline		8 week		12 week						
		Mean (SD)	t	p-value	Mean (SD)	t	p-value	Mean (SD)	t	p-value		
Physical fitness												
Experimental group	43	47.48 (8.700)	-1.237	0.110	51.04 (7.121)	-0.720	0.237	51.95 (8.606)	-0.628	0.266		
Control group	38	50.27 (11.210)			52.48 (10.340)			53.32 (11.000)				
Sit-ups 30 sec												
Experimental group	43	20.23 (6.500)	-0.082	0.462	21.47 (6.100)	-0.450	0.327	23.14 (6.500)	0.210	0.417		
Control group	38	20.37 (8.360)			22.16 (7.730)			22.82 (7.340)				
Push-ups 30 sec												
Experimental group	43	14.51 (2.340)	-2.105	0.019	15.33 (2.450)	-2.679	0.004	16.60 (3.200)	-1.770	0.039		
Control group	38	15.74 (2.890)			16.84 (2.630)			17.89 (3.310)				
Sit and reach												
Experimental group	43	7.06 (5.650)	-1.254	0.106	8.97 (4.940)	0.617	0.269	7.16 (5.370)	-0.118	0.453		
Control group	38	8.72 (6.200)			8.19 (6.430)			7.31 (6.320)				
Run												
Experimental group	43	5.67 (0.820)	1.264	0.105	5.27 (1.090)	-0.067	0.474	5.04 (0.760)	-1.241	0.109		
Control group	38	5.44 (0.790)			5.29 (0.530)			5.29 (1.040)				

APPENDIX I

LISTS OF EXPERTS

Lists of Experts for Content Validity of the physical activity promotion program and physical fitness test.

Lect. Apa Youngpradith, Ph.D. (Nursing)

Department of Public Health Nursing, Faculty of Nursing, Mahidol University.

Assoc. Prof. Aporn Deenan, Ph.D. (Nursing)

Department of Medical and Surgical, Faculty of Nursing, Burapha University.

Dr. Chakarg Pongurgorn, M.D., Ph.D. (Kinesiology)

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Assist. Prof. Nareupon Vongjaturapat, Ph.D. (Sport Psychology)

College of Sport Science, Burapha University.

Assoc. Prof. Kallaya Kijboonchoo, Ph.D. (Physiological Nutrition)

Institute of Nutrition, Mahidol University.

BIOGRAPHY

NAME	Miss Narumon Teerarungsikul
DATE OF BIRTH	11 January 1960
PLACE OF BIRTH	Nakhonsawan, Thailand
INSTITUTIONS ATTENDED	<p>Sawanpracharak Nursing College, 1982: Diploma in Nursing and Midwifery Equivalent to Bachelor of Nursing (Nursing & Midwifery)</p> <p>Sukhothai Thammathirat University, 1985: Bachelor Public Health (Public Health Administration)</p> <p>Mahidol University, 1989: Master of Science (Nursing)</p> <p>Mahidol University, 2008: Doctor of Philosophy Degree in Nursing</p>
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RESEARCH GRANT	Supported in part by the thesis Grant, Faculty of Graduate Studies, Mahidol University
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