A CAUSAL MODEL OF PROMOTING LEISURE-TIME PHYSICAL ACTIVITY AMONG MIDDLE-AGED THAI WOMEN

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ABSTRACT

Non-communicable diseases are the most compelling health problems among middle-aged Thai women. To prevent them, the Center of Disease Control and Prevention and the American College of Sports Medicine recommends that adults should accumulate at least 30 minutes or more of moderate intensity physical activity 5 days per week. Despite programs designed to promote physical activity, only 20% of Thai women perform regular physical activity. Promoting active lifestyles is a significant role of community nurses, therefore, a better understanding about factors influencing leisure-time physical activity (LTPA), is needed among middle-aged Thai women.

The purpose of this study was to develop a causal model to explain LTPA among middle-aged Thai women. The Women's Leisure-Time Physical Activity Promotion Model, based on the Health Promotion Model and Self-Efficacy Theory, included four predictors: 1) interpersonal influences composed of social support, social norms, and modeling; 2) perceived benefits; 3) perceived barriers, and 4) perceived self-efficacy. Multi-stage random sampling was employed to obtain a sample of 300 women aged 40-59 years residing in Bangkok Metropolis, Thailand. A self-administered questionnaire was employed to collect data. The SPSS and LISREL programs were used for data analyses.

Results revealed that 43.3% of the sample met the physical activity recommendations. The model fit the data well and explained 55% of the variance of the women's LTPA. Perceived self-efficacy was the most powerful predictor and had a positive direct effect on LTPA. Interpersonal influences, perceived benefits, and perceived barriers had indirect effects on LTPA through perceived self-efficacy. These three factors accounted for 70% of the variance in perceived self-efficacy. Interpersonal influences had a positive direct effect on perceived benefits, a negative direct effect on perceived barriers, and a positive direct effect on perceived self-efficacy.

The study results indicate that enhancing self-efficacy is needed to promote LTPA in middle-aged women. The programs should include strategies such as motivation to achieve performance, verbal encouragement, and reinforcement of the advantages of the LTPA. Campaigns employing those strategies should be held continuously and they should involve influential role models such as friends, family members, and health care providers. These strategies are important for community health nurses as well as nurses working in hospitals and clinics to promote regular physical activity among middle-aged Thai women.

KEY WORDS: LEISURE-TIME PHYSICAL ACTIVITY / MIDDLE-AGED THAI WOMEN / SELF-EFFICACY
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แบบจำลองเชิงเหตุผลเกี่ยวกับการส่งเสริมการออกกำลังกายของสตรีไทยวัยกลางคน
(A CAUSAL MODEL OF PROMOTING LEISURE-TIME PHYSICAL ACTIVTY AMONG MIDDLE-AGED THAI WOMEN)

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บทคัดย่อ

ปัญหาสุขภาพที่สำคัญของสตรีวัยกลางคนคือการป่วยและตายด้วยโรคไม่ติดต่อ อันเนื่องมาจากการมีพฤติกรรมที่ไม่เหมาะสมเช่นขาดการออกกำลังกาย เพื่อเป็นการป้องกันโรคดังกล่าว ศูนย์ป้องกันและควบคุมโรคและสถาบันเวชศาสตร์การกีฬาของสหรัฐอเมริกา แนะนำให้ประชาชนออกกำลังกายในระดับปานกลาง สะสมอย่างน้อยวันละ 30 นาที สัปดาห์ละ 5 วัน แต่จากการสำรวจพบว่าสตรีไทยออกกำลังกายอย่างสม่ำเสมอเพียงร้อยละ 20 การส่งเสริมให้สตรีวัยกลางคนมีการออกกำลังกายกันมากขึ้นจึงเป็นสิ่งสำคัญ ซึ่งการดำเนินงานดังกล่าวจำเป็นจะต้องทราบปัจจัยที่มีอิทธิพลต่อการออกกำลังกาย

การวิจัยนี้มีวัตถุประสงค์เพื่อทดสอบความสัมพันธ์เชิงสาเหตุ เกี่ยวกับปัจจัยที่เป็นตัวกำหนดการออกกำลังกายของสตรีวัยกลางคน รวม 4 ปัจจัย ได้แก่ 1) อิทธิพลของบุคคลอื่น ประกอบด้วย การสนับสนุนส่งเสริม บรรทัดฐานทางสังคมและตัวอย่างในสังคม 2) การรับรู้ประโยชน์ 3) การรับรู้อุปสรรค และ 4) การรับรู้สมรรถนะของตนเอง โดยกรอบแนวคิดมีพื้นฐานจากแบบจำลองการส่งเสริมสุขภาพของเพนเดอร์และทฤษฎีการรับรู้สมรรถนะของตนเองของแบนดูรา กลุ่มตัวอย่างคือสตรีอายุ 40-59 ปี ที่อาศัยอยู่ในกรุงเทพมหานครจำนวน 300 คน คัดเลือกโดยการสุ่มตัวอย่างแบบหลายขั้นตอน เก็บรวบรวมข้อมูลโดยใช้แบบสอบถามและทดสอบแบบจำลองด้วยโปรแกรมลิสเรล

ผลการวิเคราะห์พบว่า ร้อยละ43.3 ของกลุ่มตัวอย่างมีการออกกำลังกายตามเกณฑ์ข้างต้น แบบจำลองมีความสอดคล้องกลมกลืนกับข้อมูลเชิงประจักษ์ และสามารถอธิบายความผันแปรของการออกกำลังกายของสตรีวัยกลางคนได้ร้อยละ55 การรับรู้สมรรถนะของตนเองมีอิทธิพลโดยตรงทางบวกต่อพฤติกรรมการออกกำลังกายและทำนายพฤติกรรมการออกกำลังกายได้ดีที่สุด อิทธิพลของบุคคลอื่น การรับรู้ประโยชน์และการรับรู้อุปสรรคมีอิทธิพลทางอ้อมต่อการออกกำลังกายโดยผ่านการรับรู้สมรรถนะของตนเอง อิทธิพลของบุคคลอื่นมีอิทธิพลโดยตรงทางบวกต่อการรับรู้ประโยชน์และการรับรู้สมรรถนะของตนเอง และมีอิทธิพลโดยตรงทางลบต่อการรับรู้อุปสรรค โดยทั้งสามปัจจัยนี้สามารถอธิบายความผันแปรของการรับรู้สมรรถนะของตนเองได้ร้อยละ70

ผลการศึกษาบ่งชี้ว่าการส่งเสริมให้สตรีวัยกลางคนออกกำลังกายอย่างสม่ำเสมอนั้น ต้องมุ่งเน้นการสร้างให้สตรีเกิดความเชื่อมั่นว่าตนเองสามารถปฏิบัติได้ ซึ่งกระทำได้โดยการสนับสนุนส่งเสริมด้วยวิธีการต่างๆ เช่นช่วยเหลือและให้กำลังใจให้ออกกำลังกายอย่างเหมาะสมกับสุขภาพ รณรงค์สร้างกระแสและจัดสถานการณ์ให้เห็นตัวอย่างของการออกกำลังกาย นำครอบครัวและเพื่อนเข้ามามีส่วนร่วม ตลอดจนช่วยลดทอนปัญหาอุปสรรคของการออกกำลังกาย จึงจะช่วยให้สตรีไทยวัยกลางคนมีการออกกำลังกายอย่างสม่ำเสมอ

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CHAPTER 1
INTRODUCTION

Background and Significance of the Study

Currently, the most compelling health problems in Thailand are non-communicable diseases (NCD) such as cardiovascular disease (CVD), cancer, and diabetes which are fast replacing infectious diseases as the leading cause of disability and premature death. This is especially true among Thai women. Cardiovascular disease is the major cause of death among women, and the prevalence rapidly increases as women age (The Ministry of Public Health of Thailand [MOPH], 2002). According to Chuprapawan (2000), the number of women aged 30-39 who died from CVD was five times greater than those under the age of 30. This rate increases up to eighteen times in women aged 40-49 and almost one thousand times in women over 70 years of age. The second most important cause of death among Thai women is cancer, with liver, cervical, and lung cancer leading the list. Of NCD, diabetes is the third leading cause of death in women. Double the numbers of women die from diabetes in comparison to men. Moreover, the MOPH (2002) notes that in 1999 CVD, diabetes, depression, liver cancer, and osteoarthritis contributed to 24 percent of disability adjusted life years (DALY) among Thai women or nearly one million lost years of healthy life. The incidence of these chronic diseases is increasing every year. According to the World Health Organization (WHO) (2003), NCD contributed to 60 percent of deaths and 43 percent of disease burden in 2001 and will raise to 73 percent of all deaths and 60 percent of the global burden of disease by 2020.

These major health problems affect not only women but also their families and society. The WHO (2003) estimated that CVD accounted for 10 percent of the national expenditure or 25,000 million baht and diabetes accounted for 4-5 percent or 12,500 million baht. The problems tend to manifest themselves in women starting at the age of 40 when they have many responsibilities for family care and work outside the home. According to the Health Systems Research Institute and Institute for Population and Social Research, Mahidol University (2003), women aged 40-59 years

account for 25 percent of Thai women and 13 percent of the Thai population and this increases every year. In addition, 65.6 percent of women over the age of 13 were economically active and 30.2 percent of households were headed by women (National Statistical Office, 2004). Thus, illness or death in this age group will affect the health and welfare of families and the productivity of society at-large.

Many NCD health problems can be prevented by promoting a healthy lifestyle such as adequate physical activity. Regular physical activity is one of the most cost-effective ways to improve health and prevent diseases including CVD, cancer, diabetes, osteoarthritis, osteoporosis, as well as depression (The United States Department of Health and Human Services [USDHHS], 1996). That is, physical activity reduces the risk of CVD, some cancers, and type 2 diabetes by improving glucose metabolism, decreasing body fat, lowering blood pressure, and increasing intestinal activity. Participation in physical activity also improves musculoskeletal health, controls body weight, and reduces stress, anxiety, and feelings of depression (USDHHS, 1996). According to the WHO (2003), more than 1.9 million deaths globally will be reduced by increasing physical activity levels. Additionally, it was predicted that physically active individuals would save an estimated $75,000 million dollars per year in health care cost in the United State (U.S.) in 2000. The National Health Committee of New Zealand (2003) also reported that approximately $24 million per year would be saved if 5% of adults increased their level of physical activity. Promoting active lifestyles among middle-aged women, therefore, is a critical role for community health nurses because physical activity does not only reduce health care expenditures and human suffering but also increase**s** economic productivity and life expectancy.

Physical activity is defined as "*any bodily movement produced by skeletal muscles that results in energy expenditure*" (Casperson, Powell & Christenson, 1985, p. 126). It can be classified by the context in which it occurs including leisure time, occupation, housework, or transportation. Leisure-time physical activity (LTPA) is defined as "*an activity undertaken in the individual's discretionary time that leads to any substantial increase in the total daily energy expenditure*" including sports, exercise, and recreational activities (Bouchard & Shephard, 1994, p. 77). Exercise is a subcategory of physical activity which 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 an objective" (Casperson et al., 1985, p. 128). The Center of Disease Control and Prevention and the American College of Sports Medicine (CDC-ACSM) recommends that adults should accumulate at least 30 minutes or more of moderate intensity physical activity 5 days per week (Pate et al., 1995). In 1996 the United States Surgeon General's Report (USDHHS, 1996) has recommended that all U.S. adults participate in a moderate amount of physical activity, on all or most days of the week which refers to 150 Calories (kcal) of energy expended per day or 1,000 kcal per week. Examples of moderate intensity physical activity include 30 minutes of brisk walking, 45 minutes of table tennis, or 15 minutes of running each day. Physical activity can be performed in one period or accumulated in short bouts such as 10-minute intervals at different times during the day. It should be performed regularly and increase in duration or intensity over time to gain the most health benefits (USDHHS, 1996).

The goal of Thailand's national health policy is to increase to 60 percent the number of people aged six years and older who participate in 30 minutes of moderate physical activity for 3-5 days per week by the year 2006 (National Health Policy Committee, 2001). Despite the numerous projects designed to promote physical activity, the latest national survey reported that in 2001, 24.2 percent of Thai people 15 years of age and older perform regular physical activity and only 29.1 of men and 19.3 percent of women perform physical activity for 30 minutes 3 days a week regularly (National Statistical Office, 2001). In the U.S., women are less active than men at recommended levels, and physical inactivity and obesity are more prevalent among the less educated and older female groups (USDHHS, 1996; King, Castro, Wilcox, Eyler, Sallis & Brownson, 2000). Similarly, physical inactivity and obesity rates in Thai women increase as they get older; and the highest prevalence of obesity is among women aged 40-49 (National Health Policy Committee, 2001). Therefore, promoting appropriate levels of physical activity is critical for Thai women.

Physical activity should be promoted as a means to not only improve physiological health but also psychosocial health and quality of life. According to the U.S. Surgeon General's Report (1996), a moderate amount of physical activity is essential. Lifestyle activity incorporates physical activity alternatives such as walking

instead of driving a short distance, walking up the stairs instead of taking the elevator or performing floor exercises while watching television. In addition, the circumstance or mood during an activity cannot be underestimated (Montoye, Kemper, Saris & Washburn, 1996). Participation in physical activities which are enjoyable such as walking for exercise, aerobic dance, and active hobbies are preferable to household chores or occupational activities (Stephens, 1988). Furthermore, evidence shows that regular physical activity in leisure time such as exercise, sports, and recreational activities have been shown to increase psychological wellbeing, improve quality of life, decrease depression (Farmer, Locke, Moscicki, Dannenberg, Larson & Radloff, 1988) and anxiety (Shin, 1999), and increase self-esteem (McAuley, Mihalko & Bane, 1997). Participation in these activities is believed to involve mastery experiences as well as social interaction (Hughes, 1984; McAuley & Rudolph, 1995).

Unfortunately, participation in LTPA is a major challenge for women in some societies due to gender-specific social expectations and social controls (Shaw, 1985; Jackson & Henderson, 1995). Many women spend major portions of their day in household, occupational and family-care activities, and less time on exercise or recreational physical activities (Ainsworth, Irwin, Addy, Whitt & Stolarczyk 1999; Brownson, Eyler, King, Brown, Shyu & Sallis, 2000). Some women may feel uncomfortable participating in LTPA because they believe that family needs are of primary concern and individual needs are secondary (Henderson, 1990). According to the National Statistical Office (2002), almost twice the number of Thai women aged 25-59 spent time on housework and caregiving compared to men but participated in LTPA less than men. Namely, men had 1.5 hours per day while women had only 1.3 hours per day for participating in activities during free time. Women may be too fatigued from daily responsibilities to perform physical activity therefore prefer to rest or do other passive activities (e.g. watching television) during free time (Nies, Vollman & Cook, 1998; Consunsi, 2000; National Statistical Office, 2002). To increase physical activity of women, it is necessary to understand why some women are inactive and what factors contribute to the adoption and maintenance of adequate levels of physical activity in discretionary time.

This study is guided by the Health Promotion Model (HPM) developed by Pender (1996) and Self-Efficacy Theory proposed by Bandura (1997). The HPM

identifies self-efficacy, benefits, barriers, and interpersonal influences as important factors affecting health behaviors. In Self-Efficacy Theory, self-efficacy is proposed as a central construct and affects behavior directly. Prior research indicates that women with low levels of physical activity report low perceived self-efficacy for participation in regular physical activity (Sallis et al., 1989). If women believe they have the power to perform regular physical activity, they may increase their efforts to be active. However, even if they feel confident to achieve a behavior such as physical activity; they may not do it if there is no motivation or incentive. Perceived benefits from physical activity may serve to positively motivate individuals. Examples of perceived benefits for being active include health improvement, enjoyment, and tension reduction (Sechrist, Walker & Pender, 1987). Conversely, women with high perceived barriers to participation in physical activity are less likely to do the activity (Lee, 1993, Walcott-McQuigg & Prohaska, 2001). Barriers to engaging in physical activity include lack of time due to occupation and caregiving duties, lack of support, lack of motivation, and lack of facilities (King et al., 2000; Sallis et al., 1989).

Interpersonal influences including social support, social norms, and modeling are very important for LTPA adoption and maintenance among women (Pender, 1996; Duncan, Duncan & McAuley 1993; King et al., 2000). Support from significant others (e.g. partner, family, friends and health care providers), encouragement, and useful guidance play a major role in the adoption and maintenance of physical activity behavior (Sallis, Hovell & Hofstetter, 1992; Duncan et al., 1993). Social norms that women should or should not participate in LTPA influence their perceptions of being active in some societies. For example, some women may perceive that leisure time is a time for relaxation and LTPA is only for men and children. Thus, women may seldom participate in physical activities with their children (Tortolero, Masse, Fulton, Torres & Kohl III, 1999). Modeling is also important. Women who frequently see significant others perform physical activity are more likely to be physically active (King et al., 2000; Sallis et al., 1989). Sallis and his coworkers (1989) reported that the number of adults at home and close friends who exercise regularly is significantly correlated with vigorous physical activity (e.g. jogging, swimming) among women.

In summary, the factors found to contribute to LTPA engagement by women are perceived self-efficacy, interpersonal influences, perceived barriers, and perceived

benefits. However, little is known about whether these factors found in the western literature are generalizeable to the Thai culture and more specifically, Thai women. Understanding Thai women's perceptions of LTPA benefits, barriers, self-efficacy, and influence of significant others will enhance knowledge for developing effective LTPA interventions for improving physiological and psychological health. The purpose of this study is to develop a causal model to explain the LTPA among middle-aged Thai women in order to elaborate a community-based program for promoting active lifestyles among this target population in the future.

Theoretical Framework

The Women's Leisure-Time Physical Activity Promotion Model (WPAPM) is derived from the Health Promotion Model (Pender, 1996), Self-Efficacy Theory (Bandura, 1997) and related literature. The model is proposed by the author to explain LTPA behavior adoption and maintenance of middle-aged Thai women.

Foundational Ideas. Several theoretical ideas formed the foundation for this study and are briefly explained below.

The Health Promotion Model. The HPM (Pender, 1996), based on expectancy value theory and social learning theory (now renamed social cognitive theory), includes three major groups of factors that influence health behavior: (a) individual characteristics and experiences (prior related behavior and personal factors), (b) behavior-specific cognitions and affect (perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related affect, interpersonal influences, and situational influences), and (c) immediate behavioral contingencies (commitment to a plan of action, response to immediate competing demands and preferences). The proposed outcomes of the HPM are health-promoting behaviors. The theoretical propositions of the HPM (Pender, Murdaugh & Parsons, 2002) include: a) persons commit to engaging in a behavior when they perceive it as useful or valued and will be less likely to perform the behavior if they perceive barriers to doing so; b) perceived self-efficacy motivates a behavior directly by efficacy expectations and indirectly by affecting perceived barriers; and c) when persons perceive that significant others model the behavior (modeling), expect the behavior to occur (social

norms), and provide assistance and support to enable the behavior (social support), they are more likely to perform the behavior.

The relationships among selected constructs of the HPM (Pender, 1996) are described in the following text. Interpersonal influences, including social support, social norms, and modeling, influence a behavior directly as well as indirectly via commitment to a plan of action. Perceived self-efficacy influences perceived barriers and has a direct effect on a behavior as well as indirect effect through commitment to a plan of action. Both perceived barriers and perceived benefits have direct effects and indirect effects on a behavior through commitment to a plan of action. The HPM does not propose any specific relationships among interpersonal influences, perceived benefits, and perceived self-efficacy. However, a negative relationship is depicted between perceived self-efficacy and perceived barriers with higher self-efficacy proposed as decreasing barriers to a behavior. The HPM is depicted in Figure 1.

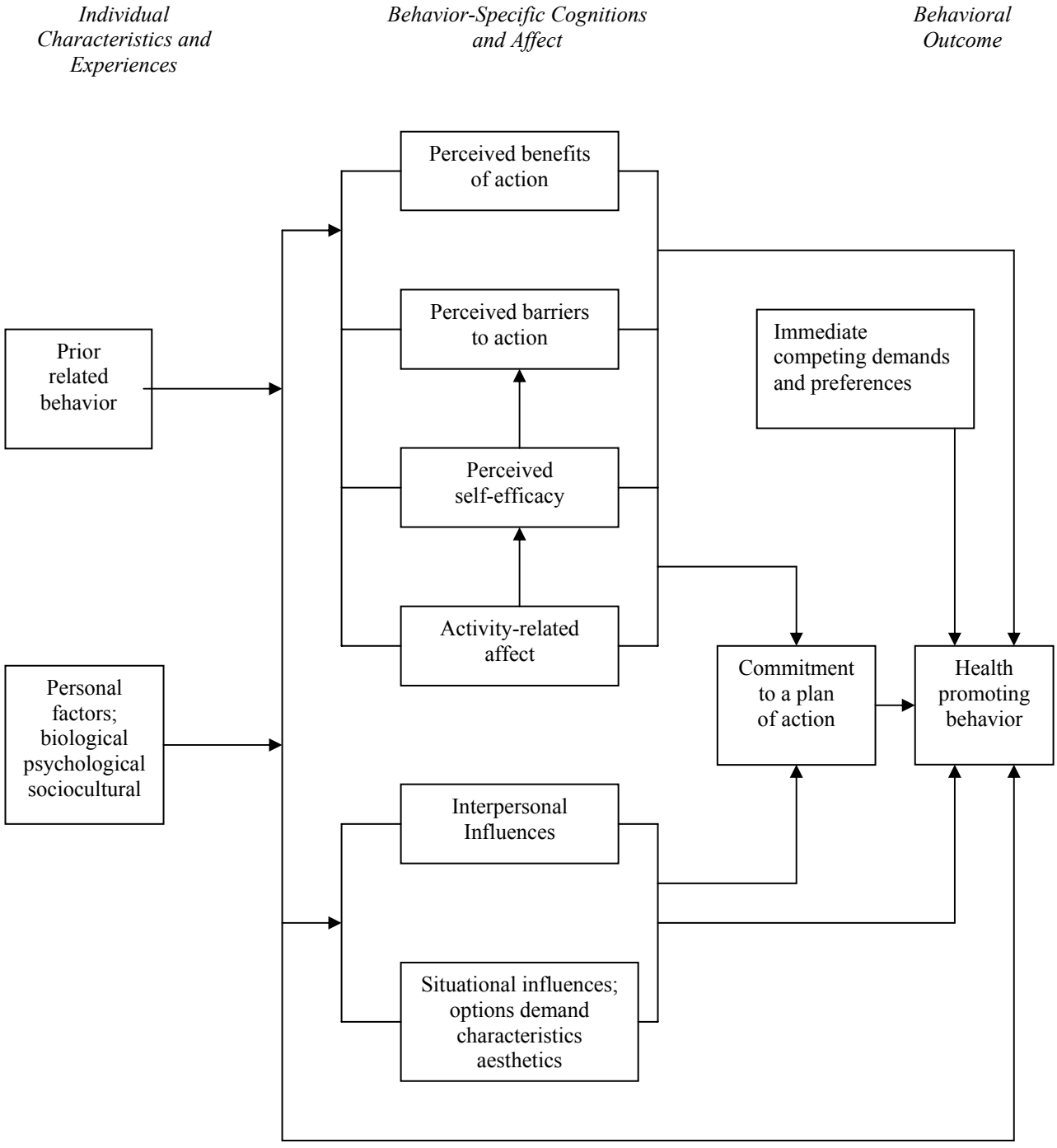


Figure 1 The Health Promotion Model (Pender, 1996)

Self-Efficacy Theory. As Bandura contends (1997), most human behaviors result from individual thoughts. Beliefs are powerful and influence individuals' emotion, motivation and action. If people believe that they have power to perform an action, they will exert effort to do it. In addition, people will perform an action which is valued by them. A behavior is a consequence of interaction between the belief in one's ability to arrange and excuse a particular course of action (perceived self-efficacy) and other cognitive constructs.

Perceived self-efficacy regulates human functioning through cognitive, motivational, affective, and selective processes (Bandura, 1997). That is, perceived self-efficacy plays a mediating role in regulation of human functioning by four processes which usually work together. Perceived self-efficacy affects thought patterns that can increase or decrease performance. Past performance results in causal attributions and outcome expectations that become organized as cognitions referred to as forethought. Forethought influences effort and performance through motivational processes. Self-efficacy also plays a key role in the self-regulation of affective states. People with high perceived self-efficacy are more likely to be able to control biological stress, anxiety arousal, and mood during a behavior. Finally, perceived self-efficacy plays a central role in the selection of types of activities to be executed and environments for activity.

Women's Leisure-Time Physical Activity Promotion Model. The WPAPM proposes that three constructs selected from the HPM (Pender, 1996) perceived benefits, perceived barriers and interpersonal influences including social support, social norms and modeling are powerful influencing factors for perceived self-efficacy and LTPA among Thai women. The empirical rationale for the model is presented next.

Physical activity is a complex health-promoting behavior which requires high perceived self-efficacy, particularly in the early stages of adoption (Sallis et al., 1992). To increase levels of physical activity, women have to believe that they are able to organize time and overcome barriers for performing regular physical activity. Sources of efficacy beliefs are successful personal experiences, vicarious experiences, social persuasion, and physiological and affective states which affect perceived self-efficacy through cognitive processing (Bandura, 1997).

Perceived benefits of being active may be used to motivate women. Perceived benefits include physiological benefits such as health improvement and weight reduction, and psychosocial benefits such as enjoyment and stress reduction. For healthy women, physical appearance and feeling better may be of greater importance than cardiovascular fitness and longevity. Furthermore, improvement in blood pressure and blood sugar control may be most important for older women or women with chronic diseases. The perceived benefits for women that are found to be effective for increasing physical activity include positive outcomes that are valuable, occur quickly, and can be seen easily (Dzewaltowski, Noble & Shaw, 1990). These perceived benefits may come from direct experiences or vicariously from indirect experiences such as observing others.

The relationships among perceived benefits, perceived self-efficacy, and physical activity are not yet clear. In the HPM, no specific relationship between perceived self-efficacy and perceived benefits is proposed. Current theories seldom specify the exact nature of the relation between perceived benefits of a behavior and self-efficacy for the behavior; however, evidence from some physical activity studies suggests that there may be a causal relationship (Hofstetter, Hovell & Sallis, 1990). As Bandura contends (1997), perceived self-efficacy plays a mediating role between forethought of outcomes and performance. The WPAPM proposes that perceived benefits as forethought influence perceived efficacy and the subsequent effort expended to perform a given behavior. Perceived self-efficacy may mediate between perceived benefits and physical activity via motivational processes. Thus, forethought regarding perceived benefits would enhance perceived self-efficacy or persistent to achieve desired outcome**s**.

Findings regarding the relationship between perceived benefits and physical activity are inconsistent. The HPM notes that perceived benefits have a direct effect on a behavior. Some studies have found that perceived benefits have only a small direct effect on LTPA among American elderly (Conn, 1998; Resnick & Nigg, 2003) and Taiwanese adolescents (Wu & Pender, 2002) while other studies showed that there was not a significant relationship between the construct and LTPA in adult American women and men (Sallis et al., 1989; Sallis, Hovell & Hofstetter, 1992). Therefore, the relationships among perceived benefits, perceived self-efficacy, and LTPA in middle-

aged Thai women need to be tested. The WPAPM proposes that perceived benefits may affect LTPA directly and indirectly through perceived self-efficacy.

Perceived barriers is also an important construct as the evidence has shown that women with greater perceived barriers are less likely to perform physical activity (Sallis et al., 1989). Barriers to performing regular physical activity may be real or imagined. Personal barriers are those which are created internally such as time constraints, lack of motivation, and fatigue, while environmental barriers such as cost and lack of facilities or equipment arise outside of an individual.

The relationships among perceived barriers, perceived self-efficacy, and physical activity are also not clear. The HPM notes that perceived self-efficacy influences perceived barriers by decreasing their power to obstruct behavior. However, evidence from some studies has shown the opposite direction of influence with perceived barriers influencing perceived self-efficacy (Hofstetter et al., 1990; Wu & Pender, 2002). Based on emerging empirical evidence, the WPAPM proposes that perceived barriers would have a negative indirect effect on physical activity through perceived self-efficacy with perceived obstacles lowering self-efficacy on confidence that a person could successfully participate in physical activity behavior. The WPAPM proposes that perceived self-efficacy plays a mediating role between perceived barriers and LTPA.

Also unclear is whether a direct correlation between perceived barriers and physical activity exists. According to the HPM, perceived barriers have a direct effect on a behavior. Some studies showed that perceived barriers had a direct effect on physical activity in the elderly (Conn, 1998) whereas other studies did not find this direct relationship in adolescents (Wu & Pender, 2002). Additionally, in a study of Thai elderly people, Chinuntuya (2001) found that perceived barriers had a significant direct effect on LTPA but that was not the case for lifestyle physical activity. Therefore, this study will examine the direct and indirect effects of perceived barriers on middle-aged Thai women's LTPA.

Interpersonal influences including social support, social norms, and modeling are very important for initiating and continuing new behavior (Pender et al., 2002; Bandura, 1997; Sallis et al., 1989), especially LTPA. For middle-aged Thai women, interpersonal influences may play a significant role in increasing levels of physical

activity due to the importance of family and friends in the culture. According to Bandura (1997), people feel comfortable and confident to perform an activity which is acceptable to significant others and gives them a sense of self-worth. Support from family, friends, health care providers, and exercise leaders may increase perceived benefits and perceived self-efficacy, and decrease perceived barriers to LTPA.

Social norms or expectations from significant others concerning whether women should or should not perform LTPA influence women's motivation and confidence to adopt and maintain regular physical activity. Perceptions that women should not participate in LTPA due to being housewives, feeling guilty for doing something for themselves and perceptions that exercise, sports, or recreational activities are inappropriate behavior may influence physical activity indirectly through perceived personal barriers. In turn, social norms may influence physical activity indirectly through perceived benefits (recognize benefits of LTPA) and perceived self-efficacy (confidence in performing LTPA due to significant others' influence). Further, expectations from others may influence self-efficacy or personal confidence among women in some societies, particularly in close-knit or dependent communities such as Thai society.

Modeling by significant others is a source of self-efficacy and may also influence perceived benefits, and perceived barriers. According to the HPM and Bandura (1997), individuals are more likely to perform physical activity when positive modeling occurs such as other individuals achieving the goal of regular physical activity in the face of barriers. The more confidence role models express and the more benefits models gain from participation in regular physical activity, the greater beliefs in efficacy women may have. Observing people participate in LTPA may increase perceived benefits and decrease perceived barriers. Modeling of regular physical activity by middle-aged peers and other significant others may indirectly increase LTPA among Thai women through effects on perception of benefits, barriers, and self-efficacy.

In summary, perceived self-efficacy is a core construct of the WPAPM. The more women believe in their abilities to perform regular physical activity in spite of barriers, the more physical activity is performed. Interpersonal influences including social support, social norms and modeling may affect physical activity indirectly

through perceived self-efficacy, perceived benefits and perceived barriers. That is, interpersonal influences positively influence perceived self-efficacy, positively influence perceived benefits, and negatively influence perceived barriers. Perceived barriers may negatively affect physical activity directly and indirectly through perceived self-efficacy. Perceived benefits may positively influence physical activity directly and indirectly through perceived self-efficacy. Because this study is exploratory in nature, these new relationships that go beyond existing theory have been proposed for testing in the Thai population.

The proposed relationships among the variables that will be tested are depicted in the WPAPM presented in Figure 2**.**

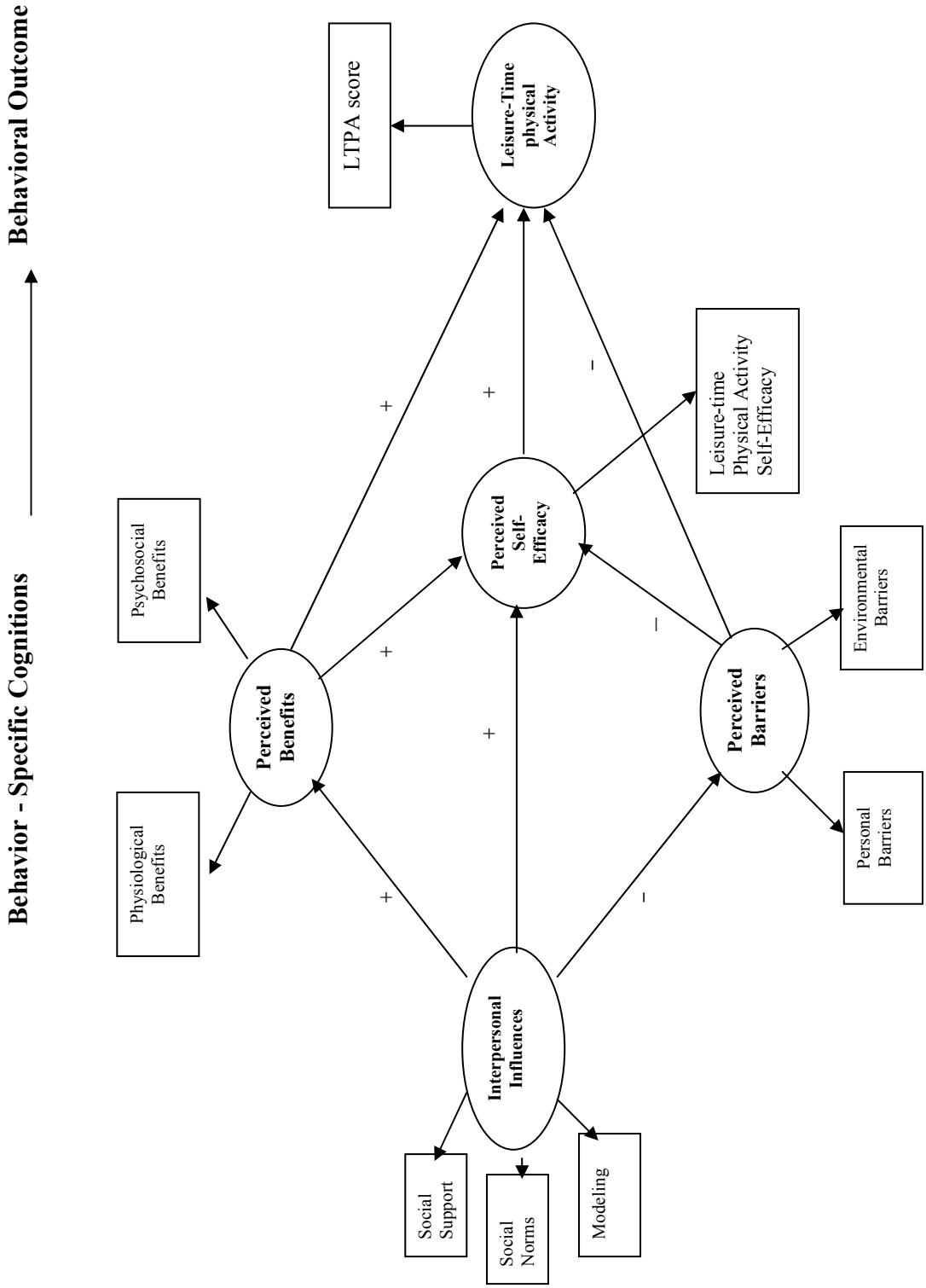


Figure 2 Women's Leisure-Time Physical Activity Promotion Model (WPAPM)

Research Questions

1. Does the hypothesized model of factors contributing to LTPA among middle-aged Thai women adequately fit the data?

2. What are the relationships among selected behavior-specific cognitions and LTPA among middle-aged Thai women?

Research Hypotheses

1. Interpersonal influences will have a positive direct effect on perceived benefits.

2. Interpersonal influences will have a negative direct effect on perceived barriers.

3. Interpersonal influences will have a positive direct effect on perceived self-efficacy and indirect effects through perceived benefits and perceived barriers.

4. Perceived self-efficacy will have a positive direct effect on middle-aged Thai women's LTPA.

5. Perceived benefits will have a positive direct effect and a positive indirect effect on middle-aged Thai women's LTPA through perceived self-efficacy.

6. Perceived barriers will have a negative direct effect and a negative indirect effect on middle-aged Thai women's LTPA through perceived self-efficacy.

7. Interpersonal influences will have an indirect effect on middle-aged Thai women's LTPA through, perceived benefits, perceived barriers, and perceived self-efficacy.

Definition of Terms

Leisure-time physical activity is defined as total energy expenditure in the past week calculated from any physical activity which an individual performed in free time in order to increase energy expenditure. It was measured with the Thai Women's Leisure-Time Physical Activity Questionnaire adapted from the Paffenbarger Physical Activity Questionnaire (Paffenbarger, Wing & Hyde, 1978).

Interpersonal influences refers to the cognitions concerning the behaviors, beliefs, or attitudes of others regarding LTPA which include social support, social norms and modeling.

Social Support refers to the perceptions of assistance and/or encouragement from others for initiating or continuing participation in LTPA. Social support was measured with the Social Support for Exercise Behavior Scale questionnaire adapted from the Social Support for Exercise Habits Scale (Sallis, Grossman, Pinski, Patterson & Nader, 1987).

Social Norms refers to an individual's perceptions of what others expect in relation to performance of regular LTPA. It was measured with the Social Norms for Leisure-Time Physical Activity Questionnaire adapted from the Exercise Norms Scale developed by Pender (1996).

Modeling refers to the number of adults in the family, friends, and others who are admired for performing LTPA regularly. It was measured with the Modeling for Leisure-Time Physical Activity Questionnaire adapted from the San Diego Health & Exercise Survey Questionnaire (Sallis, Hovell & Hofstetter, 1992).

Perceived barriers refers to the perceptions that personal and environmental factors hinder the performance of LTPA.

Personal barriers refers to the perceptions of obstacles of LTPA which are created within the person including time constraints, lack of motivation, lack of support or encouragement, negative consequences, and health problems. It was measured with the Leisure-Time Physical Activity Benefits/Barriers Questionnaire adapted from the Exercise Benefits/Barriers Scale (Sechrist et al., 1987).

Environmental barriers refers to the perceptions of barriers of LTPA which are outside of the person, and include lack of facilities or equipment, cost, unsafe environment, inconvenience and bad weather. It was measured with the Leisure-Time Physical Activity Benefits/Barriers Questionnaire adapted from the Exercise Benefits/Barriers Scale (Sechrist et al., 1987).

Perceived benefits refers to the perceptions of physiological and/or psychosocial advantages of performing LTPA.

Physiological benefits refers to the perceptions of advantages of LTPA including health benefits and physiological functioning and appearance improvement. It was measured with the Leisure-Time Physical Activity Benefits/Barriers Questionnaire adapted from the Exercise Benefits/Barriers Scale (Sechrist et al., 1987).

Psychological benefits refers to the perceptions of advantages of LTPA including psychological outlook and social integration. It was measured with the Leisure-Time Physical Activity Benefits/Barriers Questionnaire adapted from the Exercise Benefits/Barriers Scale (Sechrist et al., 1987).

Perceived self-efficacy refers to the judgment of capability to initiate or continue performing LTPA regularly in the face of various obstacles. It was measured with the Leisure-Time Physical Activity Self-efficacy Questionnaire adapted from the Exercise Self-efficacy Scale (Bandura 1997).

Middle-aged women refers to women ages between 40-59 years.

Assumptions

This study is based on the following assumptions:

1. Individuals and the environment interact with each other over time and this reciprocity determines behavior.
2. Behaviors result from cognitive processes that seek to achieve highly desired outcomes reflective of individual value structures.

Summary

The purpose of this study was to develop a causal model to explain the LTPA among middle-aged Thai women. The causal model was derived from the HPM, Self-Efficacy Theory, and related literature. This study hypothesized that the behavior-specific cognitions including interpersonal influences, perceived benefits, and perceived barriers affect the levels of LTPA of middle-aged Thai women through perceived self-efficacy. The expected benefits from this study include guidelines for developing effective community-based programs to promote active lifestyles among Thai women.

CHAPTER 2
LITERATURE REVIEW

This chapter presents an integrative review of the theoretical and empirical literature describing the concepts of interest and the interrelationships among them. The concept of physical activity and correlates of LTPA in women were examined.

Physical Activity

The following includes a literature review describing physical activity, current recommendations, physical activity measurement, and physical activity as it relates to women.

Definition of Physical Activity

Physical activity refers to "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen et al., 1985, p. 126). In humans, energy is expended in three ways (McArdle, Katch, & Katch, 2001). First, approximately 60-75 % of energy is required at rest to maintain body temperature and involuntary muscular contraction for functions including respiration and circulation. This energy level represents the resting metabolic rate. Second, 10 % of energy is required to digest and assimilate food. Last, energy is expended during physical activity and recovery. Individuals can increase metabolic rate 10 times the resting value during continuous large muscle movement such as fast walking or running. Generally, physical activity accounts for between 15 and 30 % of total daily energy expenditure. Thus, energy expended each day depends largely on one's physical activity.

Physical activity is usually described in four dimensions including intensity (e.g., degree of vigor), duration (e.g. minutes, hours), frequency (e.g. times per week), and circumstance (the purpose of an activity or mood during performing an activity) (Montoye et al., 1996). Physical activity is classified by the circumstances in which it occurs including occupation, transportation, housework, care taking, gardening, and LTPA.

Leisure-time physical activity refers to any physical activity which one chooses to do during free time such as sports, exercise, and recreational activities that lead to any substantial increase in the total daily energy expenditure (Bouchard & Shephard, 1994). Exercise is 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 an objective" (Caspersen et al., 1985, p. 128). Walking is a type of physical activity which one may perform for transportation while it is also an exercise activity if the individual plans to walk briskly for 30 minutes every day to improve physical fitness**.** In addition, information about mood during performing a physical activity should not be discarded even if two types of physical activities expend the same amount of energy (Montoye et al., 1996). That is, the individual's emotional state or the psychological effects of performing LTPA are different from housework or occupational activities. For example, a woman who is very busy doing heavy housework may expend the same amount of energy as another woman who is aerobic dancing, but the mood during exercise or the psychological benefits may not be the same.

The type, intensity and duration of physical activity determine the energy expenditure during a bout of activity. The amount of physical activity can be described in metabolic equivalents (MET). One MET is equal to energy expenditure for sitting quietly which is approximately 1 kilocalorie (kcal) per kilogram (kg) of body weight per hour or 3.5 ml of oxygen uptake per kg of body weight per minute in an adult (Ainsworth et al., 1992). For example, 3 METs is 3 times the resting rate. Energy expenditure is calculated by multiplying the body weight in kg by the MET value and duration of activity. A woman who weighs 50 kg and walks at 2 METs for 2 hours will expend 200 kcal, for example.

The MET values are classified differently. The following are examples for adults. Lee and Paffenbarger (2000) defined light (e.g. bowling and boating), moderate (e.g. golfing and dancing), and vigorous (e.g. running and swimming laps) as less than 4, 4 to less than 6, and 6 METs and over, respectively. Ainsworth et al. (1992) established a compendium of physical activities which are convenient for estimating

energy cost of each activity such as bicycling at less than 10 miles per hour (mph) equals 4 METs while at 14-15.9 mph equals 10 METs.

The USDHHS (1999) classified physical activity by the level of intensity in accordance with the CDC-ACSM recommendation. Light-intensity physical activity refers to activity requiring approximately less than 3 METs such as casual walking (less than 3 mph), lawn bowling, and Ping-Pong. Moderate-intensity physical activity refers to activity requiring approximately 3-6 METs such as brisk walking, aerobic dancing, and Tai-Chi. Vigorous-intensity physical activity includes activity requiring greater than 6 METs such as running, tennis, and vigorous calisthenics. Moreover, McArdle et al. (2001) classified physical activity based on the intensity of leisure activity related to gender. For a woman weighing 55-kg, light-physical activity (e.g. stroll walking) is equivalent to 1.2 – 2.7 METs; moderate-physical activity (e.g. brisk walking) is 2.8 – 4.3 METs; and heavy-physical activity (e.g. briskly walking uphill) is 4.4-5.9; and very heavy-physical activity (e.g. running) is 6.0-7.5 METs.

Measurement of Physical Activity

Physical activity is a complex behavior and may be difficult to measure accurately because it is based on an individual's habits and varies from day to day (Freedson & Kelly, 2000). Physical activity is normally assessed by intensity, duration, frequency, and domain. The nature of the study guides what domain of physical activity will be assessed and how it is measured. For example, if the objective of a study is to examine how much energy women expend in physical activity a week, the intensity, duration and frequency of each type or domain of physical activity (e.g., occupation, housework, or LTPA) as well as time spent in sleep must be assessed to calculate energy expenditure.

Physical activity can be measured directly and indirectly. Since each method has advantages and disadvantages, the following issues should be considered prior to selecting the type of measurement tool: a) size and characteristics of the target population (e.g., culture, gender, age, cognitive ability); b) practicality (e.g., cost, time, convenience); c) acceptability to the study subjects; and d) accuracy (reliability and validity) (Bouchard, Shephard, & Stephens, 1994). Descriptions of physical activity measurements as well as advantages and disadvantages are presented next.

Direct methods. Direct methods may include objective or subjective assessments (USDHHS, 1996). Physical activity can be measured directly by using direct observations and movement assessment devices such as mechanical or electronic motion sensors and heart rate monitoring (Ainsworth, Montoye & Leon, 1994). The direct observations include recorded observations such as watching an individual or reviewing of videotapes. This method is suitable for younger children. Direct observations are often time-intensive, expensive, invasive, and observations may alter natural behaviors (Ainsworth et al., 1994). In addition, it is more difficult to attain large sample sizes.

Mechanical or electronic motion sensors, including pedometers and accelerometers, are mechanical movement counters which are clipped to a belt at the waist. The sensor measures vertical acceleration of the body. The pedometer is the best fit for walking while the accelerometer is appropriate for a wide variety of activities. Because studies found that heart rate was a good index of oxygen consumption (Murlin & Greer, 1914), heart rate monitoring was developed. Energy expenditure can be calculated using a wristwatch-sized device which stores heart rate data. Doubly labeled water is a technique developed to measure energy expenditure in free living subjects by ingesting water with isotopes of hydrogen and oxygen (Montoye et al., 1996). A subject's urine or saliva is collected daily or 7 days after administering the first dose of isotopes orally. The production of carbon dioxide can be calculated from the difference in elimination of the two isotopes. Then, oxygen uptake and energy expenditure can be calculated.

Although these devices can eliminate elements of subjective judgment in obtaining physical activity data and assess more precise estimates of energy expenditure, there are several disadvantages (USDHHS, 1996; Bassett, 2000; Freedson & Miller, 2000). These methods are expensive and often complicated so they may not be suitable to use in large populations but to validate subjective assessments (Bouchard et al., 1994). They also may burden participants as well as alter habitual or natural physical activity. Most of these methods can neither assess patterns nor intensity of physical activity. For example, pedometers cannot differentiate between walking and running (Bassett, 2000). In addition, these tools are not always relevant to the definition of physical activity. For example, heart rate may be affected by

emotional stimuli, caffeine, fatigue, state of hydration, body temperature, and oxygen tension of the inspired air (Ainsworth et al., 1994). Therefore, in using these methods to validate other assessments (e.g., subjective method), one has to take into account those limitations (Patterson, 2000).

Subjective assessment is another method used to measure physical activity directly through information gained from self-report, including physical activity records and questionnaires (Ainsworth et al., 1994). The physical activity records, such as diaries and logs, provide a record of participation in physical activities during a specific period. Questionnaires require respondents to recall their physical activity over a particular time frame (e.g. 24 hours, 7 days, or one year) which can be filled in by a participant or an interviewer. The questionnaires include global self-assessment, recall questionnaires, and retrospective quantitative history. A global self-assessment tool includes a few questions about usual physical activity habits; the Godin Leisure Time physical activity questionnaire is an example. Recall questionnaires assess physical activity performed during a specific time such as the past week or month; the Paffenbarger Physical Activity Questionnaire is an example. The retrospective quantitative history is designed to obtain information about physical activity during long-time periods such as one year or over such as the Minnesota Leisure Time Physical Activity Questionnaire. These measurements generally provide information (i.e. type, intensity, duration, and frequency) with which energy expenditure can be calculated.

The weaknessess of the subjective assessments include recall bias (Baranowski, 1988) and social desirability bias (Warnecke, Johnson, Chavez, Sudman, O'Rourke, Lacey & Horm, 1997). Vigorous physical activities are easier to remember than light or moderate physical activities (Durante & Ainsworth, 1996). People are more likely to remember habitual activity which was performed on specific days or unusual events which occurred in the past week than activities occurring on Wednesday or Thursday, for example (Baranowski, 1988). People may over-report socially desirable behavior (e.g. exercise and diet) and underreport socially undesirable behavior (e.g. smoking, drug uses) particularly with a face to face approach (Polit & Hungler, 1985; Warnecke et al., 1997). Race or ethnicity was found to be associated with social desirability (Warnecke et al., 1997). However, self-report

assessments are widely used because of their advantages (Bouchard et al., 1994; Kriska & Caspersen, 1997). These measures are suitable for free-living people because they capture physical activity type, intensity, duration, and frequency but do not impact the subject's habitual physical activity behavior. Self-reports are simple, convenient and inexpensive. These assessments can be modified to fit specific populations such as age groups, education levels, and culture. In addition, questionnaires and interview methods are often accepted by respondents because they enjoy communicating about their activities (Montoye et al., 1996).

Indirect methods. The amount of physical activity can be estimated indirectly by measuring information related to physical activity (USDHHS, 1996). These include physiologic measurements such as physical fitness assessment and occupational classification. Physical fitness refers to "*the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies*" which includes cardiorespiratory endurance, muscular endurance, muscular strength, body composition, and flexibility (Caspersen et al., 1985, p. 128). The physical fitness assessment is based on the assumption that cardiorespiratory fitness, muscular fitness, and body composition (body mass index [BMI]) are associated with habitual physical activity (USDHHS, 1996). Measuring maximal oxygen consumption (VO_2 max), heart rate, muscular endurance and strength, and percentage of body fat are examples of physiological assessment. These assessments have limitations. For example, physical fitness does not necessarily associate with levels of physical activity (LaPorte, Adams, Savage, Brenes, Dearwater & Cook, 1984). LaPorte and colleagues noted that according to many studies, within populations, many people with high physical activity did not always have high cardiovascular fitness levels. Factors including age, gender, heredity, and medical status may influence cardiovascular fitness (Bouchard et al., 1994).

Occupational classification is another indirect assessment based on the concept that individuals performing given job tasks expend similar amounts of energy (Ainsworth et al., 1994). The Tecumseh Self-Administered Quantitative Occupational Physical Activity Questionnaire is an example. The weakness of this method is that amounts of energy within the same job classification may vary according to

responsibilities and times and only a few job titles accurately indicate the types of activities performed (Ainsworth et al., 1994).

In short, physical activity can be measured by several methods; however, most assessments focus on the amount of energy expended (LaPorte et al., 1984). Although there is no widely accepted "gold standard" method for measuring physical activity (USDHHS, 1996), self-report assessment is suitable for large populations where convenience, non-reactiveness, applicability, and accuracy are required (Kriska & Caspersen, 1997).

Benefits of Physical Activity

Regular physical activity promotes health including physical and psychological well-being, prevents chronic diseases, and is associated with longevity regardless of risk factors (Paffenbarger, Hyde, Wing & Hsieh, 1986). Following are the physiological and psychosocial benefits of physical activity.

Physiological benefits. Epidemiologic studies have shown that regular physical activity is inversely related to morbidity and mortality from cardiovascular diseases, colon cancer, diabetes (Paffenbarger et al., 1986; Blair, Kohl III, Paffenbarger, Clark, Cooper & Gibbons, 1989), osteoarthritis (Lane, Bloch, Jones, Marshall, Wood & Fries, 1986), osteoporosis (Krall & Dawson-Hughes, 1994), and obesity (Kresges, Klesges, Haddock & Eck, 1992) because it improves blood pressure (Paffenbarger, Wing, Hyde & Jung, 1983), lipoprotein levels (Duncan, Gordon & Scott, 1991), glucose tolerance and insulin sensitivity (Mayer-Davis, D'Agostino, Karter, Haffner, Rewers, Saad & Bergman, 1998), body composition (i.e. fat-free mass, fat mass, and percent body fat) and resting metabolic rate (Gilliat-Wimberly, Manore, Woolf, Swan & Carroll, 2001), immune function (Nieman, 1994), and bone density (Krall & Dawson-Hughes (1994).

With or without other risk factors, being physically active is significantly associated with lower mortality rates. Paffenbarger and colleagues (1986) investigated the relationship between physical activity and other life-style characteristics and mortality rates from all causes among 16,936 Harvard alumni males, aged 35-74, during 1962 to 1978. Physical activity was measured by asking "how many city blocks were walked, how many stairs were climbed, and types of sports participated in and time spent in those activities each week" Smoking habit, blood pressure, weight,

height, and history of parental death before the age of 65 were also assessed. The study showed that men who had energy expenditure more than 2000 kcal per week had a 28 percent lower all-cause death rate than less active men ($p < .0001$). The death rates were lower as physical activity increased from less than 500 to 2000 or more kcal per week. Men aged 60 and over with the highest physical activity levels had half the risk of those at the low end. The clinical attributable rate showed that sedentary men may reduce 24 percent of risk of death if they become more active. With or without these risk factors (i.e. smoking, hypertension, gains in body weight, and early parental death), men who were more physically active had significantly lower mortality rates than those who were less active. Finally, the study showed longevity was influenced by the amount and intensity of physical activity the alumni participated in during adult life.

Similarly, Blair and coworkers (Blair, Kampert, Kohl III, Barlow, Macera, Paffenbarger & Gibbons, 1996) found that low fitness (Relative Risk [RR], 2.10; 95% Confidence intervals [CI], 1.36-3.21), and smoking (RR, 1.99, 95% CI, 1.25-3.17) were associated significantly with all-cause mortality in 7,080 women aged 20-88. Women with risk factors (i.e. smoking, systolic blood pressure greater than 140 mm Hg, and cholesterol more than 240 mg/dl) reduced death rates when physical fitness was increased. The low-fit women with no other risk factors had a death rate of 31.6 per 10,000 while fit women with 2 or 3 risk factors had death rate almost 50% lower (16.1 per 10,000).

Recently, Lee & Paffenbarger (2000) showed that greater energy expenditure was associated with increased longevity in the longitudinal Harvard Alumni Health Study. Physical activity, measured with the Paffenbarger Physical Activity questionnaire (Paffenbarger et al., 1978) was classified as light activity (< 4 METs), moderate activity (4-6 METs), and vigorous activity (≥ 6 METs). The results revealed that men with greater participation in moderate physical activity presented a trend toward lower mortality rates whereas those with vigorous physical activity significantly had lower mortality rates (p, trend = 0.07 and < 0.001 respectively). In addition, inactive and overweight men had the highest mortality.

Regular physical activity has been shown to be associated with hypertension prevention (USDHHS, 1996). Folsom, Prineas, Kaye & Munger (1990) found that

physically active women aged 55-69 years were 30 % (OR = 0.7, 95% CI, 0.6, 0.9) less likely to develop hypertension than sedentary women. Kelley (1999) reviewed ten randomized trials studies published between 1966 and 1998. He found that women participating in aerobic exercise had a small significant reduction in resting blood pressure. The effect of aerobic exercise on blood pressure was larger for women younger than 50 years of age than those who were older than 50 years. This study suggested that regular physical activity can prevent CVD among peri- and post menopausal women even if blood pressure is not lowered.

Evidence has shown that physical activity can both prevent and improve non-insulin-dependent diabetes mellitus (NIDDM or type II) (USDHHS, 1996). Kaye, Folsom, Sprafka, Prineas & Wallace (1991) revealed that women aged 55-69 with high levels of physical activity had a 50% lower incidence rate of NIDDM than women with low physical activity (OR = .05, 95 % CI 0.4, 0.7). In addition, an 8-year study of 87,253 female nurses aged 34-59 years indicated that nurses who reported participation in vigorous LTPA at least once a week were 16 % (RR =0.84, 95% CI, 0.75, 0.95) less likely to develop NIDDM than those who reported no LTPA (Manson et al., 1991). The American Diabetes Association (1990) has recommended that due to benefits of physical activity (e.g. glycemic control and cardiovascular benefits), an appropriate physical activity program may be used as a part of treatment regimen for NIDDM along with dietary control and drug therapy.

Physical activity is positively related to bone density. Krall & Dawson-Hughes (1994) found that menopausal women who walked more than 7.5 miles per week had significantly higher mean bone density of the legs and trunk regions and the whole body than those who walked less than 1 mile per week. After one year follow up, the women who walked more than 7.5 miles per week had less decline in bone density than sedentary women ($p < .05$). Also, a meta-analysis of studies dealing with the effects of aerobic exercise on bone density at the hip among menopausal women suggested that site-specific aerobic exercise has a positive effect on bone density (Kelley, 1998).

Evidence also shows that physical activity is significantly inversely associated with symptoms such as sleeping disturbance, tiredness, back pain, and constipation (Brown, Mishra, Lee & Bauman, 2000). Brown et al. found that women

aged 18 and over who participated in vigorous LTPA for 20 minutes at least 1-2 times per week or moderate LTPA for 20 minutes at least 2-3 times per week were less likely to report sleeping difficulty, tiredness, back pain, constipation, stiff and painful joints, leaking urine, hypertension syndromes and osteoporosis when compared with sedentary women. For example, middle-aged women who participated in vigorous LTPA 3-5 times per week reported less tiredness, constipation, sleeping difficulty, and back pain than sedentary women 46, 25, 21, and 15 %, respectively ($p < .002$).

Psychosocial benefits. Physical activity is positively associated with psychological well-being and quality of life (USDHHS, 1996; McAuley & Rudolph, 1995). Studies have shown that regular physical activity reduces depression, anxiety, and tension (Stephens, 1988; Farmer, Locke, Moscicki, Dannenberg, Larson & Radloff, 1988) and improves self-esteem (McAuley, Mihalko & Bane, 1997).

Stephens (1988) examined the relationship between physical activity and mental health in males and females aged 20-39 and 40 and over from four surveys conducted during 1971-1981: National Health and Nutrition Examination Survey, National Survey of Personal Health Practices and Consequences, Canada Health Survey, and Canada Fitness Survey. Physical activity was defined as recreational and household activities. The results showed that LTPA was positively related with general well-being (e.g. energy level, satisfaction, freedom from worry, and self-control), and positive mood (e.g. proud and cheerful). On the other hand, LTPA was negatively associated with depression, anxiety, and negative mood (e.g. lonely, loss of appetite, and morning tiredness). Women with a greater amount of LTPA were more likely to report higher general well being and mental health ($p < 0.001$). To understand whether the level of energy expenditure had a positive relationship with mental health, LTPA and the combination of LTPA and household chores were analyzed separately. It was clear that only LTPA was associated with positive affect scale scores rather than occupational and household activities. This relationship was especially true among women age 40 and over.

Similarly, Farmer and colleagues (1988) showed that U.S. women with little or no LTPA were more likely to have greater body mass index (BMI), blood pressure, heart rate, and reported more depressive symptoms than those with more LTPA. At 8 years follow up, little or no LTPA was found to be a significant predictor of increased

depressive symptoms in White women who reported few depressive symptoms at baseline. Also, a study of 82 adult participants in a 12-week aerobic fitness program (DiLorenzo, Bargman, Stucky-Ropp, Brassington, Frensch & LaFontaine, 1999) found that increasing aerobic fitness had beneficial short-term and long-term effects on psychological outcomes (i.e. anxiety, depression, mood, and self-concept).

Sunsern (2002) revealed that Thai postmenopausal women decreased stress after participation in an aerobic exercise program. In this one group pretest-posttest design study, 130 Thai women aged 45-59 years with naturally permanent cessation of menstruation for at least the prior 12 months, were invited to participate in 40-50 minute sessions of aerobic exercise two times per week, for 12 weeks. After participating in the program, the mean stress score was significantly lower than those prior to participation in the program ($p < .001$).

McAuley and coworkers (1997) found that after participation in a 20-week walking program, formerly sedentary middle-aged males and females had significantly improved global self-esteem ($p< .003$) and physical self-worth ($p< .001$). Additionally, in a review of 38 studies, McAuley and Rudolph (1995) found that physical activity was strongly associated with psychological well being among adults aged over 45 (mean age, 56.7 years) and physical fitness was not necessarily related to psychological outcomes. They concluded that possible mechanisms underlying the relationship regarding physical activity roles include improving self-efficacy, social integration, and physiological responses.

Physical Activity Recommendations

Due to the known benefits of physical activity, a panel of U.S. experts convened by the CDC-ACSM released a recommendation to promote participation in moderate intensity activities that "*Every U.S. adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week*" (Pate et al., 1995, p. 404). Moderate-intensity referred to activity performed at an intensity of 3 to 6 METs.

The U.S. Surgeon General's Report (SGR) (USDHHS, 1996) recommends that every adult should participate in a moderate amount of physical activity, on all or most days of the week. A moderate amount of physical activity is approximately equal to physical activity that expends 150 kcal of energy per day or 1,000 kcal per week.

Because this recommendation stresses the amount of physical activity rather than the intensity, people can select activities that they like and fit into their daily lives. That is, vigorous activity (greater than 6 METs) such as running and tennis can be performed for a short time (15-20 minutes); moderate activity (3-6 METs) such as brisk walking and aerobic dancing should be performed 30 minutes; and light activity (less than 3 METs) such as playing volleyball and ping-pong can be done for 45-60 minutes (USDHHS, 1996). Physical activity can be performed in one period or accumulated in short bouts such as 10-minute intervals at different times during the day. People should perform physical activity regularly and increase the duration or the intensity to gain more health benefits.

The recommendation further suggests that to avoid injury or pain, sedentary people should begin physical activity with short duration of light or moderate intensity activity and gradually increase the duration or intensity until the goal is reached (USDHHS, 1996). People with chronic diseases such as CVD or diabetes, or who are at high risk for these health conditions, should first consult a physician before beginning a new program of physical activity. Men over age 40 and women over age 50 should consult a physician before starting a vigorous activity program. To improve cardiovascular and musculoskeletal health, individuals should perform strength exercises at least twice per week.

Physical Activity and Women

How physically active are women, particularly Thai women? How much physical activity is needed to influence the health of Thai women? These questions will be addressed in the following sections.

Prevalence of physical activity among women. Studies have shown that American and Australian women are more likely to be inactive than men, particularly those who are older, have lower education and lower income (USDHHS, 1996; Owen & Bauman, 1992). The U.S. SGR (USDHHS, 1996) noted that data from five national surveys indicated that: a) more women than men were physically inactive; b) physical inactivity increased with age; and c) the prevalence of inactivity increased with decreasing levels of education and income. For example, data from the Behavioral Risk Factor Surveillance System (BRFSS) (USDHHS, 1996) indicated that, 25.4 percent (95 % CI 24.2, 26.6) of women aged 18-29 reported no LTPA while

32.1 percent (95% CI 30.9, 33.3) and 50.5 percent (95% CI 48.5, 52.5) of those aged 45-64 and 75 and over reported no LTPA, respectively. As reported by Yeager, Macera and Merritt (1993), of White women with a college education, 19.8 percent (95 % CI 18.1, 21.4) reported no LTPA, whereas 47.2 percent (95 % CI 44.6, 49.6) of those who had not finished high school reported no LTPA. In addition, 21.2 percent (95 % CI 18.5, 23.8) of White women with an income of $50,000 or more reported no LTPA while 42.9 percent (95 % CI 40.6, 45.3) of those with an annual family income less than $10,000 reported no LTPA.

Physical activity among Thai women. The prevalence of inactivity among Thai women is similar to other countries. Although Thailand's government encourages people aged six and older to participate in 30 minutes of moderate physical activity for at least 3 days per week, only one in five women participate in regular physical activity (National Statistical Office, 2001). In addition, Thai people participating in regular physical activity were more likely to be younger and live in urban areas. Most women prefer to play volleyball and aerobic exercises. Pongma (1999) reported that 45 percent of female teachers aged 40-60 did not exercise regularly. Consunsi (2000) found that less than 30 percent of women aged 45-59 who attended a menopausal clinic exercised 20 minutes, 3 times a week. Further, Sriaka (2000) found that of 331 female nurses working in a hospital, 82.78 percent reported that they performed LTPA but only 2.72 percent reported participation in moderate-intensity physical activity 20-60 minutes for 3-5 days per week. Brisk walking was the most commonly reported physical activity (39.42%), followed by jogging (38.69%), calisthenics (34.31%), bicycling (33.58%), and aerobic dancing (28.10%). Dasa (2001) also found that 4.55% of female faculty members, aged 20-60 working in a University in Thailand reported participating in moderate LTPA for 20-60 minutes for 3-5 days per week.

According to National Statistical Office (2002), Thai people spend most free time on passive activity. The National Statistical Office reported that Thai people have free time 3.8 hours per day and use 3 hours for watching television and videos and listening to music. Women with higher education levels are less active in free time than those with lower education. In addition, the survey indicated that women aged

25-59 spent almost 6 hours per day on housework and care giving responsibilities which are two times more than men.

Physical activity and Thai women's health. The important leading causes of death among Thai women are CVD, cancer, infectious diseases, and diabetes (MOPH, 2000). In 1998, 99.6 per 100,000 women died from CVD. Women aged 30-39 were five times more likely to die of CVD than women under 30 years of age. This trend increases to eighteen times in women aged 40-49 and almost one thousand times in women aged over 70. According to Chuprapawan (2000), two thirds of women with hypertension are working and most live in low income areas. The second most important cause of death among Thai women is cancer with liver, cervical, and lung cancer leading the list. Approximately 38 per 100,000 women died from cancer and with the prevalence increasing with age. Diabetes has become one of the most daunting challenges to public health in Thailand. The death rate due to diabetes is double for women. That is 38.3 per 100,000 of women and 19.6 per 100,000 men died from diabetes in 1998.

In 2002, the MOPH revealed that in 1999 AIDS was the leading cause of disability adjusted life years lost (DALY) followed by CVD, diabetes, and depression (i.e. 10, 7, 7, and 4 percent respectively) among Thai women. Although depression was the fourth leading DALY for Thai women, this is not the case for men. Other health problems among Thai women include obesity and malaise (National Health Policy Committee, 2001). Women aged 40-49 have the highest prevalence of obesity. Back pain is the most common health problem for middle-aged women followed by osteoarthritis and peptic ulcer.

Osteoporosis also is a health problem associated with inactivity among Thai women. Limpaphayom et al. (2001) found that the prevalence of osteoporosis in women increased with age and more after menopause. For women ranging in age from 40-80 years the age-adjusted prevalence of osteoporosis was 19.8% and 13.6% for lumbar spine and femoral neck, respectively. The prevalence of this disease among women less than 50 years of age was less than 5% whereas after the age of 70, it was 50%, markedly increasing after the age of 55 years. In addition, women in rural areas had a 1-5% lower of prevalence rate than those living in urban areas.

Correlates of Leisure-Time Physical Activity in Women

To promote physical activity for health in women, it is necessary to understand the cognitive constructs that are related to participation in LTPA. The following section will present the conceptualization of the model constructs selected for this study and review of relevant literature. The constructs are interpersonal influences, perceived barriers, perceived benefits, and perceived self-efficacy.

Interpersonal Influences and Leisure-Time Physical Activity

Interpersonal influences refer to "cognitions concerning the behaviors, beliefs, or attitudes of others" including social support, social norms, and modeling (Pender et al., 2002, p. 72). The extent to which beliefs and behaviors of women rely on social expectations and social controls may vary by culture. Evidence has shown that interpersonal influences or social influences play an important role in engaging and continuing participation in LTPA among adults, especially women (Sallis, Hovell and Hofstetter, 1992; Duncan et al., 1993). These social environments affect women's cognitions and behavior in a variety of ways, which are discussed below.

Social Support. Vaux (1988) portrayed social support as the "wind beneath a bird's wings which is an essential part of our flight" (p. 28). Social support refers to perceived availability of psychological and instrumental resources which has been shown to be a cause of psychological and physical well-being (Cohen & Wills, 1985). As explained by Cohen and Wills, social support influences health through the *main-effect process* and the *buffering process*. The main-effect process refers to social network support which protects against negative psychological states and protects and maintains well-being. However, social networks may not always fulfill the individuals' needs. The buffering mechanism occurs when individuals feel stress. If people fail to cope with the situation, they may feel helpless and experience low self-esteem. Perceived adequate support will reduce stress reactions by increasing one's confidence to cope with the stressful event, by solving the problem, by weakening the importance of the problem, or by reducing physiological response to the stress.

Social support consists of esteem support, informational support, social companionship and instrumental support (Cohen & Wills, 1985). Esteem support or emotional support is promoting one's worth by encouragement. Informational support or appraisal support is giving guidance and helping to cope with the problem. Social

companionship relates to including friends in performing activities such as walking or exercising. This support reduces stress by increasing sense of belonging, relieving anxiety from a problem and promoting a positive mood. Instrumental support or tangible support (e.g. money, equipment and services) decreases stress directly by facilitating conveniences or solving the problem. In sum, social support works as a stress buffer as well as health maintenance. For some people, initiating a new behavior, such as participation in LTPA, causes stress. Support from others can help relieve this stress but can also provide access to information, money for transportation, motivation to engage in physical activity, positive feedback, and verbal encouragement or reinforcement for continuing physical activity.

Factors related to social support include gender, personality traits (Cohen & Wills, 1985), and culture (Pender et al., 2002). Women and men are different in their needs for support. Cohen and Wills concluded from several studies that women prefer talking with close friends about their feelings and problems while men prefer friendship and achievement in activities. Culture or social milieus may influence the need of support. Personality traits such as sociability and competence are also associated with support. People with many friends or networks are more likely to perceive more support (Cohen & Wills, 1985). In short, effective social support is that which is perceived as adequate and suitable for individuals' needs in a particular context.

Social support greatly affects the physical activity of adults. Evidence has shown the more individuals perceive social support for doing physical activity, the greater the behavior performed (Sallis et al., 1989; Sallis, Hovell, Hofstetter & Barrington, 1992; Duncan et al., 1993). For example, Sallis and colleagues (1989) indicated that friend support was an important predictor of vigorous physical activity (e.g. jogging, aerobic dance) in men younger than 50 and women older than 50 years of age ($\beta = .16$, $p < .000$; $\beta = .14$, $p < .03$, respectively). Duncan and coworkers (1993) found that formerly sedentary adults who reported more support from instructors and friends adhered to a 5-month brisk walking and jogging program than did those with less support.

Women, however, are more sensitive to social influences related to physical activity than men. For instance, Sallis, Hovell and Hofstetter (1992) examined

predictors of adoption and maintenance of vigorous physical activity in men and women over a 24-month period. A random sample of residents between 18 to 90 years of age (mean age, 50.3 years) in San Diego, California completed questionnaires. Vigorous physical activity was defined as physical exercise in free time for at least 20 minutes, which is hard enough to make heart rate and breathing increase a large amount. Social support including support from family and friends, self-efficacy, perceived barriers, perceived benefits, modeling and other variables were assessed. The results showed that, education, self- efficacy, modeling and support from family and friends had significant effects on vigorous physical activity in women while self-efficacy, age, neighborhood and environment were related to men's physical activity.

Women and men may require differing types of support for physical activity. For example, Duncan et al. (1993) have shown the role of social support by gender. They conducted a 5-month brisk walking or jogging program to explore the association between gender-specific provisions of social relations with exercise adherence among sedentary adults. Social support was comprised of six social provisions: attachment or emotional support; social integration or network support; reassurance of worth or esteem support; reliable alliance or tangible aid; guidance or informational support; and opportunity for nurturance measured by the Social Provisions Scale. The study revealed that nonadherers perceived less support than did adherers. Men and women were influenced by different types of support. For women, five of six social provisions (except tangible aid) were significantly associated with exercise adherence whereas only social integration was related with the program adherence in men ($p < .05$). In addition, previous studies showed that performing physical activity with a friend or a partner was more important for women than men (Ball, Bauman, Leslie & Owen, 2001; De Bourdeaudhuij & Sallis, 2002; Nies et al., 1998).

The role of social support on women's physical activity is clearer when studies include housework, occupational activity and LTPA. Social support is positively associated with physical activity such as sports and exercise rather than chores. For example, Sternfeld et al. (1999) investigated the associations between psychosocial factors (i.e. social support, self-efficacy and perceived barriers), demographic data (i.e. age, body mass index) and types of physical activity (i.e. sports

and exercise, active living, household/care giving and occupation) among 2,636 women aged 20-65 years. The Kaiser Physical Activity Survey adapted from Baecke, Burema & Fritjers's instrument (1982) was used to measure physical activity, social support, self-efficacy and perceived barriers. The study revealed that social support was associated only with sports and exercise participation. Women with high perceived social support for physical activity were three times more likely to participate in sports and exercise than those with low social support (OR = 3.05, 95 % CI 2.51, 3.69) while it was not the case for housework, care giving, and occupation.

The need of support for physical activity is dynamic. Some studies showed that social support is more important in the early stages of physical activity participation (Sallis, Hovell & Hofstetter, 1992) while many studies emphasized that support from significant others was related with both adoption and maintenance stage (Oka et al., 1995; Litt, Kleppinger and Judge, 2002). For instance, Sallis and coworkers (1992) found that social support was more important in the initial adoption stage of vigorous physical activity. The role of social support may decrease during the maintenance phase when the activities are performed due to habit. Oka et al. (1995) proposed that support from exercise leaders was important in the first 6 months of an exercise program but in the second 6-month period, support from family, friend and staff were more important predictors of exercise adherence. Litt and colleagues (2002) examined the role of social support and self-efficacy on exercise adherence among older women. The participants were asked to perform a home-based exercise program including upper or lower body exercises and weight-resistance exercise 3 times each week at home, attending an exercise class 1-2 times per month, and walking 3 times per week for 12 months. The study revealed that social support and readiness for exercise were the best predictors of exercise adherence in the first 3 months. At 12 months, social support was still the best predictor followed by self-efficacy and level of readiness to exercise.

The primary sources of social support in women are spouses, family, and friends (Eyler et al., 2002, Nies, Vollman & Cook, 1998, 1999; Dishman, Sallis & Orenstein, 1985; Sallis et al., 1989). Professional support or supports from health care providers such as physicians and nurses also have an effect on physical activity in women. A study (Booth, Bauman, Owen & Gore, 1997) examined the sources of

support or assistance among Australians aged 18 to 78 years, and found that people would prefer to become more active. The study further revealed that the most preferred sources for both men and women was advice regarding appropriate activities from doctors or other health professionals. Interestingly, this preference increased with age. Similarly, Lee (1993a) has stated that women need recommendations from their physicians regarding whether they should exercise or what are appropriate physical activities. Middle-aged European American women need support from a health professional to encourage them to be active and to motivate them to start exercising; they also need encouragement to continue the exercise (Nies et al., 1998).

In short, it can be seen that social support is an important predictor of women's LTPA both in the adoption and maintenance stages. The primary source of women's support is spouse, family, friends and health care providers. Social support including providing information, guidance, reinforcement, positive feedback, encouragement, aid, and important people to the individual may facilitate Thai women's LTPA.

Social Norms. Social norms is another type of interpersonal influence that shape women's behavior (Pender et al., 2002). According to Baron and Byrne (1991), the social environment influences individuals' perceptions, attitudes and behaviors. Wilson, Lisle, Kraft & Wetzel (1989) explain that social norms or cultural norms dictate how people expect to feel or act in different situations. When individuals hold an expectation about how they will react to a situation, these expectations shape both their cognitions and their subsequent affect. According to Bandura (1997), social norms serve as a source of perceived self-efficacy. People behave in ways that make them satisfied and they avoid performing in ways that are against social standards because they may be criticized (Bandura, 1997). Social norms related to LTPA refer to individuals' perceptions regarding the extent to which significant others and/or society expect them to engage or participate in LTPA.

The perception that other persons think women should perform or should not perform LTPA affects women's physical activity. Studies have found that cultural and gender roles influence women's LTPA in some societies (Eyler et al., 1998; Tortolero et al., 1999). A qualitative study showed that Chinese, Hispanic and Filipino women perceived women are active enough during the day because they have many

responsibilities such as caregiving and household chores (Eyler et al., 1998). These women perceived that they should not waste time in performing jogging or aerobic dancing like “most Americans” (Eyler et al., 1998, p. 644). Tortolero and colleagues (1999) conducted focus groups among African American and Hispanic women aged 35-75 living in Houston, Texas. They found that women viewed sports and exercise as activities for males and children and that women should not have leisure time. They reported participating in sport or recreation activities as part of playing with their children or socializing. Moreover, some women related leisure time to “being lazy” and “the most disgusting time” (Tortolero et al., 1999, p. 138). The women indicated feeling guilty if they had leisure time. Hoebeke (2002) found that low-income women, particularly African American women and Latina women did not have prior experience with exercise because of cultural influences. They have been taught to work hard performing housework and have taught their children the same values.

Whereas social norms may impede engaging in physical activity, they may also promote women to participate in exercise or physical activity. For instance, American Indian women who routinely walk in the morning stated that it was a cultural expectation to walk in the morning before praying (Henderson & Ainsworth, 2000).

Social norms are significantly related to physical activity, such as walking for exercise in Latino adults (Hovell, Sallis, Hofstetter, Barrington, Hackley, Elder, Castro & Kilbourne, 1991), African American and American Indian women (Henderson & Ainsworth, 2000), but the relationship is not consistent in Caucasian populations (Sallis, Hovell & Hofstetter, 1992) or young adults (Dzewaltowski, Noble & Shaw, 1990). It is possible that social norms play a direct role in physical activity in particular societies, gender or behaviors (Dzewaltowski et al., 1990), as well as indirectly through intention (Pender & Pender, 1986), outcome expectations, and self-efficacy (Yordy & Lent, (1993). Yet, few studies investigated this relationship, particularly among women with close-knit networks such as in the Thai society.

In summary, cultural or gender roles may inhibit or facilitate women’s physical activity participation. Some women may be insufficiently active due to a perception that they should not perform activities such as sports, aerobic dance or have recreational time. Social norms may affect LTPA in middle-aged Thai women.

Modeling. Modeling refers to a "vicarious experience through observing others engaged in a particular behavior" (Pender et al., 2002, p. 72). According to Bandura (1997), individuals often compare themselves to particular persons in similar situations. They motivate themselves that if others can do it, they can also perform the activity. Moreover, seeing others perform an activity with a positive consequence may stimulate individuals to do the activity. Modeling serves as an effective tool to enhance self-efficacy.

Evidence supports that seeing others perform regular physical activity is significantly related to level of physical activity among adults (Sallis et al., 1989; Hofstetter et al., 1990; Hovell et al., 1991; Sallis, Hovell & Hofstetter, 1992) particularly in women (De Bourdeaudhuij & Sallis, 2002; King et al., 2000). The greater the frequency of observing others exercise, the more the physical activities were performed. Sallis and associates (1989) investigated the relationship between social learning theory variables (i.e. self-efficacy, modeling, and social support) and self-reported vigorous exercise among 1,789 adults in San Diego, California. The results indicated that self-efficacy was strongly related to exercise followed by modeling and social support. However, when genders were compared, some studies showed that modeling affects women's physical activity more than men's. For example, De Bourdeaudhuij and Sallis (2002) reported that seeing significant others participate in physical activity was significantly associated with Belgium women's LTPA while this was not the case in men. Also, King et al. explored factors influencing physical activity among 2,912 U.S. women 40 years of age and older. Physical activity was defined as sports, exercise, recreational and others activities such as walking and gardening engaged in the past two weeks. They found that the women who frequently see others exercise are more likely to be active (OR = 1.26, 95 % CI 1.06, 1.50).

The role of modeling in women may vary with age and society. Younger women are more likely to be influenced by modeling than older women. Sallis et al. (1989) found that for women, modeling is more important among younger groups (ages 18-49 years) than among the older (over 49 years). Similarly, De Bourdeaudhuij and Sallis (2002) reported that seeing the significant others participate in LTPA was significantly associated with LTPA in women ages 16-45. King et al. (2000) found

that among racial-ethnic women -White, African American, Hispanic and American Indian-Alaskan Native, the effects of modeling on physical activity can be seen clearest in African American women. Namely, African American women who reported more frequently seeing others exercise were most likely to be active (OR = 2.08, 95% CI 1.45, 2.98) while this was not the case in White women (OR = 0.95, 95% CI 0.65, 1.37).

In conclusion, research evidence indicates that interpersonal influences are a significant factor contributing to LTPA among middle-aged women. Less is known among Thai women. The characteristics of Thai society include close-knit networks and respect for elders. Moreover, Thai women have less education and fewer opportunities for social and economic participation compared to their counterparts in some developed countries (UNDP Human Development Report, 1999). The studies reported above; while helpful to guide research, do not generalize to the Thai population. Therefore, how the social interactions within the network and gender-related roles affect the cognition and behavior regarding LTPA of Thai women needs to be investigated.

Perceived Barriers and Leisure-Time Physical activity

According to the HPM (Pender et al., 2002), perceived barriers are defined as perceptions concerning the expense, unavailability, inconvenience, difficulty, or time-consuming nature of a particular action which may be imagined or true. Individuals will not accomplish an action if it is perceived to be too difficult or is not satisfying. An action is less likely to occur when readiness to act is low and barriers are high. Bock and colleagues (2001) found that middle-aged adults who met the CDC-ACSM criteria of physical activity had lower perceived barriers than those who did not meet the criteria. Barriers to participation in physical activity vary based on factors such as gender (Booth et al., 1997), age (Booth et al., 1997; De Bourdeaudhuij & Sallis, 2002), and types or domains of physical activity (Sternfeld et al., 1999).

Regardless of whether the barriers are accurate or not, several studies have shown that perceived barriers greatly affect women's LTPA (Sallis et al., 1989; Eyler et al., 2002). Women's barriers to engaging or participating in LTPA can be personal or environmental (Sechrist et al., 1987; King et al., 2000; Salmon, Owen, Crawford, Bauman & Sallis, 2003).

Personal barriers. Personal barriers refer to perceptions of obstacles which are created within the person including time constraints, lack of motivation, lack of support or encouragement, negative consequences, and health problems. The most frequently mentioned barrier for women is lack of time (King et al., 2000; Booth et al., 1997). Time constraints may be due to family or occupational responsibilities. King and coworkers (2000) examined women's barriers to performing LTPA such as jogging, swimming, and dancing. Overwhelmingly, the most frequent obstacle reported by 2,912 U.S. women was lack of time, which is similar to Australian (Booth et al., 1997), Canadian (Yoshida, Allison & Osborn, 1988), European Union (e.g. Austria, Belgium, and Denmark) (Zunft et al., 1999), and Thai women (Jullason, 2000). Qualitative studies have explained that because of the various roles that women assume (i.e. spousal, maternal, occupational and main caregiver roles) women have less time than men to engage in LTPA (Nies et al., 1998, 1999; Eyler et al., 1998).

Lack of motivation or lack of interest is a barrier frequently cited by women (Sternfeld et al., 1999; Booth et al., 1997). Booth et al. (1997) found that approximately 33 % of inactive Australian women 18-78 years of age cited the primary barrier to participation in LTPA was lack of motivation. Less active women were more likely to consider other health-related behaviors, such as a healthy diet, adequate rest or refraining from smoking to be more important for their health than physical activity (Lee, 1993b). Some inactive Thai women may not have sufficient knowledge of the importance of physical activity, nor realize the negative consequences of being inactive.

Lack of support or encouragement related to LTPA from significant others such as spouse, family, friends, health professionals, and exercise leaders are reported most often by women (Nies et al., 1998; Ball, Bauman, Leslie & Owen, 2001; Jaffee, Lutter, Rex, Hawkes & Bucaccio, 1999). For instance, African American women aged 35-50 stressed that the major barriers to participate in LTPA were lack of child care and no company (Nies et al., 1998). Also, Ball et al. (2001) examined factors that influenced walking for exercise in Australian adults. The investigators indicated that the respondents who reported there was no one to walk with were 31 % less likely to walk. Compared to men, women are 21% more likely to walk if they have someone to walk with (OR = 1.21, 95%, CI 1.05, 1.40). In addition, Jaffee and colleagues (1999)

investigated perceived barriers to being physically active among 1,406 working women ages 35 years and older (mean age, 44.8 years). They found that lack of encouragement from significant others was an important barrier for women who were thinking about starting LTPA while it was not the case among those who were currently active (16.1%, 3-5%, respectively).

Physical problems including lack of energy, being too tired, fatigue, being too old, and health problems are commonly stated by women as hindrances to performing LTPA (King et al., 2000; Zunft et al., 1999; Juarbe, Turok & Perez-Stable, 2002). King (2000) reported that women aged 40 and over who frequently reported the following physical problems-- lack of energy, too tired, and not in good health-- were more likely to be sedentary (OR = .90, 95 % CI .84, .97; OR = .92, 95 % CI .85, .99; OR = .93, 95 % CI .86, .99, respectively). Women portrayed themselves as being too tired due to occupational and household work and preferred to rest when they completed their tasks (Eyler et al., 1998; Consunsi, 2000). In addition, some women indicated that fear of injury and perceived that they were too old to be active (King et al., 2000; Zunft et al., 1999; Booth et al., 1997). Health problems including arthritis, back injuries, leg problems, asthma, heart disease, hypertension, cancer diagnosis, diabetes complications, and depression were cited by women as barriers to performing regular physical activity (Eyler et al., 1998; Juarbe et al., 2002).

Lack of skill, lack of knowledge of how to perform LTPA, lack of self-discipline, and inadequate time management are barriers to being physically active in some women who want to be active but perceived they cannot adopt or maintain physical activity (Nies et al., 1998; Lindgren & Bengt, 1999). Women who dropped out of an exercise program frequently reported the activity to be boring, not enjoyable or satisfying (Johnson, Corrigan, Dubbert & Gramling, 1990; Booth et al., 1997) as well as negative consequences such as discomfort, sweating, and pain (Eyler et at., 2002). Feeling inferior (Lindgren & Fridlund, 1999), shy or embarrassed (Booth et al., 1997; Jaffee et al., 1999) and self-conscious about physical appearance (King et al., 2000) were also reported. For instance, an inactive Swedish woman aged 20-36 felt uncomfortable exercising in an aerobic club because she thought others were perfect; she wanted “to go to a more normal place where there are more normal people” (Lindgren & Bengt, 1999). Lee (1993b) reported that 34 percent of middle-aged

Australian women agreed that "I'd look silly in exercise clothes" (p. 478). Similarly, Jaffee and coworkers (1999) found that women aged over 35 (mean age = 44.8 years) living in Minnesota who were not currently active lacked confidence to exercise in front of others.

The perception that women should not perform sport, exercise or recreational activities may also hinder women from being active (Booth et al., 1997; Zunft, et al., 1999; Tortolero et al., 1999). For example, studies showed that "not being the sporty type" was a barrier to increasing level of physical activity among European Union (Zunft et al., 1999) and Australian women (Booth et al., 1997). Minority women in Houston, Texas felt guilty for taking time out for themselves and perceived sports as a male-oriented activity (Tortolero et al., 1999, pp. 137-138).

Environmental barriers. Another type of barrier to performing LTPA among women are environmental barriers, which refer to perceptions of barriers which are outside of the person, and include lack of facilities or equipment, cost, unsafe environment, inconvenience, and bad weather.

Lack of facilities or equipment is the most common environmental barrier for not engaging or maintaining LTPA in all populations, including American (Juarbe et al., 2002; Nies et al., 1999), Australian (Booth et al., 1997), and European Union women (Zunft et al., 1999). For example, in a study (Juarbe et al., 2002), Latina women reported that there was no place near their homes to participate in LTPA easily, and indicated that their homes were too small to perform physical activity. Also, African Americans perceived lack of space and equipment in the home as a barrier to performing aerobic exercise (Nies et al., 1999). Some women reported the presence of equipment and space for performing physical activity in their work place but were not allowed to use them (Nies et al., 1999). Eyler et al. (1998) revealed that some minority women in California and Missouri mentioned that they did not know of programs in their communities, and when they did know, they did not understand how to access the programs. Additionally, the women needed programs which were appropriate to their culture and age so that they could feel more comfortable.

Unsafe and unattractive surroundings are also barriers to being active (King et al., 2000; Ball et al., 2001; Eyler et al., 1998). King and coworkers (2000) explored the relationships between environmental barriers and physical activity among U.S.

women. The environmental factors refer to neighborhood characteristics such as feeling safe walking, jogging, enjoyable scenery and the presence of street lights. Women who reported higher perceived environmental barriers were more likely to be inactive. The lower the rating of the convenience factors, the lower the physical activity reported. Studies reveal that women want to walk for exercise after work but the streets or parks would become dark before they reached home (Nies et al., 1998; Eyler et al., 1998; Henderson & Ainsworth, 2000).

Cost is also a factor in hindering women from increasing their physical activity (Zunft et al., 1999; Booth et al., 1997). Commercial gyms and fitness centers require high membership costs and classes which many women cannot afford. However, although expense was mentioned as an obstacle for women not currently physically active or thinking about starting, it was not important for women who exercised regularly or did not intend to become active (Jaffee et al., 1999; Johnson et al., 1990).

Bad weather is also perceived by some women as a barrier (King et al., 2000; Nies et al., 1998). Salmon et al. (2003) investigated the associations of LTPA and sedentary behavior among 1,332 Australian adults. They found that the respondents who reported bad weather as a barrier were more likely to be sedentary (OR = 1.5, 95 % CI 1.1, 1.9).

In short, perceived barriers to performing LTPA greatly affect level of physical activity. Understanding what barriers middle-aged Thai women perceive to engaging in LTPA, as well as how to decrease these perceptions is essential; therefore, perceived barriers is included in the proposed model as an important construct.

Perceived Benefits and Leisure-Time Physical Activity

According to the HPM (Pender, et al., 2002), perceived benefits refer to "mental representations of positive or reinforcing consequences of a behavior" (p. 70). As Bandura explains (1997), an outcome is the consequence of an action which includes positive expectations or incentives and negative expectations or disincentives. The outcomes can be physical, social, and self-evaluative. Positive physical outcomes include health benefits, pleasant sensory experiences, or physical pleasures whereas negative physical outcomes are physical discomforts, unpleasant sensory experiences, or pain. Positive social outcomes include favorable social reactions (e.g. monetary

reward, social recognition) and power, while negative social outcomes are unfavorable social reactions. The last outcome includes a positive and negative self-evaluative reaction to one's own action. Self-satisfaction is a positive outcome, while self-criticism is a negative outcome that these outcomes are more important than tangible rewards (Bandura, 1997).

It is proposed that perceived benefits or positive outcome expectations influence behavior through perceived self-efficacy. Although the benefits of physical activity may be valued, individuals may remain sedentary if they do not believe that they can perform the activities. Perceptions of benefits for performing a behavior may be a result of the consequences of previous direct experience or vicarious experience through seeing others perform the behavior (Bandura, 1977) as well as from significant others' influences. Benefits from performance of physical activity among women can be classified as physiological benefits and psychosocial benefits.

Physiological benefits. Perceived physiological benefits include life improvement, physical performance, and preventive health (Sechrist et al., 1987). Health benefits are frequently mentioned by women and include cardiovascular functioning (Jaffee et al., 1999), maintenance of normal cholesterol levels, heart attack prevention, high blood pressure prevention (Juarbe et al., 2002), improvement in muscle tone (Jones & Nies, 1996), prevent of stiff joints (Walcott-McQuigg & Prohaska, 2001), looking younger, and longevity (Jaffee et al., 1999). For Latina women, aged 40-79 (mean age, 55 years), 91 percent stated that they performed regular physical activity for health benefits including overall physical health improvement, disease prevention, and mental health enhancement (Juarbe, Turok & Perez-Stable, 2002).

Women reported improved physiological functioning including improved sleep, walking better, and feeling more energetic (Sechrist et al., 1987; Walcott-McQuigg & Prohaska, 2001). Some women experience enhanced work performance. For example, Latina women reported that they "exercise to improve my health and for my children" and "when I exercise, I have more energy to do my work" (pp. 881-882). In addition, being active improved their roles as mothers, spouses, or family members (Juarbe et al., 2002).

Weight reduction or weight control also is a common stated benefit, especially by younger women (Nies et al., 1998; 1999; Zunft, et al., 1999; Jaffee et al., 1999; Cash et al., 1994). Cash and colleagues found that appearance/weight management including improved body shape and appearance was the strongest motivator for being regularly physically active ($p < .001$) among women aged 18-52 (mean age, 24.6 years).

Psychosocial benefits. Psychosocial benefits of physical activity, including psychological outlook and social integration have been shown to be significantly related to women's physical activity (Sechrist et al., 1987).

Studies have found that a perceived benefit for women was enjoyment (Jones & Nies, 1996; Jaffee et al., 1999; Lindgren & Fridlund, 1999). Swedish women aged 20-36 emphasized that enjoyment was the most important reason for performing LTPA (Lindgren & Fridlund, 1999). Factors including beauty, peace, and quiet environment, fresh air, talking with someone during performing LTPA, and beautiful music were associated with LTPA among women (Eyler et al., 1998; Henderson & Ainsworth, 2000; Nies et al., 1989).

Feeling better or spiritual well-being (Juffee et al., 1999), stress and tension reduction (Jones & Nies, 1996), body image, self-confidence, and self-esteem improvement (Nies et al., 1998; 1999; Jaffee et al., 1999), and increasing sense of accomplishment (Sechrist et al., 1987) also are perceived benefits of regular physical activity. A Latina women mentioned that a benefit of performing regular physical activity was reducing stress at work and she said “I feel mentally and physically good when I exercise” and “My mind feels clear, and I use this time to pray and meditate; it gives me a great start to my day” (Juarbe et al., 2002, p. 881).

Social interactions are also perceived benefits for regular physical activity, such as meeting people and having contact with friends (Sechrist et al., 1987; Cash et al., 1994). Cash et al. (1994) found that 101 exercising women ranging in age from 18 to 52 years reported socializing (including meeting new people, socializing with friends, and doing what is socially expected) as a perceived benefit.

Women who are not regularly active or never participate in LTPA report fewer perceived benefits when compared to women who are currently active which this may be the result of little direct experience (Lee, 1993; Bock et al., 2001).

Perceived psychosocial benefits appear to predict women's physical activity more than perceived physiological benefits (Lee, 1993; Jones & Nies, 1996; Jaffee, et al. 1999). For example, Lee (1993) revealed that active Australian women ages 50-64 years had significantly more perceived psychological benefits than those who did not intend to be active ($p = .036$). Jones & Nies (1996) showed that stress and tension reduction, enjoyment, and mental health improvement were the top three psychosocial benefits cited by women aged 60-90. Jaffee and colleagues (1999) reported the greatest predictors of physical activity among 1,406 working women were having fun and enjoyment. Similar to enjoyment, enhanced spiritual well-being and increased self-esteem were also different across the women who were active and inactive. It may be possible to infer that women continue with a regular exercise program because they receive psychosocial benefits such as enjoyment, psychological well-being, self-esteem, and social interaction which occur more quickly and can be seen easier than physiological benefits such as cardiovascular function and longevity which take a long time to get and measure (Dzewaltowski, Noble & Shaw, 1990).

In short, women who perceive physical activity to be beneficial are more likely to be active. Perceived benefits, therefore, is included in the model to explore determinants of LTPA among middle-aged Thai women.

Perceived Self-Efficacy and Leisure-Time Physical Activity

Perceived self-efficacy, a central construct in the HPM (Pender, 2002), refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). According to Bandura (1997), the beliefs of humans are the most powerful influence on individuals' emotion, motivation and action. The behavior may not be performed if the individual is not assured of his/or her capability to handle the situation.

As Bandura explains (1997), major sources of self-efficacy include enactive mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. Enactive mastery experiences are the most influential source of efficacy information. Successes strengthen one's belief in efficacy whereas failures weaken it, particularly when it occurs prior to the efficacy belief becoming strong enough. Individuals also observe others' behaviors as well as their consequences as a vicarious experience, known as modeling. Moreover, verbal persuasion or positive

feedback can strengthen efficacy beliefs. The last source of efficacy information is physiological and affective states such as fatigue, pain, stress or enjoyment which affect perceived self-efficacy through cognitive processing. Positive mood or physiological states enhance one's efficacy while anxiety or discomfort decreases level of efficacy.

Empirical studies have revealed that perceived self-efficacy is consistently an important predictor of physical activity level in all populations (Sallis et al., 1986, 1989; Sallis, Hovell & Hofstetter, 1992; McAuley, 1992, 1993). The more perceived self-efficacy people report, the more regularly they perform physical activity. In a study of 2,053 adults ages 20-74 years, Sallis et al. (1989) showed that perceived self-efficacy was the variable most highly correlated with vigorous LTPA ($r = .48$, $p < .05$). Also, in a 2-year follow up of the same study, Sallis and colleagues (1992) found that perceived self-efficacy was strongly predictive of adoption of vigorous LTPA in both women and men ($p < .04$, $p < .001$, respectively). The results also showed that if perceived self-efficacy increased, the physical activity increased.

McAuley (1993) revealed that perceived self-efficacy was a significant predictor of physical activity in middle-aged adults. Physical activity referred to the extent and regularity of LTPA such as jogging and biking for the past 4 months. The results indicated that perceived self-efficacy was significantly associated with regular physical activity and energy expenditure ($r =. 52$ and .47, respectively, $p < .05$). Bock, Marcus and Pinto (2001) found that adults who met the CDC-ACSM criteria (reported at least 5 days of moderate- intense physical activity per week for at least 30 minutes each time, or at least 3 days of vigorous exercise per week for at least 20 minutes each time) had significantly higher perceived self-efficacy than those who did not achieve the criteria ($p < .001$).

Hovell et al. (1991) investigated the relationships between social learning variables such as perceived self-efficacy, social support, and modeling and physical activity among 127 Latino adults (women = 38%), averaging 43.3 years of age. Physical activity was classified as vigorous LTPA and walking for exercise. The study showed that perceived self-efficacy was the strongest variable associated with vigorous LTPA and walking ($r = .50$ and .31, respectively, $p < .05$) and produced the largest standardized coefficient for vigorous LTPA ($\beta = .32$, $p < .001$). It was also

found that perceived self-efficacy, friend support, and family support were not significantly related to gender, age, education, and income.

Perceived self-efficacy for physical activity has been found to have a significant positive relationship to stage of physical activity. For instance, Marcus, Selby, Niaura & Rossi (1992) had 1,063 government employees (mean age 41.1 years) completed a questionnaire using stage-of-change and exercise self-efficacy measure. The study revealed self-efficacy scores were significantly related to stage in the behavior change process ($F [3,861] = 85.93$, $p < .001$). Subjects in the maintenance stage (regularly physically active, 20 minutes at least 3 times per week, for at least 6 months) had the highest self-efficacy scores, while those in the precontemplation stage (not currently exercising and do not intend to start exercising in the next 6 months) had the lowest scores.

Sternfeld et al. (1999) revealed that women between the ages of 20-65 years with high perceived self-efficacy were 4 times more likely to report a high level of participation in LTPA such as sports and exercise (OR = 3.96, 95% CI 2.92, 5.38). Also, women with higher self-efficacy for exercise adherence continued in weight-resistance exercise program over 12 months (Sternfeld et al., 1999). Litt and colleagues (2002) found that older women with higher self-efficacy better maintained their level of exercise for a year while those with lower self-efficacy decreased exercise frequency by the end of the program.

In sum, perceived self-efficacy has been shown as the most powerful predictor of physical activity so it is included as a core construct in the proposed model.

Relationships among Correlates and Leisure-Time Physical Activity

Relationships among the selected constructs and LTPA are not well understood because results of existing studies are inconsistent varying across types of physical activity and populations. Among the Thai population, few physical activity studies have been conducted and very few focus on middle-aged women. Literature related to interrelationships among the selected variables is presented next.

In a study by Hofstetter et al. (1990), interpersonal influences, perceived barriers, and perceived benefits were found to be the proximal variables explaining the

greatest proportion of variation in perceived self-efficacy. Hofstetter et al. (1990) examined the relationships between perceived self-efficacy for physical activity and independent variables including social support, normative beliefs, modeling, exercise knowledge, perceived barriers, perceived benefits and other variables (e.g. smoking behavior, exercise injury, age, and education) among 2,053 adults between the ages of 20 and 74. The participants completed instruments based on Social Cognitive Theory. Physical activity was classified as sports or recreational physical activity performed in school and current participation in LTPA. The study showed that among the variables, perceived barriers, perceived benefits, social norms, modeling, and social support (proximal variables) explained the greatest variance in perceived self-efficacy ($p < .001$). These proximal variables had direct effects on perceived self-efficacy rather than indirect effects. Perceived barriers had the largest direct effect on perceived self-efficacy and accounted for 77% of the total effect. Perceived benefits, exercise knowledge, and normative beliefs had direct effects on perceived self-efficacy and accounted for 63% of the total effect.

Duncan & McAuley (1993) investigated the roles of social support and self-efficacy on a 5-month brisk walking program among sedentary males (N = 41) and females (N = 44) between 45-64 years of age (mean age, 53.98 years). Social support was measured with the Social Provisions Scale (Russell & Cutrona, 1987). Perceived self-efficacy was measured with two scales: the Exercise Self-efficacy Scale (Bandura, 1977) and Barriers Self-efficacy Scale (McAuley et al., 1990). Latent growth modeling techniques were employed. The results showed that social support significantly affected physical activity indirectly through self-efficacy ($\beta = .417$, $t = 3.492$). Namely, the direct effect of social support on the physical activity was nonsignificant ($\beta = .281$, $t = 1.537$) while social support was significantly associated with perceived self-efficacy ($\beta = .716$, $t = 3.035$) and perceived self-efficacy was significantly related to physical activity ($\beta = .582$, $t = 2.553$).

Resnick et al. (2002) found that social support indirectly influenced exercise via perceived self-efficacy among 74 older adults (female = 85%) with a mean age of 85.6 years living in a continuing care retirement community. Exercise referred to participation in at least 20 minutes of regular aerobic or resistive exercise three times per week. The Self-efficacy for Exercise Scale (Resnick & Jenkins, 2000), Social

Support for Exercise Habits Scale (Sallis et al., 1987), and the Outcome Expectations for Exercise Scale (Resnick et al., 2000) were used. The outcome expectations referred to the perceptions of benefits for exercise. The results indicated that 57 % of the older adults reported regular exercise. Bivariate correlations between model variables showed that support from friends was significantly correlated with exercise and perceived self-efficacy ($r = .28, .21$, respectively, $p < .05$) and family support was not significantly related to any variables. There were statistically significant correlations between perceived self-efficacy and perceived benefits and exercise ($r = .70$ and $.66$, respectively, $p < .05$). Path analysis indicated that friends' support indirectly affected exercise through perceived self-efficacy. Namely, friends' support was not significantly related to exercise directly ($\beta = .14$, $p > .05$) but significantly associated with perceived self-efficacy ($\beta = .22$, $p < .05$) and perceived self-efficacy was significantly related to exercise ($\beta = .40$, $p < .05$). The study also showed that perceived benefits was significantly related to perceived self-efficacy ($\beta = .70$, $p < .05$) and exercise ($\beta = .32$, $p < .05$).

In 2003 Resnick & Nigg did not find the direct relationship between perceived self-efficacy and perceived benefits. The purpose of the study was to test the specific components of Social Cognitive Theory and the Transtheoretical Model in explaining exercise behavior among older adults. A sample of 179 older adults (women 75%) average age was 86.1 years (SD = 5.9), living in a continuing care retirement community were interviewed by nursing students. Exercise behavior referred to participation in at least 20 minutes of continuous exercise such as jogging and swimming at least 3 days per week. Perceived self-efficacy was measured with the Self-efficacy for Exercise Scale (Resnick & Jenkins, 2000) and outcome expectations referred to perceived consequences of exercise which were measured with the Outcome Expectations for Exercise Scale (Resnick et al., 2000). The measurement of social support was not included in the article. The study showed that perceived self-efficacy and outcome expectations had a significant direct effect on exercise behavior ($\beta = .50, .15$, respectively, $p < .05$). The exercise behavior was influenced by social support indirectly via perceived self-efficacy ($\beta = .13$, $p < .05$) and outcome expectations ($\beta = .04$, $p > .05$).

Conn (1998) investigated the relationships among perceived self-efficacy, perceived barriers, outcome expectancies or perceived benefits, age, perceived health, previous behavior, and exercise behavior among a nonprobability sample of 147 older adults (women 69%) between 65-100 years of age (mean age 78.53 years). The subjects were recruited from senior centers and other organizations. Exercise was measured with the Health Promoting Lifestyle Profile and the Baecke Physical Activity Scale. Perceived self-efficacy was measured with the Exercise Self-efficacy Scale (McAuley, 1993). Perceived barriers and outcome expectancies were measured with the Exercise Benefits/Barriers Scale (Sechrist et al., 1987). The subjects were interviewed in their home. The study found that perceived self-efficacy had the greatest direct relationship with exercise ($\beta = .35$, $p = .0001$) followed by perceived barriers ($\beta = -.28$, $p = .0001$) and perceived benefits ($\beta = .17$, $p = .02$). Perceived barriers had direct negative effects on perceived self-efficacy ($\beta = -.49$, $p = .0001$) and perceived self-efficacy had a direct positive effect on perceived benefits ($\beta = .50$, $p = .0001$).

Wu and Pender (2002) examined the relationships among interpersonal influences including social support, social norms, and modeling, perceived self-efficacy, perceived barriers, perceived benefits, competing demands, and LTPA among 832 Taiwanese adolescents between 12-15 years of age. The participants were asked to report LTPA (e.g. bicycling and skateboarding) on the Child/Adolescent Activity Log (Garcia, George, Coviak, Antonakos & Pender, 1997) for five days. Social support was measured with a scale adapted from the Child/Adolescent Exercise Social Support Scale (Garcia, Norton, Frenn, Coviak, Pender & Ronis, 1995). Social norms was assessed with the Children's Exercise Social Norms Scale (Garcia et al., 1995) and modeling was assessed with a scale adapted from the Child/Adolescent Exercise Modeling Scale (Garcia et al., 1995). Perceived self-efficacy was measured with a scale adapted from other instruments (i.e. Bandura, 1996 and Pender, 1997) and measures of perceived barriers and benefits were also adapted from other instruments (i.e. Sechrist et al, 1987; Steinhardt & Dishman, 1989; Tappe et al., 1989; Garcia et al., 1995). Bivariate correlations among social support, social norms, and modeling ranged from .60 to .70 ($p < .01$).

The study showed that perceived self-efficacy was the strongest predictor explaining 19 % of the variance in adolescent's LTPA. Interpersonal influences were not directly related to LTPA ($\beta = .03$, $p > .05$) but had indirect effects on LTPA through perceived self-efficacy, perceived barriers, perceived benefits, and competing demands which accounted for 83% of the total effect. Interpersonal influences had a negative direct effect on perceived barriers ($\beta = -.25$, $p < .05$) and a positive direct effect on perceived benefits ($\beta = .40$, $p < .05$). Perceived benefits had a small direct effect on LTPA ($\beta = .10$, $p < .05$). However, when interpersonal influences were divided into peers and family influences, perceived benefits did not have a direct effect on LTPA. Perceived barriers did not influence LTPA directly but indirectly through perceived self-efficacy. That is, perceived barriers were not directly related to LTPA ($\beta = -.02$, $p > .05$) but significantly influenced perceived self-efficacy ($\beta = -.50$, $p < .05$).

Chinuntuya (2001) examined the relationships among social support, perceived barriers, perceived self-efficacy, commitment to a plan of exercise, and physical activity among 300 Thai elderly ranging in age from 60 to 87. Physical activity included LTPA and lifestyle physical activity (LSPA) (e.g. housework and carrying) which were measured with The Yale Physical Activity Survey Questionnaire. Independent variables were measured with instruments modified from Pender's questionnaires. Data were collected by interview. The study showed that the determinants of LTPA and LSPA were different. Social support had significant positive and indirect effects on LTPA and LSPA through commitment to a plan of exercise; however, the direct effect was less than the indirect effect in both LTPA and LSPA. That is, in the LTPA model, the direct effect was 0.45 ($p < .05$) and indirect effect through commitment to a plan of exercise was 0.65 ($p < .001$) and in LSPA model, the direct effect was 0.21 ($p < .05$) and indirect effect was 0.30 ($p < .001$). Perceived self-efficacy had a positive direct effect on LTPA ($\beta = .37$, $p < .05$) but it was not the case for LSPA ($\beta = .13$, $p > .05$). Also, perceived barriers had negative direct effects ($\beta = -.26$, $p < .05$) and indirect effects on LTPA through commitment to a plan of exercise ($\beta = -.33$, $p < .01$) but there was no statistically significant relationship between perceived barriers and LSPA. Namely, in LSPA, the path

coefficient of perceived barriers and LSPA was -0.15 ($p > .05$) and of perceived barriers and commitment to a plan of exercise was -0.03 ($p > .05$).

The four constructs selected for this study have been shown to be the most powerful determinants of LTPA in previous studies. Recent research on relationships among them can be summarized as follows.

The Effects of Perceived Self-Efficacy on Leisure-Time Physical Activity. Studies have indicated that perceived self-efficacy serves a mediational role in the relationship between variables and physical activity. It mediates the effect of social support on exercise in sedentary middle-aged men and women (Duncan & McAuley, 1993; Duncan & Stoolmiller, 1993); the effects of social support, modeling, and social norms on LTPA in adolescents (Wu & Pender, 2002); the effects of social support, modeling, social norms, perceived barriers, and perceived benefits on LTPA in adults (Hofstetter et al., 1990); and the effects of perceived barriers on LTPA in elderly persons (Conn, 1998) and adolescents (Wu & Pender, 2002). .

The Effects of Interpersonal Influences on Leisure-Time Physical Activity. Results of studies have indicated that interpersonal influences had a significant indirect effect on LTPA through perceived self-efficacy, perceived barriers, and perceived benefits (Duncan & McAuley, 1993; Wu & Pender, 2002). In addition, interpersonal influences had a positive effect on perceived benefits and a negative effect on perceived barriers. According to Bandura (1997), social support, modeling, and social norms play important roles as sources of perceived self-efficacy. Social support contributes to enhancing self-esteem and perceived benefits, and decreasing perceived barriers particularly among women (Cohen & Wills, 1985; Duncan et al., 1993). Receiving specific guidance of how to participate in physical activity and information about the outcomes of being physically active increases perceived benefits, decreases anxiety or perceived barriers and enhances perceived self-efficacy for performing LTPA in women (Duncan & McAuley, 1993; Duncan et al., 1993). Emotional support, such as positive feedback or encouragement, increases self-worth and self-confidence. Instrumental support, such as offering to care for children or do household tasks decreases barriers to LTPA participation (Duncan et al., 1993; Nies et al., 1998, 1999). Finally, social companionship enhances a sense of belonging and

positive mood as well as reduces barriers to performing LTPA among women (Cohen & Wills, 1985; King et al., 2000).

The Effects of Perceived Barriers on Leisure-Time Physical Activity. Conn (1998) and Chinuntuya (2001) found that perceived barriers had a significant negative direct effect on LTPA in elderly persons whereas Wu & Pender (2002) did not find this in adolescents. However, Chinuntuya (2001) did not find the direct effect of perceived barriers on LSPA. Hofstetter et al. (1990) and Wu & Pender (2002) revealed that perceived barriers had negative indirect effects on LTPA via perceived self-efficacy while Conn (1998) and Chinutuya proposed the opposite.

The Effects of Perceived Benefits on Leisure-Time Physical Activity. Conn (1998), Resnick et al. (2002), and Resnick and Nigg (2003) found that perceived benefits had a significant positive direct effect on LTPA in elderly persons. Wu & Pender (2002) found a small direct effect of perceived benefits on adolescents' LTPA but when family and peers influences were analyzed separately, the direct effect was not found. In addition Conn (1998) and Resnick et al. (2002) indicated that perceived benefits were influenced by perceived self-efficacy.

Summary

Substantial evidence has shown that participation in 30 minutes or more of at least moderate physical activity each day, for at least 3-5 days per week can prevent diseases such as CVD, cancer, diabetes, and depression. Because performing physical activity in discretionary time provides a large amount of physiological and psychosocial benefits, it should be promoted in Thai women along with lifestyle physical activity. In view of the high prevalence of health problems related to physical inactivity in Thai women, it is critical to study what factors determine LTPA among middle-aged Thai women. The HPM (Pender, 1996), the Self-efficacy Theory (Bandura, 1997), and related literature indicate that interpersonal influences, perceived barriers, perceived benefits, and perceived self-efficacy are powerful influences on women's LTPA. However, a review of recent research indicates inconsistencies in findings regarding relationship**s** among these variables. Therefore, this study will examine the relationships among the factors to gain a better understanding of the role each plays in promoting regular physical activity as part of a healthy lifestyle. In depth

knowledge concerning these relationships will provide guidance in structuring effective physical activity interventions for middle-aged Thai women.

CHAPTER 3
METHODOLOGY

This chapter describes the research design and methods used to conduct the present study. The research design, sampling techniques and sample selection, instrumentation, protection of human subjects, data collection, and data analysis procedures were included. A pilot study and findings are also presented.

Research Design

A descriptive cross-sectional design was used to test the WPAPM model which proposes relationships among the cognitive processes of interpersonal influences, perceived self-efficacy, perceived benefits, and perceived barriers and the outcome of LTPA in middle-aged Thai women. The data was obtained from self-report questionnaires completed by the sample subjects.

Population and Sample

Population of the Study. The population for this study was Thai women aged 40-59 years living in the Bangkok Metropolis, the capital of Thailand.

Sample Size. No definite formula for calculating sample size for structural equation modeling (SEM) is mentioned by Jöreskog & Sörbom (1996-2001). However, Hair, Anderson, Tatham & Black (1998) suggested that a minimum ratio is at least five respondents for each estimated parameter. The most appropriate ratio is 10: 1 (Hair et al., 1998, p. 604). In this study the hypothesized model contained 26 free parameters; therefore a sample size of 260 was a minimum requirement. The addition of 15% of the minimum requirement was employed to cover attrition of the sample selected. Therefore, a sample of 300 middle-aged Thai women was recruited for this study.

Sampling Technique. In order to meet the general statistical assumption of SEM which is normal distribution of the sample (Munro, 2001), a multi-stage random sampling was used to yield a probability sample of middle-aged Thai women.

Characteristics of Bangkok Metropolis. According to the Department of Policy and Planning, Bangkok Metropolitan Administration (2003), Bangkok Metropolis is comprised of 5,782,159 people, 2,796,409 male and 2,985,750 female, residing within 1,569 square kilometers. There are 771,996 women aged 40–59 in this population.

There are 50 districts in Bangkok Metropolis which are formally grouped into 6 zones according to the geographical area. Each zone consists of 7-9 districts which have similar population characteristics. Each district is comprised of 15-59 communities. The communities are formally classified into 5 types according to population density (i.e. slum community called "congested community", urban community, suburban community, government housing developmental community called "flat community", and private housing developmental community called "distributive community"). Each district has 2- 5 types of community.

Stage 1. One district was randomly selected from each of the 6 zones.

Stage 2. In order to represent women in each community, community samples were randomly selected from each of the district samples. One community was randomly selected from each community type.

Stage 3. In each district, 50 persons were selected by a systematic sampling technique from name lists obtained from the community leaders.

The sampling frame configuration is depicted in Figure 3.

Sample Selection. The following were inclusion criteria:

1. Women between 40 – 59 years of age
2. Living in the Bangkok metropolis at least one year
3. Able to read and write in the Thai language, and
4. Without disabilities that would prevent participation in moderate or vigorous physical activity.

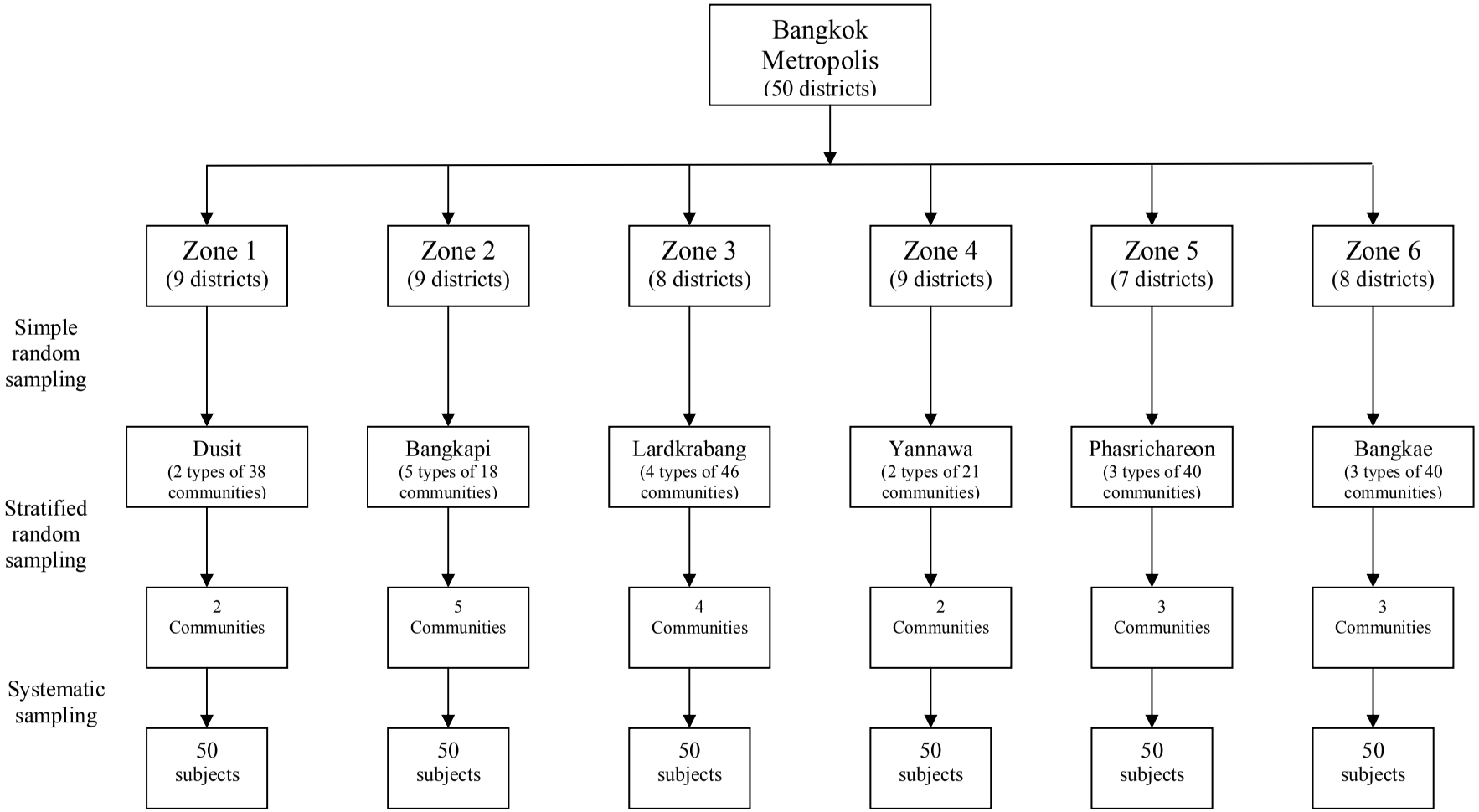


Figure 3 Sampling Configuration

Instrumentation

Instrumentation includes the selection, application, and development of measurement tools (Burns & Grove, 2001). Self-administered questionnaires were suitable for this study due to the convenience for respondents to complete the questionnaires (i.e. time, pace, and place), the possibility of anonymity, standardized format, and no risk of interviewer bias, thereby increasing reliability and validity (Waltz, Strickland & Lenz, 1984). This method also is appropriate for large sample sizes and free-living people because it is simple and inexpensive.

Instrument Selection. According to Waltz et al. (1984), modifying an existing instrument is more efficient than developing a new one; however, there are many issues to be considered before selecting the instrument. First, the purpose for which the tool was first developed and for which it is being considered should be congruent, including the aim of the measurement tool, population, setting, and time perspective. Second, the conceptualization which guided the development of the instrument employed in the current study should be relevant. That is, the assumptions regarding the nature of the entity being assessed should be compatible. Finally, the psychometric properties, reliability and validity, not only at the time of development but in subsequent applications should be acceptable (Waltz et al., 1984). After extensive review of the literature**,** six existing instruments were selected to measure the theoretical constructs of interest.

Translation and Adaptation. After permission was granted to use and modify the instruments, the investigator translated and adapted them to accomplish a closer cultural fit for middle-aged Thai women. Ten middle-aged women living in a community were asked to respond to the preliminary questionnaires which included open-ended interviews in order to assure that instrument content and language were appropriate for the target population. Face validity was then established by having three Thai experts knowledgeable regarding the development of questionnaires and familiar with the study constructs. The accuracy, appropriateness, and relevance of the items to the target population were examined (Nunnally & Bernstein, 1994). A pilot study was conducted to determine the validity, internal consistency reliability, readability, and possible response bias.

The study variables and indicators are presented in Table 1. In addition to the study variables, demographic and health status information were collected which included age (number of years from birth), education (years of formal education), income (monthly total family earnings), marital status, menstrual status, weight (kg), and height (cm).

Table 1 Theoretical Constructs and Measures

Theoretical Constructs	Measures
1. Leisure-time physical activity	-Leisure-time physical activity index score
2. Interpersonal influences	
Social support	-Social Support for Leisure-Time Physical Activity Questionnaire score
Social norms	-Social Norms for Leisure-Time Physical Activity Questionnaire score
Modeling	-Modeling for Leisure-Time Physical Activity Questionnaire score
3. Perceived barriers	
Personal barriers	-Leisure-Time Physical Activity Benefits/Barriers Questionnaire score
Environmental barriers	-Leisure-Time Physical Activity Benefits/Barriers Questionnaire score
4. Perceived benefits	
Physiological benefits	-Leisure-Time Physical Activity Benefits/Barriers Questionnaire score
Psychological benefits	-Leisure-Time Physical Activity Benefits/Barriers Questionnaire score
5. Perceived self-efficacy	-Leisure-Time Physical Activity Self-efficacy Questionnaire score

The discussion of each instrument is presented next.

1. The Thai Women's Leisure-Time Physical Activity Questionnaire

The Thai Women's Leisure-Time Physical Activity Questionnaire was translated and adapted from the Paffenbarger Physical Activity Questionnaire (PPAQ) (Paffenbarger et al., 1978). The PPAQ was selected because it: a) was developed for assessing LTPA in adults; b) can yield type, intensity, duration, and frequency of the activity; and c) has acceptable psychometric properties. The PPAQ is a self-report physical activity assessment questionnaire first developed to identify LTPA for adults with hypertensive cardiovascular disease. The questionnaire asks how many flights of stairs an individual climbed up each day, how many city blocks or equivalent an individual walked each day, and what recreational and sports activities were played in hours per week in the past week per year. Sports and other activities are classified as vigorous, moderate, light, sitting, and sleeping. A summary estimate of energy expenditure can be derived by multiplying the average hours per week of reported activity by the intensity. Walking one city block = 8 kcal. Climbing 10 steps = 4 kcal. Light intensity = 5 kcal/min, mixed or moderate intensity = 7.5 kcal/min, and vigorous intensity = 10 kcal/min (Paffenbarger et al., 1978). However, in 2000 the MET value for light, moderate, and heavy intensity was lowered (< 4, 4-6, and > 6 METs, respectively) (Lee & Paffenbarger, 2000).

Validity. Ainsworth, Leon, Richardson, Jacobs & Paffenbarger (1993) validated the Paffenbarger total index with several objective measurements in 28 men and 50 women between the ages of 21 and 59 years. The correlations between the questionnaire and specific physical activity indices, maximal oxygen capacity, Caltrac monitor, and percent of body fat were 0.69, 0.60, 0.29, and -0.44 respectively ($p < 0.05$). Sallis & Saelens (2000) reported the validity weighted mean of the total physical activity assessed from the questionnaire were 0.30 and 0.32 in their investigation regarding assessment of physical activity by self-report. Compared to other questionnaires such as the Minnesota Leisure-Time Physical Activity Questionnaire and CARDIA Physical Activity History, the validity weight mean of the PPAQ was higher.

Reliability. Test-retest over two weeks in 45 Latinos between the ages of 18 and 55 years for stair flights climbed was 0.68; for blocks walked was 0.23; for sports

was 0.67, and total kcal/wk was 0.34 ($p < 0.05$ except blocks walked) (Rauh, Hovell, Hofstetter, Sallis & Gleghorn, 1992). Jacobs, Ainsworth, Hartman and Leon (1993) indicated that the PPAQ had high one month test-retest correlation coefficients in 59 adults aged 20-59 (i.e. 0.78 for stairs, 0.63 for blocks walked, 0.75 for sports, and 0.72 for total index).

Adaptation. The investigator translated and adapted the PPAQ to fit the target population, middle-aged Thai women. Because the length of city blocks in Bangkok metropolis are not equal, time spent walking is more appropriate for estimating energy expenditure. The subjects were asked "*Do you normally walk for at least ten minutes without stopping each day?* (DeBusk, Stenestrand, Sheehan & Haskell, 1990)" If *"yes"*, they were asked "*For each time, on the average, how many minutes or hours do you walk?" and "how many times per day?"* And "*What is your usual pace of the walking*?" Similarly, the subjects were asked "*Do you normally climb up stairs each day?*" If "*yes"*, then they were asked "*How many flights of stairs do you climb up each day?*" To capture Thai women's lifestyles, the stairs were classified as home, office, and bridges across the street.

The subjects were asked "*In the past 7 days, did you do the following activities?"* A list of LTPA choices included walking for exercise, jogging, yoga, aerobic dancing, ballroom dancing, Tai-Chi, stationary bicycling, calisthenics, and sports (e.g. badminton, swimming, and ping-pong). They were also asked "*How many times in the past 7 days did you do this activity?*"; "*For each time, on the average, how many minutes or hours did you do this activity?*" and "*How would you rate your level of exertion (RPE)?"* (in order to rate performing light, moderate, and vigorous). The average number of hours of walking as well as light, moderate, and vigorous physical activity was calculated. The average number of hours of each physical activity was multiplied by the corresponding MET values for that activity and totaled for an average MET expenditure for a week per subject. To determine the regular and habitual physical activity, the subjects were asked "*Do you perform this activity every week?"* and if "*yes*", then, they were asked "*How long (month/year) have you performed each activity?"*

In addition, to understand time use in discretionary time the following question was added. "*What is the most favorite activity you usually do when you have*

free time? A list of passive and active activities choices were available including watching television or listening music, playing games or using the computer, talking, sleeping, reading, walking for pleasure, aerobic dancing, playing sports, and gardening.

Leisure-time physical activity index score. According to Ainsworth and colleagues (1992), energy expenditure values can be expressed in kcal/kg/hour, kcal/min, kcal/hour, or kcal/24 hours. The most accurate way to determine energy expenditure is to multiply the MET value and duration of activity by the body weight in kilograms. For this study, energy expenditure was calculated by multiplying the MET value modified from the Ainsworth Compendium (2000) (see Appendix I) by the body weight and duration in hours. The formula for calculating the physical activity index score in kcal per week is: MET value x hours per week x kg body weight and 1 flight (10 steps) equal 4 kcal (Paffenbarger et al., 1978).

For example, a woman weighing 50 kg who performs aerobic dance with light effort (4.5 METs) for 45 minutes 3 days per week (2.25 hours per week) and strolls (3 METs) 15 minutes per day for exercise (1.75 hours per week) the calculation of kcal per week would be the sum of these activities:

Aerobic dance = 4.5 X 2.25 X 50 = 506.25 kcal

Strolling = 3 X 1.75 X 50 = 262.50 kcal

Total leisure-time physical activity score = 506.25 + 262.50 = 768.75 kcal/week

For this study climbing up stairs as well as walking was not classified as LTPA if they were not identified as LTPA by the subjects.

2. The Social Support for Leisure-Time Physical Activity Questionnaire

The Social Support for Leisure-Time Physical Activity Questionnaire was translated and modified from the Social Support for Exercise Behavior Scale developed by Sallis et al. (1987) which measured perceived social support for exercise behavior. Sallis and colleagues interviewed adults aged 45 years or younger with a child aged 8 to 16 years in the house and in the process of changing exercise patterns to construct items. The instrument was then administered to 171 adults. Most were introductory psychology students (mean 21.3 years), female, and Caucasian. The

respondents were asked to rate "*how often anyone living in your household has said or done (if you are trying to exercise regularly) during the last three month*" and "*how often have your friends, acquaintances, or coworkers said or done (if you are trying to exercise regularly) during the last three month".* The scale contained 5 items for support from friends and 15 items for support from family, scored on a 5-point scale ranging from *"none "*= 1, "*rarely*" = 2, "*a few times*" = 3, "*often*" = 4, and *"very often"* = 5. Items that did not apply were scored as "1" A sum score was calculated to quantify this measure. Higher scores indicated that an individual perceived more social support for exercise.

Results of the factor analysis indicated that the factor solution accounted for 59 % of the variance; eigenvalues were greater than 2; and all items loaded between 0.50-0.86. For criterion-related validity, friend support and family support were significantly related with vigorous exercise ($p < .001$). The alpha coefficients ranged from 0.61-0.91: friend support- exercising together = 0.84; family support-participation and involvement = 0.91, and family support-rewards and punishments = 0. 61. Test-retest reliabilities over 2 weeks were 0.79 for friend support-exercising together, 0.77 for family support-participation and involvement, and 0.55 for family support-rewards and punishments. It can be seen that the internal consistencies were high and test-retest reliabilities were acceptable.

Adaptation. The investigator translated and adapted the scale for appropriateness because social support perceived by Thai women is different than Americans. In addition to family and friend support, professional support including support from health professions, health volunteers, and community leaders were included. The item "*Discussed exercise with me*" was divided into two items ("*talked to me about benefits of LTPA*" and "*gave me information regarding places, schedule, or how to perform LTPA*"). Four items were added ("*blamed me that my duties were neglected by LTPA*", "*asked me my feeling or consequences after LTPA*", "*provided equipments, clothes, or money for my LTPA*", and "*gave me a ride to the LTPA place*"). The modified questionnaire consisted of 20 items. The discouragement items were reversed scored (none = 5, rarely = 4, a few times = 3, often = 2, and very often = 1). The subscale of social support was scored by calculating the mean of all items. Higher scores indicated that an individual perceived more support from others.

3. The Social Norms for Leisure-Time Physical Activity Questionnaire

The Social Norms for Leisure-Time Physical Activity Questionnaire was adapted from the Exercise Norms Questionnaire developed by Pender (1996). The original instrument was developed for adolescents. The adolescents were asked the extent to which family members, friends, closest teacher, and physician expected them to exercise ranging from "*not at all*" = 0, "*sort of*" = 1, and "*a lot*" = 2.

Adaptation. The Exercise Norms Questionnaire was translated and adapted to fit the target population. The study sample was asked "*How much do you think the following people (family members, friends, boss or respectable persons, health professionals, health volunteers, and community leaders) would feel if you perform LTPA regularly at least 3 days a week, for at least 30 minutes?"* The answer to each item was coded on a 6-point scale ranging from "*strongly agree*" = 5, "*agree*" = 4, "*neutral*" = 3, "*disagree*" = 2, "*strongly disagree*" = 1, and "*I don't know*" = 0. The subscales were scored by calculating the mean of all the items. Higher scores indicated that an individual perceived more expectations to performing LTPA.

4. The Modeling for Leisure-Time Physical Activity Questionnaire

The Modeling for Leisure-Time Physical Activity Questionnaire was adapted from the San Diego Health & Exercise Survey Questionnaire (Sallis et al., 1992). Sallis and colleagues developed 2 items to measure the concept of modeling which is derived from Social Cognitive Theory. Adults aged 18-90 were asked to identify the number of adults at home, close friends, and acquaintances who exercised at least 3 times a week, for at least 20 minutes without stopping, which is hard enough to cause a large increase in heart rate or breathing.

Adaptation. Items on the questionnaire included "*Not counting yourself, is there an adult in your family, friends, and others that impressed you as role models for performing LTPA regularly at least 3 days a week, for at least 30 minutes?* If *yes*, they were asked to identify and indicate the number of role models. The number of people from the response provided the sum score for the questionnaire. The higher the score indicated higher modeling for LTPA.

5. The Leisure-Time Physical Activity Benefits/Barriers Questionnaire

The Leisure-Time Physical Activity Benefits/Barriers Questionnaire was translated and modified from the Exercise Benefits/Barriers Scale (EBBS). The EBBS was developed by Sechrist, Walker & Pender (1987) based on the HPM (Pender, 1986, 1987) and consists of benefits of exercise subscale and barriers to exercise subscale. The psychometric evaluation of the instrument was based on the responses of 650 healthy adults aged 18-88 years (mean = 38.7 years). Sixty percent of the sample was female and 68 percent were currently married.

The benefits subscale consists of 29 items in which respondents were asked to indicate the degree to which they agree or disagree with each of the items in the subscale. The four choices included: *strongly agree* = 4, *agree* = 3, *disagree* = 2, and *strongly disagree* = 1. The possible range of scores was 29-116. Higher scores indicate that an individual perceived more benefits of exercise. Factor analysis results showed that the benefits factored into life enhancement, physical performance, psychological outlook, social interaction, and preventive health with all items loading at .46 to .80. The Cronbach's alpha coefficient was 0.95. Test-retest reliability over two weeks was 0.89.

The barriers subscale consists of 14 items. The respondents indicated the level of agreement regarding barriers to exercise ("*strongly agree*" = 4, *agree* = 3, *disagree* = 2, and "*strongly disagree*" = 1). The possible range of scores is 14-56. Higher scores indicate that an individual perceives more barriers to exercise. Factor analysis showed barrier factors of exercise milieu, time expenditure, physical exertion, and family encouragement with all items loading between 0.48-0.85. The Cronbach's alpha coefficient was 0.87. Test-retest reliability over two weeks was 0.77 (Sechrist et al., 1987).

Adaptation of benefits subscale. The EBBS was translated and adapted to reflect middle-aged Thai women's benefits and barriers to LTPA. According to the face validity, 3 items were deleted because of redundancy (i.e. exercising makes me feel relaxed, exercise is hard work for me, and exercise improves overall body function for me). Two items were combined to one item ("*exercise increases my muscle strength*" and "*my muscle tone is improved with exercise*" to "*LTPA increases my muscle strength and tone*"). Three items were combined to one item ("*exercise*

increases my stamina", "*my physical endurance is improved by exercising*", and "*exercise allows me to carry out normal activities without becoming tired"* to *"LTPA increases my stamina and allows me to carry out normal activities without becoming tired*"). Based on the literature and content experts, "LTPA helps me look fresh" was added. The benefits subscales were categorized into physiological and psychosocial benefits. Therefore, 25 items remained (from 29 items) including 16 physiological and 9 psychological benefits**.** The subscale of perceived benefits was scored by calculating the mean of all items. Higher scores indicated that an individual perceived more benefits of LTPA.

Adaptation of barriers subscale. To adapt the barriers subscale, one item was deleted (i.e. exercise is hard work for me) and two items ("my spouse does not encourage exercising" and "my family members do not encourage me to exercise") were combined to ("*Family members or significant other do not encourage me to LTPA")*. Based on a literature review (e.g. Sallis et al., 1989; Booth et al., 1997; King et al., 2000), 8 items were added including 6 personal barriers (being too old, not in good health, lack of knowledge of how to perform LTPA, no company, fear of injury, and not appropriate for women) and 2 environmental barriers (unsafe environment and unattractive surroundings). Finally 14 personal and 6 environmental barriers were included in the subscale. The subscale of perceived barriers was scored by calculating the mean of all items. Higher scores indicated that an individual perceived more barriers to perform LTPA.

According to the preliminary questionnaire testing, the four-point Likert scale was modified to a five-point Likert scale by adding "*unsure"* because some respondents could not make the decision whether they would agree or disagree. The responses ranged from "*strongly agree*" = 5, *agree* = 4*, unsure* = 3*, disagree* = 2, to "*strongly disagree*" = 1.

6. The Leisure-Time Physical Activity Self-efficacy Questionnaire

The Leisure-Time Physical Activity Self-efficacy Questionnaire was translated and adapted from the Exercise Self-efficacy Scale (ESS). The ESS was developed by Bandura (1997) based on Self-efficacy Theory. According to Bandura's suggestions for self-efficacy scale construction (2001), to develop a self-efficacy scale,

it is important to understand the structure and function of self-efficacy beliefs of the target population. Perceived self-efficacy must be tailored to the specific domain of functioning that is the object of interest. A preliminary study is needed to identify the barriers to perform physical activity behavior. The items should be phrased in terms of "*can do*" rather than "*will do*" because *can* is a judgment of capability while *will* is a statement of intention. The subjects will be asked to rate "*how sure are you that you can get yourself to perform your exercise routines regularly*" under various barriers, such as when they are tired and during bad weather. Efficacy scales are unipolar, ranging from 0 (*cannot do at all*) to 100 (*certain can do*). The items are summed and average score is obtained. High scores indicate high perceived self-efficacy to perform regular physical activity.

The ESS psychometric properties and appropriateness for Korean adults with chronic diseases was addressed by Shin, Jang and Pender (2000). The subjects included 249 adults aged 18-79 (mean = 48.94 years). Of the sample, 51.8 % were women; 71.1 % were married; 34 % had CVD; and 24.9 % reported exercise regularly. The instrument was translated into Korean with back-translation technique. Cronbach's alpha coefficient was 0.94. In the factor analysis, all items loaded between 0.57-0.72. Test-retest reliability over two weeks was 0.77.

The instrument was translated into Thai and modified to fit the target population. According to previous studies (e.g. Shin, Jang and Pender, 2000; Asawachaisuwikrom, 2001) as well as open-ended interviews from 10 middle-aged Thai women, 15 impediments were established which included pressure from work, tired, sad, ill, raining, vacation, visitors are present, and experiencing family problems; when they have to get up very early or go to bed late, spend time in early morning or at night, or perform LTPA alone; and when they have to care family members who are sick. The subjects were asked to rate "*how sure are you that you can get yourself to perform LTPA routines regularly (accumulating at least 30 minutes each day, for at least 3 days per week)* under the 15 barriers. The perceived self-efficacy subscale was scored by calculating the mean of all items. Higher scores indicated that an individual perceived high self-efficacy to LTPA.

Social Desirability Index

Since physical activity is a socially desirable behavior, a potential source of measurement error includes respondents estimating construct measures in a positive direction. Also, item response may be affected by social desirability when items are closely related on a single dimension scale.

Social desirability was measured using Strahan & Gerbasi's (1972) shortened version of the Marlowe-Crowne Social Desirability Index (Crowne & Marlowe, 1960). The 10-item scale requires respondents to decide whether each statement having underlying social desirability properties is true or false. The statements indicating socially desirability (e.g. "I'm always willing to admit it when I make a mistake") will be given a value of 2, whereas those not indicating social desirability (e.g. "I like to gossip at times") will be given a value of 1 if respondents choose a true response. The relationship between social desirability and theory variables was used to determine potential bias of this study. Nonsignificant relationships were desired.

Protection of Human Subjects

Prior to data collection, approval was obtained from the Faculty of Graduate Studies, Mahidol University. Each subject was informed in writing that participation was voluntary. The subjects could choose not to participate in the study without consequences. They were notified regarding the purpose of this study and were assured of the confidentiality of their answers by using code numbers on the questionnaires. The code numbers were destroyed when the analysis of study data was completed.

Data Collection

The following describes the data collection for this study.

1. The self-report questionnaires were developed taking into consideration clarity and attractiveness of the questionnaires, wording of the cover letter, and instructions (Waltz et al., 1984). The questionnaires were clear, easy to read, and attractive. Clear instructions and examples were provided. The cover letter established rapport and provided information including the purpose of the study, confidentiality,

an estimate of time required for completion, and the name, address, and telephone number of the investigator.

2. The data collection permission letters from Faculty of Graduate Studies, Mahidol University were brought to the Directors of the 6 districts. Assistance in meeting community leaders was obtained from the Community Development and Social Welfare division of the districts. Once subjects were identified, the investigator contacted the subjects. If a subject did not wish to participate or did not meet the criteria for inclusion, the next number on the recruitment list for that community was selected. Potential subjects who were not at home or not available to contact on that day were contacted on the following day. To avoid confounding of measures, only one member was included in the study if more than one person in a family was randomly selected.

3. The potential subjects were invited to participate in the study at a community place (e.g. temple and community health center). The investigator, then, introduced herself, established rapport, explained the purpose of the study, what contribution the subjects will make, how the subjects were selected, and emphasized the confidentiality or anonymity of the information (Polit & Hungler, 1985). The investigator gave details of how to complete the questionnaires and answered questions. To avoid social desirability bias, the investigator stayed in a convenient place for subjects to ask questions and collected the questionnaires once completed. The investigator read each item carefully to make sure the questionnaire was completed and asked subjects to check again if the answer was not clear. After completing the questionnaire, each subject received a pen in appreciation for participation.

Pilot Study

Purposes of the pilot study were to: identify problems with the design, determine if the sampling technique was effective, assess the instrument development process including cultural implications of using the study research instruments proposed (e.g. clarity, readability, language, and administration), psychometric properties, detect potential problems in data collection, and to practice data analysis techniques (Prescott & Soeken, 1989; Burns & Grove, 2001).

Pilot Procedures. Convenience sampling was employed to recruit a sample of 50 middle-aged women. Fifty subjects were selected in order to include women to assure diversity in socioeconomic status (education level, occupation and income) and physical activity behavior (active and inactive). After the respondents were identified, the investigator introduced herself and explained the objectives of the study to them. They were informed of their right to participate or not to participate in the study. The written consent form was signed if the subject was willing to respond to the questionnaire. The subjects were then asked to complete the questionnaire as well as evaluate the clarity and appropriateness of the questions, instructions, and format. The investigator recorded the time spent to complete the questionnaires, problems related to questionnaire administration, and suggested improvements.

Results of the Pilot Study. The age range of the respondents were 40 to 58 years old with a mean of 48.16 (SD = .73). Of the 50 respondents, 48% had completed elementary school, 18% had completed high school, 10% had a technical or trade certificate, 20% earned a bachelor degree, and 4% had higher than a bachelor degree. Thirty-two percent were housewives, 26% were storekeepers, 20% worked in clerical and services positions, 12% were government servants, 8% were teachers, and 2% were farmers. With regard to marital status, 68% were currently married, 24% were widowed, separated or divorced, and 6% were never married. Thirty percent were head of their families. The most frequent type of LTPA reported was walking for exercise (40%), followed by aerobic dancing (34%) and calisthenics (e.g. sit-up) (18%). Thirty two percent reported no LTPA in the past week.

Overall, the questionnaires were acceptable with good psychometric properties. Participants had no difficulty in responding to the questionnaire. Time spent to complete the questionnaires ranged from 20-60 minutes. The data was analyzed using SPSS. Cronbach's alpha was used to measure internal consistency of each instrument. The alpha coefficients ranged from 0.84 – 0.96 therefore the items in each instrument measured the same construct (Pedhazur & Schmelkin, 1991). The alpha coefficients alpha, mean, SD, and possible and actual scores of the instruments are presented in Table 2.

Table 2 Psychometric Properties of the Instruments Used in the Pilot Study (n = 50)

Instruments	No. of Items	Possible Score	Actual Score	Mean (SD)	Corrected Item-Total Correlation	Coeffici-ent Alpha
Social Support for LTPA Questionnaire	20	20-100	32-92	52.58 (14.20)	0.18 - 0.87	0.95
Social Norms for LTPA Questionnaire	4	4-20	8-20	16.66 (2.71)	0.51-0.78	0.84
Leisure-Time Physical Activity Benefits/Barriers Questionnaire						
Benefits Subscale	25	25-125	88-125	106.32 (11.63)	0.31 - 0.77	0.94
Physiological benefits	16	16-80	58-80	68.52 (7.41)	0.33-0.75	0.90
Psychosocial benefits	9	9-45	28-45	37.80 (5.00)	0.51-0.97	0.88
Barriers Subscale	20	20-100	20-75	46.38 (12.30)	0.24-0.75	0.89
Personal barriers	14	14-70	14-52	31.50 (9.02)	0.30-0.81	0.87
Environmental barriers	6	6-30	6-25	14.88 (4.33)	0.27-0.60	0.68
Leisure-Time Physical Activity Self- efficacy Questionnaire	15	0-1500	0-1500	469.80 (412.23)	0.56 - 0.91	0.96

The findings indicated some items in the LTPA Benefits Questionnaire should be combined. Item 5 "*I will prevent heart attacks by LTPA*" and item 15 "*LTPA improves functioning of my cardiovascular system*" were similar with a moderate correlation (0.57). The reliability analysis indicated if item 5 was deleted, the alpha would increase to 0.934 and if item 15 was deleted, the alpha would be relatively unchanged at 0.933. Since the meaning of item 5 was similar to item 15, item 5 was deleted. Exploratory factor analysis was employed for the benefits subscale to fit the sample. The results indicated that item 25 "*LTPA helps me decrease fatigue*", item 29 "*LTPA increases my mental alertness*" and item30 "*LTPA improves the quality of my work*" fall in psychosocial benefits subscale. Thus, the benefits subscale includes 24 items (12 physiological and 12 psychosocial) and the barriers subscale includes 20 items (14 personal and 6 environmental).

For the Social Support for Leisure-Time Physical Activity, the pilot study indicated redundancy for some items. Item 12 "*talked to me about benefits of LTPA*" and item 15 "*gave me information regarding places, schedule, or how to perform LTPA*" were combined to "*gave me information regarding benefits, places, schedule, or how to perform LTPA"*. Item 6 "*helped plan activities around my LTPA*" and item 19 "*changed their schedule so we could perform LTPA together"* were combined to "*changed their schedule or helped plan activities so I could perform LTPA"*. The final Social Support for Leisure-Time Physical Activity Questionnaire consisted of 18 items.

Data Analysis

Data analysis included the application of descriptive and inferential statistics. Descriptive statistics were used to delineate characteristics of the sample and examine the distribution of demographic variables and the variables of interest in this study using the Statistical Package of the Social Science for Personal Computer (SPSS/PC) 10.07. Inferential statistics were used to determine reliability of the instruments and subscales and to answer research questions using maximum likelihood method run by a structural equation modeling program, LISREL 8.52. An alpha level of .05 was the accepted level of significance for this study. The following were processes of data analysis to answer the research questions.

1. Preparation of the data for analysis. Missing data was checked to prevent compromised analytic power and nonresponse bias (Patrician, 2002). The data was cleaned to prevent random and systematic errors (e.g. typing or coding the wrong value) by using descriptive statistics (Roberts, Anthony, Madigan & Chen, 1997).

2. The sample characteristics were analyzed by descriptive statistics.

3. The assumption underlying multivariate analysis for the structural equation model including normality, homoscedasticity, the linearity of all relationships, and multicollinearity were tested.

4. The measurement model was evaluated to verify that the theoretical constructs were accurately represented by observed variables using confirmatory factor analysis. Separate measurement models were tested for each latent variable. According to Jöreskog and Sörbom (1996), there are two methods to assess the

measurement model, overall fit and measurement model fit. The overall model fit is indicated by chi-square value (χ^2), relative or normed χ^2 (χ^2 /df), and goodness-of-fit indices. The nonsignificant χ^2 means that there is no difference between the observed matrix and that predicted from the proposed model. The goodness-of-fit index (GFI) and adjusted goodness-of-fit index (AGFI) are greater than 0.9, root mean square residuals (RMR) are close to zero (Hair et al., 1998) and normed χ^2 is less than 2 (Pedhazur & Schmelkin, 1991) indicating a good fit. For the measurement model fit, the observed variable loading related to the construct and relationships among indicators and the construct were examined. The squared multiple correlations (R^2), which is the proportion of variance in the observed variable that is accounted for by the latent variables for which it is an indicator, were also examined.

5. Once it was determined that the measurement models fit the data, then the hypothesized model was analyzed. In the proposed model there was one exogenous variable (interpersonal influences) and four endogenous variables (perceived benefits, perceived barriers, perceived self-efficacy, and LTPA). Leisure-time physical activity was the outcome variable. In this step, path coefficients and R^2 were estimated and the effects of the independent variables on the dependent variable were determined to answer the research questions and test the hypotheses. The goodness-fit-indices were used to determine whether the model adequately fit the data.

Summary

A descriptive, cross-sectional research design was used to examine the relationships among selected behavior-specific cognitions and LTPA among middle-aged Thai women. The population of this study includes Thai women aged 40-59 years living in the Bangkok Metropolis, the capital of Thailand. Multi-stage random sampling was employed to obtain a sample of 300 subjects. Six self-report instruments were used to collect data. The investigator translated and modified the instruments to fit the target population. Results of the pilot study indicated that the instruments were culturally appropriate for middle-aged Thai women, no problems were found during data collection, and psychometric properties of the instruments were acceptable. For this investigation self-report administration was employed to collect data. The data was analyzed by using maximum likelihood method run by the LISREL program.

CHAPTER 4
RESULTS

This chapter presents the findings of the study. The descriptive statistics for the demographic characteristics and the major study variables are presented. The results of the preliminary analyses are reported, including the reliability of the instruments and tests of the assumptions underlying the statistical analyses. The structural equation modeling analyses and the findings for each hypothesis are presented.

Characteristics of Study Sample and Study Variables

Description of Study Sample

The subjects for the study were 300 women who lived in Bangkok Metropolis at least one year. The data analysis showed no missing data for variables. The following presents characteristics of the sample including demographic information, health status, and general activities.

Demographic Characteristics. Subjects ranged in age from 40-59 years, with a mean of 47.75 (SD = 5.38). Average weight was 60.01 kg (SD = 10.33) and ranged from 35 to 100 kg. The height range of the sample was 140 to 173 centimeters with a mean of 155.83 (SD = 5.7). Body Mass Index ranged from 16.53 – 43.86 with a mean of 24.73 (SD = 4.21). Based on the International Obesity Task Force for Asians (International Diabetes Institute, 2000), 40% of the sample was obese (Table 3).

Table 3 Body Mass Index of the Sample (n = 300)

Body Mass Index	n	%
Less than 18.5 (underweight)	8	2.7
18.5 – 22.9 (normal)	101	33.7
23 – 24.9 (risk for obesity)	71	23.7
25 – 29.9 (obesity I)	88	29.3
30 or more (obesity II)	32	10.7

Sixty-six percent were married, 20% were widowed, divorced, or separated, and 14% were never married. Approximately 46% of subjects had 4-7 years of education and 25% had 8-12 years. Two subjects had obtained a Ph.D. and 4 subjects had no formal education. Most of the sample (32.7%) reported a household income ranging from 10,001-20,000 Baht per month. Twenty-three subjects (7.7%) reported a household income less than 5,000 Baht per month and only 4 subjects (1.3%) reported the income above 100,000 Baht per month. For occupation, 25.7% were housewives, 19% worked for a government or state enterprise office, and 17% were storekeepers. Thirty-two percent reported being head of the household. The majority of the sample (63%) reported no caregiver burden. Approximately 52% of the sample reported a regular menstrual cycle while 37.3% were menopausal. Of 300 women, only 16 (5.3%) were using hormone replacement therapy. The frequency distribution including means and standard deviations of the demographic characteristics of the overall sample are presented in Table 4.

Table 4 Demographic Characteristics of the Samples (n = 300)

Items	n	%
Marital status		
Married	198	66.0
Widowed/divorced/separated	60	20.0
Single	42	14.0
Educational background		
No formal education	4	1.3
4-7 years	137	45.6
8-12 years	75	25.0
Vocational education	14	4.7
Bachelor degree	54	18.0
Master degree	14	4.7
Ph.D.	2	0.7
Household income (Baht per month)		
Less than 5,000	23	7.7
5,001 – 10,000	47	15.7
10,001 – 20,000	98	32.7
20,001 – 30,000	46	15.3
30,001 – 40,000	19	6.3
40,001 - 50,000	16	5.3
50,001 - 100,000	47	15.7
100,001 or more	4	1.3
Occupation		
Housewife	77	25.7
Civil/state enterprise servant	57	19.0
Storekeeper/vendor	51	17.0
Factory employee	31	10.3
Services (e.g. dressmaker)	28	9.3
Company employee	26	8.7
Academic/Professional	22	7.3
Business	5	1.7
Unemployed	2	0.7
Community volunteer	1	0.3
Head of household		
No	204	68.0
Yes	96	32.0

Table 4 Demographic Characteristics of the Samples (n = 300) (continued).

Items	n	%
Number of caregiver burden		
0	189	63.0
1	75	25.0
2	27	9.0
3	6	2.0
4	2	0.7
5	1	0.3
Menstrual status		
Regular	155	51.7
Irregular	33	11.0
Menopause	112	37.3
Using hormone replacement therapy (HRT)		
No	284	94.7
Yes	16	5.3

Health Status. Table 5 shows that only 11% of the study sample reported no health problems during the past month. The most common health problems reported were knee pain (49%), back pain (47.7%), migraine headache/dizziness (45.5%), irritability (42%), and excessive tiredness (40.7%).

Table 5 Self-Reported Health Problems (n = 300)

Health Problems	n	%
None	33	11.0
Knee pain	147	49.0
Back pain	143	47.7
Migraine headache/dizziness	137	45.7
Irritability	126	42.0
Excessive tiredness	122	40.7
Osteoarthritis	106	35.3
Insomnia	100	33.3

Table 5 Self-Reported Health Problems (n = 300) (continued)

Health Problems	n	%
Incontinence	94	31.3
Reduced sex drive	91	30.3
Constipation	84	28.0
Allergy/asthma	70	23.3
Hypertension	55	18.3
Depression	51	17.0
Loss of appetite	46	15.3
Weakness/faintness	43	14.3
Low self esteem	43	14.3
Osteoporosis	28	9.3
Diabetes	18	6.0
Heart disease	16	5.3
Cancer	7	2.3
Others (nephritis, hypotension, uterus tumor)	5	1.7

General Activities. Following are activities the sample performed during free time and included walking and climbing stairs.

Activities performed during free time. Forty eight percent of Thai women reported watching television or listening to music as a favorite activity during free time followed by talking with family members or friends (13%) and gardening (8.7%). When the activities were grouped by active and passive activities, 79% reported participating in passive activities (e.g. watching TV and talking) whereas only 21% reported active activities (e.g. gardening and performing LTPA) during free time (Table 6).

Table 6 Activities Performed During Free Time (n = 300)

	Activities	n	%
1	Watching television/listening to music	145	48.3
2	Talking with family members/friends	39	13.0
3	Gardening	26	8.7
4	Sleeping	25	8.3
5	Reading	24	8.0
6	Aerobic dancing	21	7.0
7	Walking for pleasure/shopping	11	3.7
8	Hand-craft	3	1.0
9	Playing sports	2	0.7
10	Tai-chi	1	0.3
11	Yoga	1	0.3
12	Meditation (sitting)	1	0.3
13	Meditation (walking)	1	0.3

Walking and climbing upstairs. Ninety-two subjects (30.7%) did not walk for at least ten minutes without stopping each day in the past week (Table 7). Of the 300 study participants, 28.7% reported walking for 30 minutes to one hour per day while 19.3% reported walking more than 1 hour each day. For stair climbing, all steps the subjects climbed daily including at home, office, and bridges across streets were divided by 10 to determine the number of flights. Thirty three subjects (11%) reported they did not climb stairs daily. Ninety-six subjects (32%) climbed 1-5 flights daily and 31 subjects (10.4%) climbed 26 flights or more per day.

Table 7 Walking and Climbing Characteristics of the Sample (n = 300)

Characteristic	n	%
Minutes of walking daily (for at least 10 minutes without stopping)		
Less than 10	92	30.7
10 - 29	64	21.3
30 - 59	86	28.7
60 - 89	28	9.3
90 - 119	19	6.3
120 or more	11	3.7
Number of stair flights climbed daily (1 flight = 10 steps)		
0	33	11.0
1 - 5	96	32.0
6 - 10	59	19.7
11 - 15	36	12.0
16 - 20	30	10.0
21 - 25	15	5.0
26 or more	31	10.3

Description of Study Variables

Study variables in this study included LTPA and behavior-specific cognitions: interpersonal influences, perceived benefits, perceived barriers, and perceived self-efficacy. This section presents descriptive statistics for LTPA among subjects followed by other study variables.

Leisure-Time Physical Activity. The statistical analyses revealed that 74 subjects (24.7%) reported no LTPA during the past week (Table 8). Among the subjects reporting participation in LTPA, the most popular LTPA was walking for exercise (41%) followed by aerobic dancing (36%) and calisthenics or stretching exercise (21%). The subjects also were asked if they performed LTPA every week regularly. It can be seen that more subjects reported aerobic dancing regularly than other activities. For example, 84 out of 123 women reported walking regularly for exercise while 96 of 108 women (88.89%) reported aerobic dancing regularly.

Table 8 Regularity of Leisure-Time Physical Activities Performed in the Past Week (n = 300)

	Leisure-Time Physical Activity	n	%
	No LTPA	74	24.7
1	Walking for exercise	123	41.0
	Regular*	84	28.0
	Irregular	39	13.0
2	Aerobic dancing	108	36.0
	Regular	96	32.0
	Irregular	12	4.0
3	Calisthenics (stretching exercise)	63	21.0
	Regular	42	14.0
	Irregular	21	7.0
4	Jogging	29	9.7
	Regular	15	5.0
	Irregular	14	4.7
5	Stationary bicycling	19	6.3
	Regular	13	4.3
	Irregular	6	2.0
6	Badminton	15	5.0
	Regular	8	2.7
	Irregular	7	2.3
7	Yoga	13	4.3
	Regular	12	4.0
	Irregular	1	0.3
8	Tai-Chi	11	3.7
	Regular	9	3.0
	Irregular	2	0.7
9	Ballroom dancing	6	2.0
	Regular	3	1.0
	Irregular	3	1.0

Table 8 Regularity of Leisure-Time Physical Activities Performed in the Past Week (continued)

	Leisure-Time Physical Activity	n	%
10	Pe'tanque	4	1.3
	Regular	2	0.7
	Irregular	2	0.7
11	Swimming	3	1.0
	Regular	1	0.3
	Irregular	2	0.7
12	Bicycling	3	1.0
	Regular	3	1.0
	Irregular	0	0
13	Climbing up stair	2	0.7
	Regular	2	0.7
	Irregular	0	0
14	Ping-pong	1	0.3
	Regular	0	0
	Irregular	1	0.3
15	Bamboo stick exercise	1	0.3
	Regular	1	0.3
	Irregular	0	0
16	Tennis	1	0.3
	Regular	0	0
	Irregular	1	0.3
17	Gardening	1	0.3
	Regular	1	0.3
	Irregular	0	0
18	Rope jumping	1	0.3
	Regular	1	0.3
	Irregular	0	0

* Regular refers to LTPA performed every week

The LTPA score (total energy expenditure in the past week) was computed by multiplying frequency of performance by duration in hours by intensity in METs by the body weight in kg {frequency x duration (hours) x intensity (METs) x body weight (kg)}. The LTPA score ranged from 0 to 5910.75 kcal/week with a mean of 794.36 (SD = 902.34). The skewness coefficients were highly positive (1.78) indicating the majority of the sample reported low LTPA (Table 9). The kurtosis value was highly leptokurtic (4.39).

Table 9 Descriptive Statistics for Study Variables (n = 300)

Variables	Mean (SD)	Median	Possible range	Actual range	Skewness (SE=.14)	Kurtosis (SE=.28)
Leisure-time physical activity						
LTPA score	794.36 (902.34)	546	0- highest possible	0- 5910.75	1.78	4.39
Interpersonal influences						
Social support	46.28 (11.25)	45	18 - 90	30 - 76	0.49	-0.61
Social norms	15.43 (3.43)	16	4 - 20	4 - 20	-1.07	1.36
Modeling	5.94 (13.80)	2	0- highest possible	0 – 174	7.80	81.69
Perceived benefits						
Physiological benefits	51.02 (5.72)	50	12 – 60	34 - 60	-0.23	-0.04
Psychosocial benefits	48.57 (6.19)	48	12 - 60	31 - 60	-0.05	-0.21
Perceived barriers						
Personal barriers	31.55 (8.45)	31	14 - 70	14 – 63	0.76	1.25
Environmental barriers	15.23 (3.80)	15	6 - 30	6 - 30	0.33	0.82
Perceived self-efficacy						
LTPA self-efficacy	501.70 349.46)	460	0-1500	0-1500	0.42	-0.54

Physical activity recommendations. According to the CDC-ACSM recommendations (Pate et al., 1995) for moderate activity, this study identified the respondents who met the physical activity recommendations based on duration, frequency, and intensity; namely, accumulated 30 minutes of moderate-intensity for 5 days a week or 20 minutes of vigorous-intensity for 3 days a week or 45-60 minutes of light-intensity for 5-7 days a week. Table 10 and Figure 4 demonstrate that 130 of the subjects (43.3%) met this recommendation. Among this group, 103 women reported participating in LTPA every week regularly while 27 women did not perform regularly. Ninety-six subjects (32%) reported participation in LTPA but did not meet the recommendation. That is 56.7% of the women did not meet this recommendation.

Table 10 Proportion of Subjects Meeting CDC-ACSM Recommendations (n = 300)

Characteristic	n	%
No LTPA	74	24.7
Some LTPA (not met the recommendation)	96	32.0
Met the recommendation (irregular)	27	9.0
Met the recommendation (regular)	103	34.3

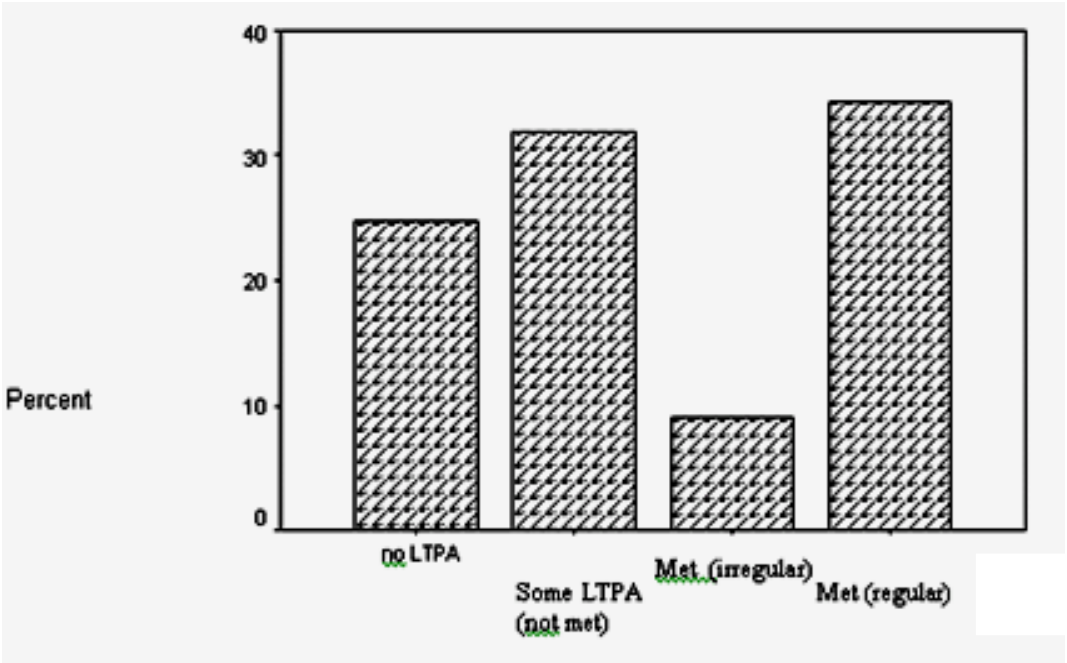


Figure 4 Proportion of Subjects Meeting CDC-ACSM Recommendations

According to the SGR guidelines (USDHHS, 1996), adults should participate in a moderate amount of physical activity which refers to 1,000 kcal per week. The results indicated that 30.7% of the sample met this criterion and 69.3% did not.

Since the body weight of women in this study was less than those in Western cultures, the criterion of SGR maybe not appropriate for them. All women in this study meeting the CDC-ACSM recommendations may not reach 1,000 kcal per week. To estimate the cut point (the lowest total energy expenditure per week) of Thai women in this study who met the CDC-ACSM recommendations, the LTPA score of the woman with the smallest body weight who met the CDC-ACSM recommendations was calculated. That is, the smallest energy expenditure of the subject who met the criteria was 612.5 kcal per week (2.5 hr x 5 MET x 49 kg.). Therefore, for this study, it was determined that 600 was the cut point with 47.3% of the sample meeting this criterion and 52.7% did not (Table 11 and Figure 5).

Table 11 Total Energy Expenditure (LTPA Score) During the Past Week (n = 300)

Energy Expenditure (kilocalories/week)	n	%
0	74	24.7
1-600	84	28.0
601-999	50	16.6
1000-2500	74	24.7
2501 and over	18	6.0

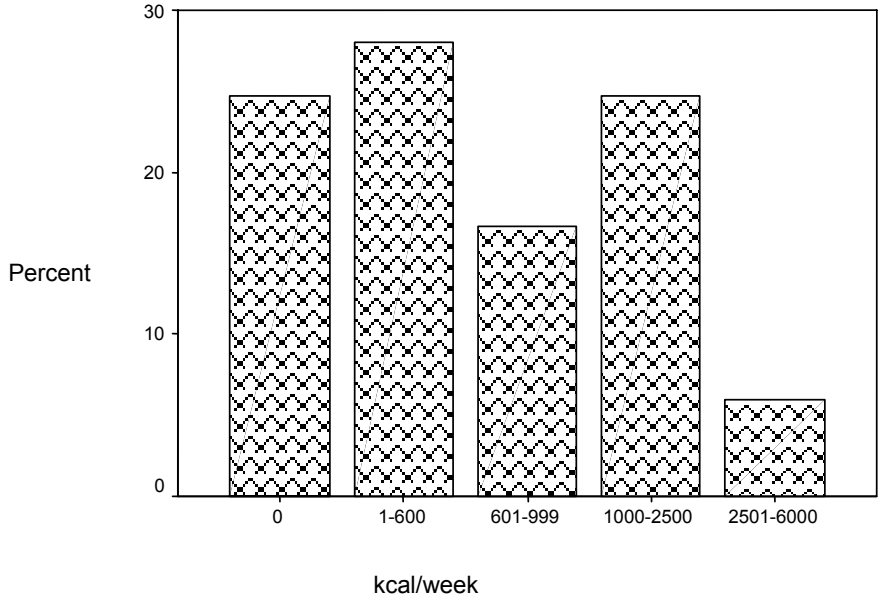


Figure 5 Total Energy Expenditure (LTPA Score) During the Past Week

Table 12 demonstrates that more women met the CDC-ACSM recommendations compared with the SGR guidelines but close to the criterion used in this study.

Table 12 Comparison of Proportion of the Sample Meeting Each Recommendation.

	CDC-ACSM (30 min 5 days/week)	SGR (1,000 kcal/week)	Criterion used in This Study (600 kcal/week)
Not met	56.7	69.3	52.7
Met	43.3	30.7	47.3

It should be noted that this study did not include other physical activities such as housework, occupation, and transportation therefore the number of subjects meeting the recommendations may be underestimated.

Interpersonal Influences. The total sum scores for social support ranged from 30 – 76, with a mean of 46.28 (SD = 11.25). The skewness was positive (0.49) which indicated that most of the sample reported receiving low social support to participate in LTPA. The highest social support reported was "Gave me helpful reminders to do LTPA" (M = 2.62, SD = 1.14), followed by "Gave me encouragement to stick with my LTPA program" (M = 2.59, SD = 1.10) and "Offered to do LTPA with me" (M = 2.55, SD = 1.01). The lowest type of social support reported was "Gave me rewards for LTPA" (M = 1.56, SD = 0.82). For discouragements (e.g. "Got angry at me for LTPA"), the analysis revealed that the sample rarely received discouragement. In regard to source of social support, the sample perceived most support from friends (M = 47.67, SD = 12.97), followed by family members (M = 47.31, SD = 13.41) and others (i.e. health care providers and volunteers) (M = 43.86, SD = 12.70).

The mean of total sum social norms scores was high (M = 15.43, SD = 3.43) with a possible score range of 4 – 20 and skewness was negative (-1.07) indicating subjects perceived high expectations from significant others. The women had the highest expectations from family members (M = 4.24, SD = 0.77), followed by health care providers (M = 4.13, SD = 0.7) and friends (M = 4.01, SD = 0.70) and the lowest from bosses or respectable persons (e.g. community leaders and religious leaders) (M = 3.94, SD = 0.79).

The total sum modeling scores ranged from 0 to 174, with a mean of 5.94 (SD = 13.80). Skewness (7.80) and kurtosis (81.69) values were high indicating low perceived modeling. The most frequent modeling was friends (53%) followed by others (46%) and family members (37.7%). Twenty-seven percent reported they did not have role models for LTPA.

Perceived Benefits. The total sum scores for perceived physiological benefits ranged from 34 to 60 with a mean of 51.02 (SD = 5.72). The mean total scale score on the perceived psychosocial benefits was 48.57 (SD = 6.19) with a range of 31 to 60. The skewness coefficient and the kurtosis value of these scores were negative and close to zero indicating normal distributions.

The most important physiological benefit identified by the women was "LTPA increases my level of physical fitness" (M = 4.39, SD = 0.66), followed by

"LTPA helps me sleep better at night" (M = 4.36, SD = 0.62) and "My disposition is improved by LTPA" (M = 4.33, SD = 0.63) while the least was "LTPA will keep me from having high blood pressure" (M = 4.03, SD = 0.81). For the psychosocial benefits subscale, the sample had the highest perceived benefits for the item "LTPA decreases feelings of stress and tension" (M = 4.34, SD = 0.68), followed by "LTPA improves my mental health" (M = 4.33, SD = 0.69) and "I enjoy LTPA" (M = 4.28, SD = 0.75) and the lowest for "LTPA increases my acceptance of others" (M = 3.75, SD = 0.84).

Perceived Barriers. The total sum scores for perceived personal barriers ranged from 14 to 63 while perceived environmental barriers ranged from 6 to 30 with a mean of 31.55 (SD = 8.45) and 15.23 (SD = 3.80), respectively. Unlike perceived benefits, the distribution of perceived barriers was positively skewed (0.76 and 0.33) indicating that most of the subjects tended to report low barriers.

The most important personal barriers to LTPA were "I don't know how to do LTPA that fit my age and health conditions" (M = 3.11, SD = 1.09), followed by "I am fatigued by LTPA" (M = 2.52, SD = 1.00) and "I had no company to do LTPA with" (M = 2.42, SD = 1.10) whereas the least was "Women should not perform sports, exercise or recreational activities" (M = 1.89, SD = 0.97). For the environmental barriers subscale, the highest was "LTPA facilities do not have convenient schedules for me" (M = 3.21, SD = 1.11), followed by "There are too few places for me to do LTPA" (M = 2.82, SD = 1.13) and "Place for me to do LTPA is not beautiful or attractive" (M = 2.52, SD = 1.08) while the lowest was "It cost too much money to perform LTPA" (M = 1.91, SD = 0.76).

Perceived Self-efficacy. The mean of total sum scores for LTPA self-efficacy was 501.70 (SD = 349.46), with a possible score range of 0 - 1500. The skewness value was positive (0.42) indicating that the majority of the subjects had low efficacy beliefs for LTPA. The sample had the highest confidence in performing LTPA "During vacation" (M = 49.80, SD = 35.63), followed by "If I perform at night" (M = 47.87, SD = 36.92), "If I have to perform alone" (M = 44.50, SD = 36.32), and "If I have to pay more" (M = 44.23, SD = 36.44). The lowest self-efficacy item was "During family problems" (mean = 15.97, SD = 26.04), followed by "When I have to take care of family members who are ill" (M = 17.63, SD = 26.75) and "When it rains"

(M = 22.57, SD = 30.42). The spread, mean and standard deviation for study variables are presented in Appendix J.

Psychometric Properties of the Instruments. Table 13 includes the reliability coefficients (Cronbach's alpha) of the scales ranging from 0.83 to 0.96 which is not different from the pilot study.

Table 13 Reliability Coefficients of the Instruments (n = 300)

Instruments	No. of Items	Corrected Item-Total Correlation	Alpha Coefficient
Social Support for LTPA Questionnaire	18	0.13-0.77	0.96
Social Norms for LTPA Questionnaire	4	0.30-0.56	0.83
Leisure-Time Physical Activity Self- efficacy Questionnaire	15	0.51-0.75	0.93
Leisure-Time Physical Activity Benefits/Barriers Questionnaire			
Benefits Subscale	24		0.94
Physiological benefits	12	0.52-0.69	0.90
Psychosocial benefits	12	0.50-0.71	0.89
Barriers Subscale	20		0.89
Personal barriers	16	0.35-0.65	0.87
Environmental barriers	4	0.24-0.57	0.67
Leisure-Time Physical Activity Self-efficacy Questionnaire	15	0.51-0.75	0.93

Preliminary Analyses

According to Tabachnick & Fidell (1996), the assumptions underlying multivariate analysis included normality, homoscedasticity, linearity, and multicollinearity. This section presents the assessment of the statistical assumptions prior to the SEM analysis.

Normality. The assumption of normality was assessed using means, standard deviations, skewness, and kurtosis. Skewness values ranged from -0.05 to 7.80 and kurtosis values ranged from -0.04 to 81.69 (Table 8). By using the PRELIS program (Jöreskog & Sörbom, 1996), LTPA score, social support, social norms, modeling, and LTPA self-efficacy were treated as censored variables therefore the normality assumption was met. That is, Pearson's Skewness Coefficients {skewness = (mean – median)/SD} of the study variables did not exceed ± .2 indicating acceptable distributions (Hildebrand, 1986 as cited in Munro, 2001, p. 43).

Homoscedasticity. Residuals scatterplots were examined to assess homoscedasticity. The spread of the residual variables around the zero axis within ± 2 standard deviations indicated this assumption was not violated.

Linearity. Linearity was also assessed by residual scatterplots of the independent variables against the dependent variables and residuals plots. The problem of nonlinearity was not found. The results of these assumptions testing are presented in Appendix K.

Multicollinearity. Correlation and regression analysis among the observed variables were employed to detect multicollinearity. From Table 14, the correlation coefficients ranged from 0.10 to 0.79 which was less than 0.80 indicating that the observed variables were not redundant (Hair et al., 1998, p. 613). All correlation coefficients among the observed variables were significant except the correlation between modeling and physiological benefits (0.10, $p > .05$). Tolerance values ranged from 0.32 to 0.90 which were above 0.10 and Variance Inflation Factors ranged from 1.11 to 3.10 which were below 5.3 indicating no problem of multicollinearity (Hair et al., 1998, p. 193) (Table 15).

Table 14 Correlation Matrix of Observed Variables

Variables	LTPA	SS	SN	MD	BEP	BEPS	BAP	BAE	SE
LTPA	1.00								
SS	.35**	1.00							
SN	.18**	.35**	1.00						
MD	.25**	.26**	.13*	1.00					
BEP	.23**	.33**	.19**	.10	1.00				
BEPS	.30**	.46**	.26**	.19**	.79**	1.00			
BAP	-.35**	-.36**	-.18**	-.22**	-.36**	-.37**	1.00		
BAE	-.27**	-.30**	-.16**	-.18**	-.17**	-.23**	.68**	1.00	
SE	.48**	.40**	.27**	.25**	.35**	.45**	-.49**	-.36**	1.00

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

SS = Social support
SN = Social norms
MD = Modeling
SE = Self-efficacy
LTPA = LTPA score
BEP = Physiological benefits
BEPS = Psychosocial benefits
BAP = Personal barriers
BAE = Environmental barriers

Table 15 Multicollinearity Among Independent Variables (n = 300)

Variable	Tolerance Value	Variance Inflation Factor (VIF)
1 Social Support	0.67	1.49
2 Social Norms	0.85	1.17
3 Modeling	0.90	1.11
4 Physiological Benefits	0.37	2.70
5 Psychosocial Benefits	0.32	3.10
6 Personal Barriers	0.44	2.27
7 Environmental Barriers	0.51	1.97
8 Self-Efficacy	0.65	1.55

Principal Analyses

LISREL version 8.52 was employed in order to answer the research questions and test the research hypotheses. The model and hypotheses testing are described below.

Model Testing

According to Jöreskog & Sörbom (1996-2001), analysis with LISREL consists of two models, measurement model and structural equation model. The measurement model is a model of how latent variables or constructs are indicated by the observed variables or indicators while the structural equation model is a model of hypothesized relationships among the latent variables which is based on causal relationships.

Measurement model. In this study, 4 theory constructs were evaluated including interpersonal influences, perceived benefits, perceived barriers, and perceived self-efficacy in order to specify reliability and construct validity by using confirmatory factor analysis (CFA). The equation for this model is

$$\mathbf{X} = \Lambda\xi + \delta$$

where $x' = (x1, x2,\ldots\ldots,xq)$ are the measured variables,

Λ = matrix Λx of the general model,

$\xi' = (\xi 1, \xi 2,\ldots\ldots..,\xi n)$ are latent variables, and

$\delta' = (\delta 1, \delta 2,\ldots\ldots.., \delta q)$ are error variables (Jöreskog & Sörbom, 1996-2001, p. 123).

The maximum likelihood (ML) method of parameter estimation was employed because the estimator is consistently efficient and has large-sample standard errors computed by LISREL under normal theory. The results of second-order measurement models analyses are presented next.

Assessment of overall model fit. All measurement models had good overall model fit (Table 16 and Appendix L). The second-order CFA showed that statistically significant levels were greater than 0.05, with the exception of the measurement model of perceived benefits, indicating that the predicted matrices fit the actual matrices. Although the χ^2 of perceived benefits scale was significant, the normed χ^2 was less than 2 (1.25) indicating this model fit the data (Pedhazur & Schmelkin, 1991). The

GFI and AGFI are above 0.9 and RMR are close to zero indicating high level of goodness-of-fit (Hair et al., 1998).

Table 16 Goodness- of-Fit Measures for Second-Order Models (n = 300)

Construct	Chi-square ($\chi 2$)	Degrees of Freedom (df)	P value	Goodness-of-fit index (GFI)	Adjusted Goodness-of-fit index (AGFI)	Root mean square residual (RMR)
Interpersonal influences	219.46	187	0.052	0.94	0.91	0.03
Perceived benefits	259.35	207	0.007	0.93	0.90	0.03
Perceived barriers	167.90	142	0.068	0.95	0.92	0.03
Perceived Self-efficacy	93.30	76	0.087	0.96	0.94	0.03

Assessment of measurement model fit. After the overall model had been accepted, the indicator loading and construct reliability were examined. Table 17 shows that all indicators except social support were significantly related to the constructs. Some indicators had low factor loadings (the correlation between an indicator on a factor) and R^2 (the proportion of variance of an indicator that is accounted for by a factor) less than 0.40 (Munro, 2001, p. 351) (Appendix J). In sum; however, the measurement models fit the data.

Table 17 Loading and Reliability of Indicators

Construct (number of indicators)	Loading and Reliability of Indicators			
	Loading	Standard error	t value	R^2
Social support (18)	-0.09 – 0.80	0.06-0.07	-1.50-16.92	0.01-0.65
Social norms (4)	0.49 - 0.72	0.13-0.15	5.27-6.16	0.24-0.52
Modeling (1)	0.95	-	< 0.001	0.90
Physiological benefits (12)	0.48 - 0.76	0.07-0.09	7.97-15.11	0.23-0.58
Psychosocial benefits (12)	0.51 - 0.72	0.07-0.10	8.12-14.02	0.26-0.51
Personal barriers (14)	0.39 - 0.68	0.08-0.10	6.94-10.45	0.15-0.46
Environmental Barriers (6)	0.28 - 0.66	0.10-0.10	4.46-8.68	0.10-0.44
Self-efficacy (15)	0.50 - 0.78	0.06-0.08	8.69-13.89	0.25-0.61

Structural equation model. The hypothesized model was tested. The model had 1 exogenous (interpersonal influences) with 3 observed variables (social support, social norms and modeling) and 4 endogenous (perceived benefits, perceived barriers, perceived self-efficacy, and LTPA) with 6 observed variables (physiological benefits, psychosocial benefits, personal barriers, environmental barriers, self-efficacy and calories per week)**.** The equation for SEM is

$$\boldsymbol{\eta = B\eta + \Gamma\xi + \zeta}$$

where η = an *m* x 1 random vector of endogenous variables,

B = an *m* x *m* matrix of coefficients of the endogenous variables,

Γ = an *m* x *m* matrix of coefficients of the exogenous variables,

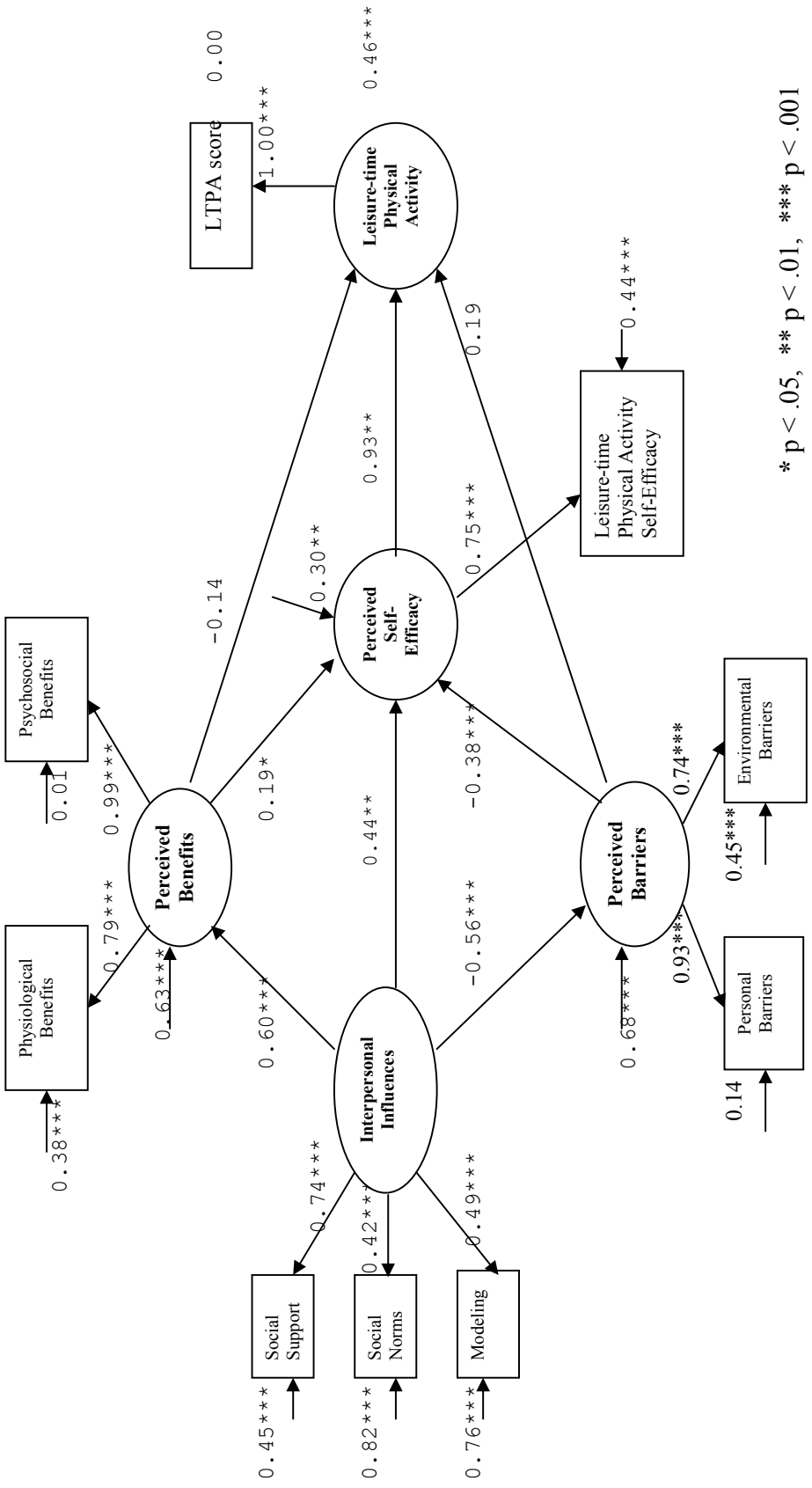
ξ = an n x 1 random vector of exogenous variables and

ζ = an m x vector of equation errors in the structural relationship between η and ξ (Jöreskog & Sörbom, 1996-2001, p. 2).

Model Identification. Since only an overidentified model can be tested, identification assessment of the theoretical model had to be performed. According to Tabachnick & Fidell (1996), the overidentified model is a model with more data points (variances & covariances) than free parameters. The number of data points is {p(p + 1)}/2, where p equals the number of observed variables. That is the hypothesized model had the number of data points 45 {(9) (10)/2} and 26 free parameters. Therefore the model is overidentified which can be tested.

Step One : Hypothesized model testing

The hypothesized model tested is shown in Figure 6. Path coefficients were standardized because it is easier to compare the model coefficients (Hair et al., 1998). The findings revealed that the hypothesized model fit the data with $\chi^2 = 30.39$, df = 21, p = 0.08, GFI = 0.98, AGFI = 0.95 and RMR = 0.03. The hypothesized model accounted for 54% of the variance in LTPA among the study sample. The largest standardized residual was 1.84 which is acceptable because it is not above 2.58 (Hair et al., 1998; Pedhazur & Schmelkin, 1991).



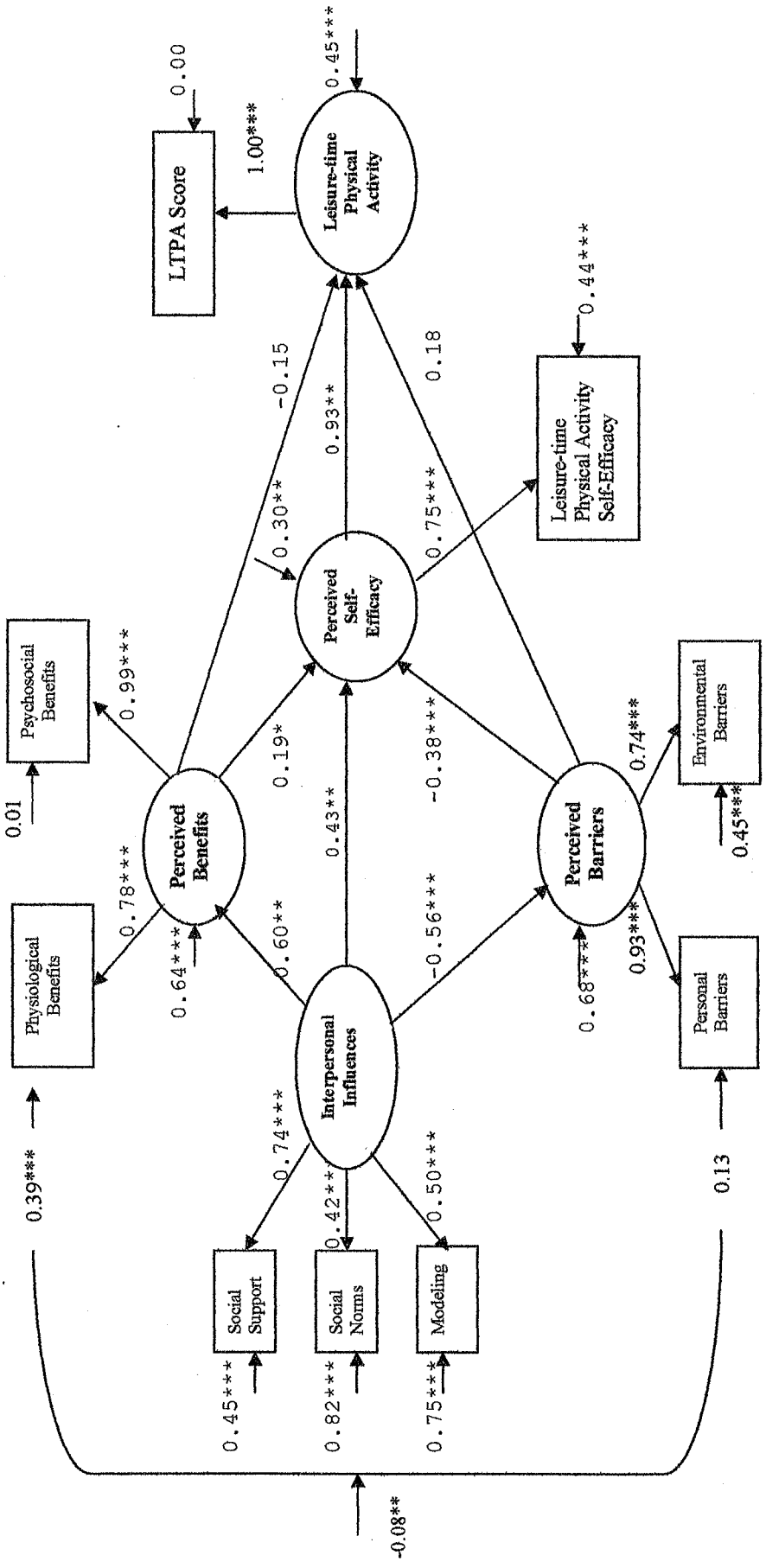
Goodness-of-fit indices: $\chi^2 = 30.39$, df = 21, p = 0.08, GFI = 0.98, AGFI = 0.95, RMR = 0.03

Figure 6 Hypothesized Model of Women's Leisure-Time Physical Activity Promotion Model

Step Two: Model Modification

Although, the level of p value (0.08) was above 0.05, it did not reach the desired level (0.10 or 0.20 [Hair et al., 1998, p. 622]). In addition, the χ^2 should be lower. The modification index was 10.47 suggesting that if the Theta-Epsilon metric (TE) between physiological benefits and personal barriers was freed, the χ^2 would decrease, therefore improve model fit. The relationship between these errors was -0.08 ($p < 0.01$) (Figure7). This suggestion made sense from a theoretical perspective in that a woman who reported a high score in one scale would report a low score in another scale. Therefore, to improve fit, the model was modified.

The modified model had better fit than the original model (Figure 7): $\chi^2 = 19.64$, df = 20, p = 0.48, GFI = 0.99, AGFI = 0.97 and RMR = 0.02. It can be seen that the p value and goodness-of fit indices were improved by adding the relationship between the errors of physiological benefits and personal barriers. According to the suggestion of Jöreskog & Sörbom (1996-2001, p. 29) "*a large drop in χ^2, compared to the difference in degrees of freedom indicates that the changes made in the model represent a real improvement*". The difference in χ^2 was more than that of df ($\chi^2 1 - \chi^2 2 = 10.75$, df1 - df2 = 1) indicating that the modified model had a better fit. See figure 8 for the WPAPM structural equation modeling and Table 18 for comparisons of the hypothesized and modified models.



* $p < .05$, ** $p < .01$, *** $p < .001$

Goodness-of-fit indices: $\chi^2 = 19.64$, df = 20, p = 0.48, GFI = 0.99, AGFI = 0.97, RMR = 0.02

Figure 7 Modified Structural Model of Women's Leisure-Time Physical Activity Promotion Model

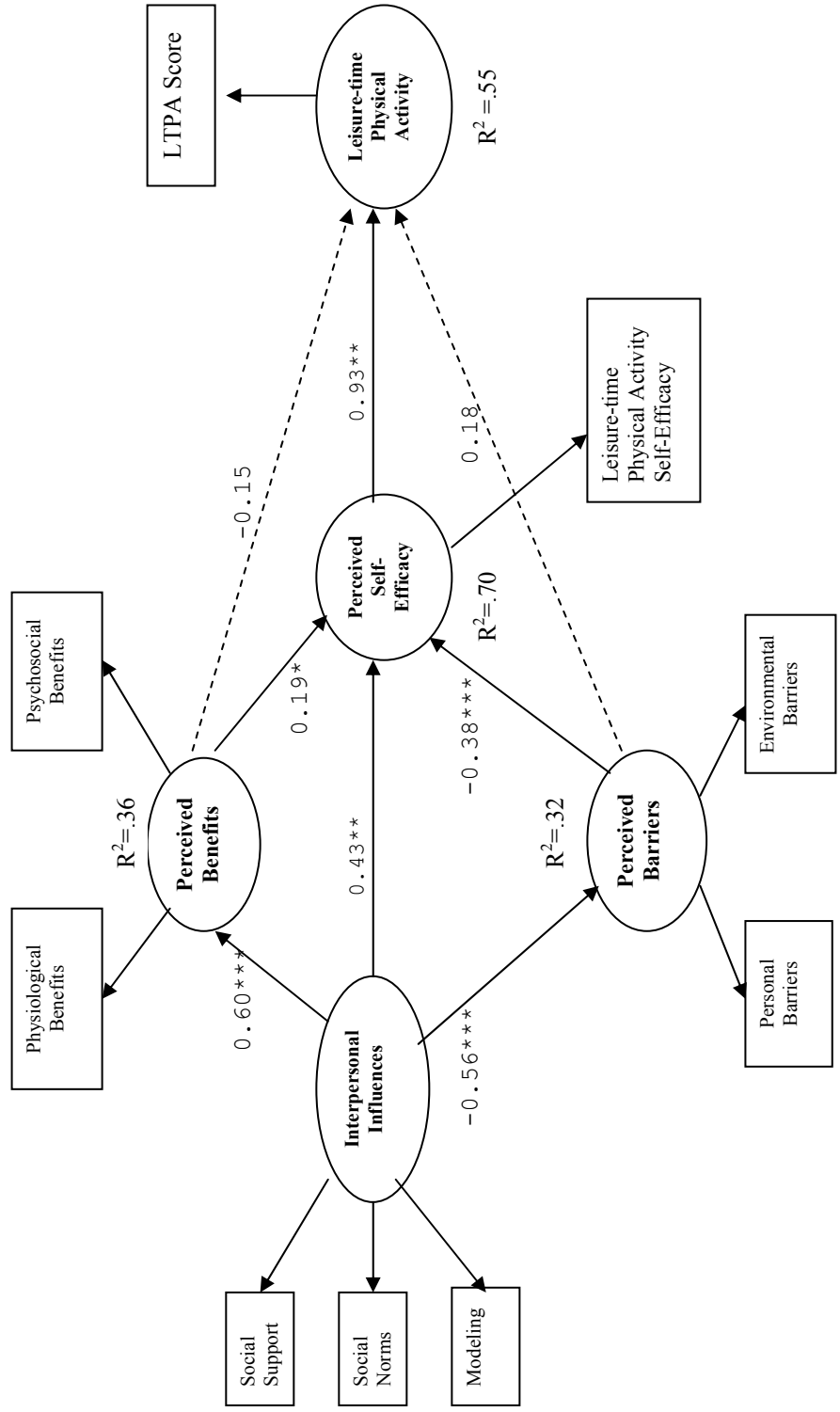


Figure 8 Structural Equation Modeling of Women's Leisure-Time Physical Activity Promotion Model

* p < .05, ** p < .01, *** p < .001

Table 18 Comparison of Hypothesized and Modified Structural Models

Goodness-of-Fit Indices	Hypothesized Model	Modified Model
Chi-square (χ^2)	30.39	19.64
Degrees of freedom (df)	21	20
P value	0.08	0.48
Goodness-of-fit index (GFI)	0.98	0.99
Adjusted goodness-of-fit index (AGFI)	0.95	0.97
Root mean square residual (RMR)	0.03	0.02
Normed fit index (NFI)	0.98	0.99
Normed chi-square	1.45	1.02
Largest standardized residuals	1.84	1.82
R^2 for structural equations	0.54	0.55

Evaluation of goodness-of-fit criteria (Hair et al., 1998) is presented next.

1. Offending estimates. The modified model had no negative error variance, standardized coefficients exceeding 1.0, or very large standard errors indicating that there were no offending estimates.

2. Overall model fit. The absolute fit measures showed that elements of the covariance matrix reproduced by parameter estimates of the hypothesized model were not significantly different from the covariance of the empirical data. The RMR was small (0.02) indicating the data fit the modified model well. The normed fit index exceeded 0.9. The AGFI was close to 1, $\chi 2$ (19.64) was close to degrees of freedom (20), and the normed $\chi 2$ was not greater than 2 indicating that the model was parsimonious.

3. Measurement model fit. Most indicator loadings were statistically significant at the level .001. The reliability of the indicators ranged from 0.01 to 0.90 indicating almost indicators were sufficient in their representation of the constructs.

4. Structural model fit. All path coefficients were statistically significant except the paths from perceived benefits to LTPA (β = -0.15, SE = 0.14, t = -1.08) and perceived barriers to LTPA (β = 0.18, SE = 0.21, t = 0.99). In addition, the correlations between the constructs were not high. The R^2 for the structural equations was 0.55.

That is, the modified model accounted for 55% of the variance in participation in LTPA among middle-aged Thai women. For other predictors, the model accounted for 70% of the variance in perceived self-efficacy, 32% of the variance in perceived barriers, and 36% of the variance in perceived benefits (Figure 8).

In sum, the results revealed that after the hypothesized model was modified by adding the path between the error term of physiological benefits and personal barriers, the WPAPM had better fit to the empirical data as well as parsimony.

Hypotheses Testing

In order to test the seven hypotheses, the direct and indirect effects were examined. Table 19 summarizes the effects of the causal variables on the affected variables.

Table 19 Effects of Causal Variables on Affected Variables

Affected variables / Causal variables	Perceived benefits			Perceived barriers			Perceived self-efficacy			Leisure-Time Physical Activity		
	DE	IE	TE	DE	IE	TE	DE	IE	TE	DE	IE	TE
Interpersonal Influences	0.60***	-	0.60***	-0.56***	-	-0.56***	0.43***	0.33**	0.76***	-	0.52***	0.52***
Perceived benefits	-	-	-	-	-	-	0.19*	-	0.19*	-0.15	0.18*	0.03
Perceived barriers	-	-	-	-	-	-	-0.38***	-	-0.38***	0.18	-0.35*	-0.17*
Perceived self-efficacy	-	-	-	-	-	-	-	-	-	0.93**	-	0.93**

* $p < 0.05$, ** $p < .01$, *** $p < .001$

Note: DE = Direct effect

IE = Indirect effect

TE = Total effect

Effect of Perceived Self-Efficacy on LTPA. Perceived self-efficacy had a significant direct effect on LTPA ($\beta = 0.93$, $p < 0.01$).

Effect of Perceived Benefits on LTPA. Perceived benefits did not have a significant direct effect on LTPA ($\beta = -0.15$, $p > 0.05$) but had a significant indirect effect through perceived self-efficacy (0.19 x 0.93 = 0.18). The total effect of perceived benefits on LTPA was 0.03 (0.18-0.15).

Effect of Perceived Barriers on LTPA. A significant direct effect of perceived barriers on LTPA was not found ($\beta = 0.18$, $p > 0.05$) but a significant indirect effect through perceived self-efficacy (-0.38 x 0.93 = -0.35) was found. The total effect of perceived barriers on LTPA was -0.17 (0.18-0.35).

Effect of Interpersonal Influences on LTPA. Interpersonal influences had an indirect effect on LTPA. Namely, through 1) perceived benefits (0.60 x -0.15 = -0.09); 2) perceived benefits and perceived self-efficacy (0.60 x 0.19 x 0.93 = 0.11); 3) perceived barriers (-0.56 x 0.18 = -0.10); 4) perceived barriers and perceived self-efficacy (-0.56 x -0.38 x 0.93 = 0.20); and 5) perceived self-efficacy (0.43 x 0.93 = 0.40). The total indirect effects are (1) + (2) + (3) + (4) + (5) = 0.52.

Effect of Interpersonal Influences on Perceived Self-Efficacy. Perceived self-efficacy was influenced by interpersonal influences directly ($\beta = 0.43$, $p < 0.001$) and indirectly through perceived benefits and perceived barriers ($\beta = 0.33$, $p < 0.01$). Namely, through perceived benefits 0.60 x 0.19 = 0.12 and through perceived barriers 0.56 x -0.38 = 0.21. Thus, the total effect of interpersonal influences on perceived self-efficacy was 0.76 (0.12 + 0.21 +0.43). In sum, the direct effect of interpersonal influences accounted for 56.58% of the total effect on perceived self-efficacy while the indirect effect accounted for 43.42%.

Following are the results of hypotheses testing.

Hypothesis One: *Interpersonal influences will have a positive direct effect on perceived benefits.*

The findings supported that interpersonal influences had a positive direct effect on perceived benefits ($\beta = 0.60$, $p < 0.001$).

Hypothesis Two: *Interpersonal influences will have a negative direct effect on perceived barriers.*

The findings supported that interpersonal influences had a negative direct effect on perceived barriers ($\beta = -0.56$, $p < 0.001$).

Hypothesis Three: *Interpersonal influences will have a positive direct effect on perceived self-efficacy and indirect effects through perceived benefits and perceived barriers.*

The findings supported that interpersonal influences had a positive direct effect on perceived self-efficacy ($\beta = 0.43$, $p < 0.001$) and also indirect effects through perceived benefits ($\beta = 0.12$, $p < 0.01$) and perceived barriers ($\beta = 0.21$, $p < 0.01$).

Hypothesis Four: *Perceived self-efficacy will have a positive direct effect on middle-aged Thai women's LTPA.*

The findings supported that perceived self-efficacy had a positive direct effect on middle-aged Thai women's LTPA ($\beta = 0.93$, $p < 0.01$).

Hypothesis Five: *Perceived benefits will have a positive direct effect and a positive indirect effect on middle-aged Thai women's LTPA through perceived self-efficacy.*

The findings demonstrated that perceived benefits had a nonsignificant negative direct effect on middle-aged Thai women's LTPA ($\beta = -0.15$, $p > 0.05$) and a significant positive indirect effect on middle-aged Thai women's LTPA through perceived self-efficacy ($\beta = 0.18$, $p < 0.05$). Therefore the hypothesis was partially supported.

Hypothesis Six: *Perceived barriers will have a negative direct effect and a negative indirect effect on middle-aged Thai women's LTPA through perceived self-efficacy.*

The findings indicated that perceived barriers did not have a significant positive direct effect on middle-aged Thai women's LTPA ($\beta = 0.18$, $p > 0.05$) but had a significant negative indirect effect on middle-aged Thai women's LTPA through perceived self-efficacy ($\beta = -0.35$, $p < 0.05$). Therefore the hypothesis was partially supported.

Hypothesis Seven: *Interpersonal influences will have an indirect effect on middle-aged Thai women's LTPA through, perceived benefits, perceived barriers, and perceived self-efficacy.*

The findings supported that interpersonal influences had indirect effects on LTPA through perceived benefits, perceived barriers, and perceived self-efficacy ($\beta = 0.52$, $p < 0.001$).

Additional Research Findings

An open-ended question was included in the questionnaire and subjects were interviewed in order to gather opinions regarding LTPA. Four major topics were included.

1. LTPA Modeling. Subjects were asked to identify the important persons that represented models for LTPA. Among the important other people, aerobic dance leaders were mentioned most frequently, followed by political leaders (i.e. Prime Minister, the Minister of MOPH), sports figures, and stars/singers. For family members, husbands emerged as the most important LTPA model among the women. Of the sample, only 6 women reported health care providers (Table 20).

Table 20 Leisure-Time Physical Activity Modeling Perceived by the Sample (n = 300)

Modeling	n	%
None	81	27.0
Family members	119	37.7
Husband	53	17.7
Son / daughter	49	16.3
Relative	29	9.7
Mother	8	2.7
Father	8	2.7
Friends	159	53.0
Others	138	46.0
Aerobic dance leader	36	12.0
Political leader	24	8.0
Sports figure	18	6.0
Star/singer	14	4.7
Boss	8	2.7
Health care provider	6	2.0
None identified	31	10.3

Additionally, 2 subjects (0.67%) suggested that the aerobic dance leaders should be knowledgeable about exercise that is appropriate for each type of participant. They also wanted the leaders to have a good personality.

2. Social support for LTPA. Six subjects (2%) requested information from health care providers regarding type, duration, and frequency of LTPA which are appropriate for their health status. Eleven subjects (3.7%) wanted support from the government as well as work places to provide places for LTPA in communities and budget for LTPA trainers or aerobic dance leaders continuously.

3. Barriers to LTPA. Three subjects (1%) complained that the places for aerobic dance were not convenient (i.e. too small, noisy, and air pollution). However, these women participated in aerobic dance regularly.

4. Benefits of LTPA. Twenty one subjects (7%) emphasized the advantages of LTPA. For instance, a 54 year-old woman supported the benefits of regular LTPA by saying that "*I have recovered from intestinal cancer for 4 years because I have exercised regularly*". Another 41 year-old woman said "*After you have started LTPA for 7 days, you will feel its benefits that you cannot explain"*. Nevertheless, of the 21 subjects, 5 women stated that even though they really recognized the benefits of LTPA, they did not have time to perform LTPA.

Social Desirability Index Assessment

The statistical analysis demonstrated that social desirability of the sample was moderately high but did not appear to bias this study. Strahan & Gerbasi (1972) reported reliability coefficients from .59 to .70 in four samples of college students and nonstudents. For this study, four items ("I'm always willing to admit it when I make a mistake", "I have never been irked when people expressed ideas very different from my own", "At times I have really insisted on having things my own way", and I never resent being asked to return a favor") had low item-total correlation .009, .06, .07, and .10 respectively. The reliability of the measure with the items included was .44. The four items were removed. The alpha coefficient for the 6 remaining items was .51. Item to total correlations for the 6 items were from .13 to .44.

The mean social desirability score using the Marlow-Crowne scale (Strahan & Gerbasi, 1972) was 9.29 (SD = 1.37) on a scale from 6 to 12. Pearson correlation

coefficients for the 6 items social desirability scale and theory variables were statistically nonsignificant with correlation coefficients between -.007 and .059. As a result, a social desirability response set did not emerge to bias the results of the study.

Summary

Data was analyzed by using SPSS and LISREL programs. The results from the SEM analyses showed an overall good fit between the WPAPM and the data. The model explained 55% of the variance of the women's LTPA. The research hypotheses are partially supported by the data. The findings revealed that interpersonal influences, perceived benefits, and perceived barriers had indirect effects on middle-aged Thai LTPA through perceived self-efficacy. These three factors accounted for 70% of the variance in perceived self-efficacy. Interpersonal influences had a positive direct effect on perceived benefits, a negative direct effect on perceived barriers, and a positive direct effect on perceived self-efficacy. Perceived self-efficacy accounted for the largest proportion of the variance in the middle-aged Thai women's LTPA.

CHAPTER 5
DISCUSSION

The findings of the study and related theoretical and methodological implications are discussed in this chapter. First, characteristics of the study sample and study variables are presented. Second, the model and hypotheses testing results are discussed. The last section provides an analysis of methodological issues encountered in the study.

Characteristics of the Study Sample

Socio-Demographic Data

The statistical analyses demonstrated that characteristics of the study sample were similar to those of the country. Namely, socioeconomic status of the sample included low to high incomes. Most of the sample reported household incomes ranging from 10,001 to 20,000 Baht per month which is similar to the report from the National Statistics Office (2004) that in 2002 the average monthly household income of Thai people was 13,418 Baht. In the study sample, 32% indicated they were head of their households which is similar to figures by the National Statistics Office (2004), in which 30.2% of the Thai households were headed by women. The findings of this study indicated that 40% were obese which is similar to the report of the National Health Policy Committee (2001) that 40.2% of middle-aged Thai people were obese.

Similar to the findings of Chuprapawan (2000), the health problems reported most frequently among middle-aged Thai women were back and knee pain. Approximately 50% of the sample for this study was suffering from these problems. Also, 30 – 40% of this sample reported symptoms of menopause such as headache, dizziness, irritability, excessive tiredness, and insomnia. The findings of this study also are consistent with a study of middle-aged Thai female teachers working in vocational colleges (Pongma, 1999).

In summary, the sample ranged from low to high socioeconomic status. Nine tenths of the subjects had at least one health problem indicating that the middle-aged women's health status was not good. These health problems may be related to hormonal changes with menopause and perimenopause, fatigue or stress from housework and occupational duty, and physical activity inactivity.

General Activities

Activities performed during free time. Forty eight percent of this sample preferred watching television or listening to music during free time. This is consistent with data from the National Statistics Office (2002) indicating that Thai women aged 40-59 years spent most free time using mass media including watching TV, listening to music, using the computer, and reading. Many subjects in this investigation stated that they were tired from working and needed to rest. This finding also is consistent with a study conducted in Australia in that watching TV was the most common reported leisure-time sedentary behavior among women, followed by sitting while socializing and reading (Salmon et al., 2003). These sedentary behaviors may be related to the prevalence of obesity as 40% of the sample was obese and 23.7% were at-risk for obesity (Salmon, Bauman, Crawford, Timperio & Owen, 2000).

Walking and climbing stairs. In regard to walking daily, 30.7% of the sample walked for less than 10 minutes without stopping whereas 48% reported walking more than 30 minutes daily. Although the findings indicated that 24.7% of the women did not participate in LTPA, half of the sample walked for their occupation or transportation. Many women in this study, particularly storekeepers and vendors stated that they walked 5-7 hours per day for occupation. On the other hand, approximately half of the sample was sedentary because they walked less than 30 minutes a day.

Lee and colleagues (1992) reported that the proportion of women who reported not climbing stairs was similar to the Harvard College Alumni study, 11% and 12.5%, respectively. In this study approximately 40% reported climbing more than 10 flights a day because many climbed 32-40 steps per flight using bridges to cross over streets. Although climbing more than 100 steps per day would expend at least 40 kcal per day, this activity may cause knee pain among middle-aged Thai women.

Characteristics of Study Variables

Leisure-Time Physical Activity

The results demonstrate that one fourth of the sample did not participate in any LTPA during the past week. Among women performing LTPA, walking for exercise (41%) was most commonly reported, followed by aerobic dance (36%), calisthenics or stretching exercises (21%), and jogging (9.7%) which is consistent with the findings of a study of Thai female nurses working in a hospital (Sriaka, 2000). These findings are similar to the report of the National Health Interview Survey in 1991 (USDHHS, 1996) in which walking (49.4%) was the most commonly reported LTPA among U.S. women aged 45-64, followed by gardening (29.6%), stretching exercises (21.4%), riding a bicycle or exercise bike (12.6%), stair climbing (10.3%), and aerobic dance (6.6%). This is not surprising because walking can be incorporated into daily activities and does not require specific equipment. There is minimal risk of pain or injury from walking. Moreover, walking is cost effective as it is free and can reduce driving costs.

Physical activity recommendation. The results of this study demonstrated that approximately 44% of the sample met the CDC-ACSM recommendations; however, fewer women (30.7%) met the criterion of the SGR (1,000 kcal/week). It is possible that the latter criterion was based on Americans' body weight which is greater than that of Thai women. This observation is consistent with the report of National Health Interview Survey (Jones et al., 1998) that the proportion of adults meeting the SGR guideline varied with body weight. Namely, fewer men met the CDC-ACSM recommendations than met the SGR guidelines (34.3% vs. 47.4%) whereas the proportion of women meeting the two criteria were similar (29.8% vs. 29.2%). In sum, this study demonstrates that the proportion of Thai women meeting the CDC-ACSM recommendations was different from those who met the SGR guidelines. Future research may investigate the criterion of weekly energy expenditure associated with decreased risk of CVD and total risk for NCD mortality among Thai women.

The proportion of women meeting the CDC-ACSM recommendations in this study is similar to an Australian study but differs from an U.S. study. For example, Brown et al. (2000) reported that 41.7% of Australian women aged 45-50 met the CDC-ACSM recommendations. In the U.S., Eyler and colleagues (1999) found that

25.2% of minority women aged 40 and older met the recommendations of the CDC-ACSM and 37.5% reported no LTPA in the past two weeks (this study 24.7 %). Like a study conducted during 1996-1997, Brownson et al. (2000) demonstrated that among minority women 40 years and older 36.7 % reported no LTPA.

At this time no research has been conducted in Thailand regarding the proportion of middle-aged women meeting the CDC-ACSM recommendations. Approximately 3% of female nurses working in a hospital (Sriaka, 2000) and 5% of female faculty members working in a University (Dasa, 2001) aged 20-60 years reported that they performed moderate-intensity physical activity for 20-60 minutes, 3-5 days per week. The MOPH reported that in 2003, 38.3% of Thai people aged 6 years and older reported participation in moderate to vigorous LTPA for 30 minutes 3 days per week but did not report data for women specifically. For people living in Bangkok Metropolis, the MOPH reported that of people aged 15 – 65 years, 35.8% reported no LTPA and only 13.7% participated in LTPA 30 minutes 3 days a week. The intensity of the activities was not reported (Department of Health, MOPH, 2004). Consunsi (2000) revealed that less than 30% of women aged 45-59 years attending a menopausal clinic exercised 20 minutes 3 times a week but this study also did not report exercise intensity.

In sum, the proportion of middle-aged physically active Thai women was not much different from that of Western women. In addition, middle-aged women in this study are more physically active than prior studies conducted in Thailand (Department of Health, MOPH, 2004; Consunsi, 2000; Sriaka, 2000). It may be due to the effect of the Thailand government campaign, “Moving for Health”, which has been in place for three years. Many women in this study, for example, stated that they became active because of government campaigns promoting physical activity as well as through encouragement from nurses and volunteers in their communities. Nevertheless, the proportion of physically active women did not reach the goal of Thailand’s national health policy.

Interpersonal Influences

Social support. The findings indicated that the sample perceived low social support for LTPA which may help to explain the low LTPA score. Friends were the source of social support reported most frequently by middle-aged Thai women. Health professionals were the source of support reported least frequently. These findings are similar to older women in the U.S. (Resnick, Orwig, Magaziner & Wynne, 2002).

The results demonstrated that women perceived they received little support from others. Namely, they occasionally received emotional and informational support and rarely received tangible support. The women reported that they seldom received assistance regarding taking over chores, transportation, and money from others. However, emotional support was shown to be the most important type of support among this sample which is similar to middle-aged women in the U.S. (Duncan et al., 1993).

Social norms. Women perceived that significant others, especially family members, expected them to participate in LTPA. This differs from minority women in the U.S. (e.g. Eyler et al., 1998; Tortolero et al., 1999) who perceived family members as not expecting them to perform LTPA. The high social norms score for LTPA may be related to many factors including Thai societal expectations, the government health promotion campaigns to increase physical activity, and acceptance of LTPA as desirable among Thai people, including middle-aged women.

Modeling. This construct has not been reported before in relation to LTPA among middle-aged Thai women. The results of this study indicated that most of middle-aged Thai women perceived friends, husbands, sons or daughters, and aerobic dance leaders as role models. Interestingly, the results of the present study demonstrated that mass media influences women's LTPA. Approximately 30% of the sample reported political leaders, sports figures, stars, and singers as role models whereas health care providers were mentioned least frequently. Health professionals may not serve as role models for LTPA as a recent study found that only 3% of female nurses participated in LTPA regularly (Sriaka, 2000). Identification of influential role models is important when promoting LTPA among women.

Perceived Benefits

Physiological benefits. As expected, the physiological benefits of LTPA appear to be important among this sample, in particular, physical fitness and physical appearance. Interestingly, many subjects did not perceive that performing LTPA would prevent hypertension. It is possible they were unaware of the broad benefits of LTPA, particularly CVD and hypertension prevention. Kairoj (1999) found that middle-aged Thai women with hypertension showed negative attitudes toward LTPA indicating that fear of fainting, weakness, headache, and falling were barriers to performing LTPA.

Psychosocial benefits. The sample perceived fewer psychosocial benefits than physiological benefits. It is possible that many were unaware of the psychosocial benefits unless they performed LTPA regularly (Lee, 1993b). This observation was related to the evidence that more than half of this sample did not meet the CDC-ACSM recommendations. Paffenbarger, Lee & Leung (1994) revealed that the Harward alumni meeting the recommendations of CDC-ACSM and SGR had better mental health than those not meeting the recommendations. In general, however, both perceived physiological and psychosocial benefits among these women were relatively high.

Perceived Barriers

Personal barriers. The results revealed that the majority of women preferred LTPA advice suitable for their age and health status. This finding is consistent with other studies (e.g. Booth et al., 1997; Nies et al., 1998; Lindgren & Bengt, 1999). Booth et al. indicated that older women wanted professional advice on appropriate activities more than younger adults. Chareansook (1998) revealed that middle-aged females and males living in a province of Thailand reported lack of knowledge in relation to age appropriate LTPA. This finding, along with findings related to social support and perceived benefits, suggest that health care providers should provide more emotional and informational support for middle-aged women in order to decrease the barriers to LTPA.

In addition, most of the sample reported that performing LTPA was acceptable for women which may reflect Thai society values. Therefore, gender may not be a barrier for Thai women.

Environmental barriers. As predicted, the findings are consistent with other studies (e.g. Booth et al., 1997; King et al., 2000; Chareansook, 1998; Kairoj, 1999) which found that lack of time, lack of place, and unattractive surroundings are the most common environmental barriers whereas cost was not a major issue for these women. Results from the interviews suggest that many women were so busy with both occupation and housework that they did not have time to do LTPA although they recognized its benefits. Some women reported that they wanted to participate in an aerobic dance program scheduled 4 to 7 pm but could not due to work or traveling home after work during those hours.

Perceived self-efficacy

Middle-aged Thai women perceived low self-efficacy for LTPA which is related to the low LTPA scores. The women had high perceived confidence in doing LTPA during vacation or at night but low perceived self-efficacy in doing LTPA when family problems arose or when family members were sick. These findings are similar to Korean adults with chronic diseases (Shin et al., 2000). This finding is relevant to the caregiving role of women with family responsibilities. Some women stated that they did stretching exercises at night after their work was completed and family needs were met. A number of studies (e.g. Henderson, 1990; Eyler et al., 1998; Nies et al., 1999) have found that women, particularly married women, are primarily responsible for housework and children.

Model and Hypotheses Testing Results

The results of the SEM analyses demonstrated that the WPAPM had a better fit by allowing the relationship between the errors of physiological benefits with personal barriers. An advantage of SEM analysis is that the error terms of variable measurement exist and are possible to correlate. The goodness-of-fit measures indicated that the proposed model constructed from the two theories (i.e. HPM and Self-Efficacy Theory) fit the empirical data well and accounted for 55% of the variance in physical activity of middle-aged Thai women. The findings depict that the strong predictors are included in the model and the model is parsimonious. Moreover, the results of this study supported the causal relationships among these predictors.

The WPAPM explained a high proportion of variance of LTPA compared to prior studies based on the HPM. Namely, Pender et al. (2002) reported 9 studies conducted in the U.S. and Taiwan that explained 10-59% of the variance in physical activity (i.e. LTPA and exercise). Chinuntuya (2001) explained 52% of the variance in LTPA and 32% of the variance in lifestyle exercise among Thai elderly. Thus, this study was comparable to other studies in which variables explained more than 50% of the variance in physical activity.

Hypotheses Testing

The findings reveal that 5 of the 7 hypotheses were supported by the empirical data whereas 2 hypotheses were not.

Hypothesis One. As expected, interpersonal influences had a positive direct effect on perceived benefits explaining 36% of the variance in perceived benefits of LTPA. Women who perceive high social support for LTPA, perceive higher expectations to perform LTPA, and experience role modeling of LTPA perceived higher benefits than women who did not have these resources. Wu & Pender (2002) found interpersonal influences accounted for 16% of the variance in perceived benefits of LTPA among Taiwanese adolescents.

Hypothesis Two. Interpersonal influences had a negative direct effect on perceived barriers. That is, the less the perception of social support, social norms, and modeling regarding LTPA, the more perceived barriers to perform LTPA the women had. This finding makes sense because women who did not receive encouragement or assistance for performing LTPA, perceived high barriers to perform LTPA. This study is congruent with Wu & Pender's study (2002) in which interpersonal influences explained 25% of the variance in adolescents' perceived barriers to participate in LTPA. In this study, interpersonal influences explained 32% of the variance.

Hypothesis Three. As hypothesized, interpersonal influences had a positive direct effect on perceived self-efficacy and an indirect effect through perceived benefits and perceived barriers. Theses three cognitions accounted for 70% of the variance in perceived self-efficacy. This finding is different from Wu & Pender's study (2002) in which interpersonal influences affected perceived self-efficacy directly and indirectly through perceived barriers only.

Interpersonal influences are a source of self-efficacy. According to Bandura (1997), sources of self-efficacy include enactive mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. Social support (i.e. emotional, informational, instrumental support and social companionship) increases self-efficacy both directly and indirectly via perceived benefits and barriers. It is clear that modeling, through vicarious experiences, raises self-efficacy. Social norms, or expectations from significant others, influence self-efficacy by creating positive feelings and confidence to participate in LTPA and may also aid in reducing barriers to perform the activity.

Hypothesis Four. Results of the present study support the hypothesis that perceived self-efficacy had a positive direct effect on women's LTPA. Perceived self-efficacy was the most powerful predictor in explaining participation in LTPA among middle-aged Thai women which is consistent with most studies (e.g. Sallis et al., 1986, 1989; McAuley, 1992, 1993; Wu & Pender, 2002). Interestingly in the current study the variance in women's LTPA explained by perceived self-efficacy was much greater (β =0.93, $p < 0.01$) than in prior studies by Wu & Pender ($\beta = 0.44$, $p < 0.05$), McAuley ($\beta = 0.24$ to 0.42, $p < 0.01$), and Conn (1998) ($\beta = 0.48$, $p < 0.001$).

There are several possible explanations for this finding. First, the sample was a very homogenous group. Second, it may due to the effects of the combination of three major predictors (i.e. interpersonal influences, perceived benefits, and perceived barriers) whereas other studies did not include all of these constructs. A final explanation for this finding may be that the relationship between self-efficacy and performance in sport or physical activity was high because the self-efficacy measure was constructed following Bandura's recommendations (2001) and the measures of perceived self-efficacy and the performance were concordant, which is supported by the study of Moritz et al. (2000).

Hypothesis Five. The findings partially support this hypothesis in that perceived benefits had an indirect effect on middle-aged Thai women's LTPA through perceived self-efficacy but no significant direct effect was found. This finding is inconsistent with the HPM in that perceived benefits typically have a direct effect on a behavior. It is incongruent with the studies of Resnick et al. (2000), Resnick et al. (2002), Resnick and Nigg (2003), and Conn (1998) in which perceived benefits had a

significant positive direct effect on LTPA in older adults ($\beta = 0.17$, $p < 0.05$; $\beta = 0.32$, $p < 0.05$; $\beta = 0.15$, $p < 0.05$; $\beta = 0.17$, $p < 0.05$, respectively). Also, this finding is inconsistent with the studies of Resnick et al. (2000), Resnick et al. (2002), and Conn (1998) in that perceived self-efficacy affected perceived benefits in older adults ($\beta = 0.57$, $p < 0.05$; $\beta = 0.70$, $p < 0.05$; $\beta = 0.50$, $p < 0.001$, respectively). However, this study is congruent with the study of Wu & Pender (2002) and Sallis et al. (1992) that perceived benefits did not have significant direct effect on adolescents' LTPA and adults' vigorous LTPA, respectively.

It is interesting that perceived benefits had a nonsignificant negative direct effect on the women's LTPA ($\beta = -0.15$, $p > 0.05$) instead of a positive effect. A possible explanation for this finding is that the perception of benefits of LTPA works effectively only through perceived self-efficacy, not by itself. That is, sedentary women in the stage of contemplation (weighing the pros and cons of LTPA) or preparation (intending to perform LTPA) who have knowledge and perceive high benefits of participation in LTPA but do not have success in enactive mastery experience will not perform LTPA regularly. From interviews, many women stated that they well understood the advantages of LTPA but they had no time to perform the behaviors. The results of this study help us to understand further why perceived benefits did not predict LTPA in some studies (e.g. De Bourdeaudhuij & Sallis, 2002; Asawachaisuwikrom, 2001; Wu & Pender, 2002).

The results demonstrate the mediational role of perceived self-efficacy between perceived benefits and LTPA which has not been tested in previous studies. This study shows that perceived benefits may increase perceived self-efficacy.

Hypothesis Six. The findings also partially support the hypothesis that perceived barriers had an indirect effect on middle-aged Thai women's LTPA through perceived self-efficacy ($\beta = -0.38$, $p < 0.001$) although the direct effect was not significant. This evidence is congruent with the study of Hofstetter et al. (1990) and Wu & Pender (2002) but incongruent with the HPM and Conn (1998). Namely, Hofstetter et al. and Wu & Pender found that perceived barriers had a negative direct effect on perceived self-efficacy ($\beta = -0.34$, $p < 0.001$ and $\beta = -.50$, $p < 0.05$, respectively) and also did not have a direct effect on LTPA. The HPM depicts that perceived self-efficacy influences perceived barriers by decreasing the power to

obstruct behavior; moreover, perceived barriers has a direct effect on a behavior. Conn found that perceived barriers had a negative direct effect on elders ($\beta = -0.28$, $p < 0.001$) and an indirect effect through perceived self-efficacy ($\beta = -.46$, $p < 0.001$).

Again, the present study revealed that perceived barriers had a nonsignificant positive direct effect on the women's LTPA ($\beta = 0.18$, $p > 0.05$). It is possible that some sedentary women or women who do not intend to participate in LTPA may not perceive the obstacles to perform the activity. In turn, for some active women, although they faced many barriers still participated in LTPA regularly. For instance, qualitative data collected from an open-ended questionnaire found that 3 subjects (1%) complained that the places for aerobic dance were not convenient such as too small, too noisy, and air pollution. However, these women still participated in aerobic dance regularly.

This finding also confirms that perceived self-efficacy serves a mediational function in explaining the influence of perceived barriers on LTPA. This study suggested that lowering the perception of barriers alone does not increase level of LTPA but a sense of efficacy has to be developed.

Hypothesis Seven. As predicted, interpersonal influences affected women's LTPA indirectly through perceived benefits, perceived barriers, and perceived self-efficacy. This finding is consistent with those of a study among the U.S. adults (Duncan & McAuley, 1993) and Taiwanese adolescents (Wu & Pender, 2002).

The results of this study confirm that the influence of social support, social norms, and modeling are not sufficient to independently increase the level of LTPA if women do not perceive high benefits, low barriers, and, the most important mediator, high self-efficacy for LTPA.

In summary, the WPAPM showed that perceived self-efficacy is the most important mediating variable explaining the effects of interpersonal influences, perceived benefits, and perceived barriers on middle aged Thai women's LTPA. Among these predictors, perceived self-efficacy is the strongest predictor followed by interpersonal influences, perceived barriers, and perceived benefits. The model is similar to the HPM in that perceived self-efficacy is a central construct but different from the HPM in that the HPM depicts that interpersonal influences, perceived benefits, perceived barriers, and perceived self-efficacy have both direct and indirect

effects on a behavior. The WPAPM found that only perceived self-efficacy had a direct effect on women's LTPA. The HPM does not propose a relationship between interpersonal influences and perceived self-efficacy or between perceived self-efficacy and perceived benefits. The HPM does however propose that perceived self-efficacy has a direct effect on perceived barriers. The WPAPM revealed that interpersonal influences had a positive direct effect on perceived benefits, a negative direct effect on perceived barriers, and positive direct and indirect effects on perceived self-efficacy through perceived benefits and perceived barriers. In addition, this study found that perceived benefits and perceived barriers did not have a direct effect on LTPA behavior of middle-aged Thai women.

This study contributes to the HPM literature by demonstrating that interpersonal influences, perceived benefits, and perceived barriers explained 70% of the variance of perceived self-efficacy. This study also confirmed the importance of perceived self-efficacy in that it was the most powerful predictor for middle-aged Thai women's LTPA. However, this investigation is an exploratory study conducted within the Thai culture therefore future studies should be conducted to validate the WPAPM in other populations, age groups, and people of different socioeconomic status.

Methodological Issues

Instrumentation Issues

Psychometric evaluations of the instruments used in this study including face validity, internal consistency and stability, and construct validity were satisfactory. However, the results indicated that some items had low reliability, particularly three social support items. These items had low variations (SD ranged from 0.24 to 0.41) (Appendix J) indicating that they did not differentiate among respondents. Some items also may not fit this sample. Therefore, theses instruments should be revised in the next study.

Another issue is some scales are relatively long. Namely, the LTPA benefits/barriers scale has 44 items and the social support for LTPA scale has 18 items. Some subjects may have felt fatigued completing the questionnaire. These scales should be revised and shortened for use in communities or clinics.

Data Collection Issues

Self-report administration was found to be appropriate for this population. Readability and clarity of the words or statements in the self-report questionnaire was very important. Although the questionnaire was tested for clarity and understanding some subjects requested further explanation from the investigator. Thus, the investigator should remain available to answer questions because some subjects may not be familiar with answering questionnaires particularly those with low education.

Limitations

This study had limitations that may have influenced its results.

1. Since the sample was randomly selected from women living in Bangkok Metropolis, the capital of Thailand, and did not include women not able to read and write the findings from this study may not be generalizable to all middle-aged Thai women.

2. Physical activity is difficult to measure directly and may be seen by subjects as a socially desirable behavior. In addition, the information obtained from self-report questionnaires might be underreported or over-reported. Use of self-report questionnaires is appropriate for this study due to the large sample size, lower cost, and ability to recruit subjects from several locations. Social desirability was assessed to determine if subjects responded to questions honestly or in a socially desirable manner.

3. Since other physical activities such as occupation and housework were not included in this study, the proportion of women meeting the CDC-ACSM and SGR recommendations may be underestimated.

Summary

The findings of this study revealed that the LTPA levels among the middle-aged Thai women were higher compared to the previous studies conducted in Thailand which may relate to the government health promotion campaigns. Nevertheless, the LTPA levels did not reach the MOPH goals. The results supported the proposed theoretical framework of this study. That is, perceived self-efficacy is an important

mediating variable explaining the effects of interpersonal influences, perceived benefits, and perceived barriers on LTPA participation.

CHAPTER 6
CONCLUSION

This chapter presents a summary of the study and review pertinent findings pertaining to the research questions. Nursing implications and recommendations for future research in health promotion are provided.

Summary of the Study

Non-communicable diseases are the most compelling health problems among middle-aged Thai women. In 2000, the MOPH reported CVD was the major cause of death among women followed by cancer, infectious disease, and diabetes. Despite evidence that participation in 30 minutes or more of moderate physical activity each day for 3-5 days per week can prevent many chronic health problems, only 20% of women perform physical activity regularly. Women aged 40-59 years who have responsibilities for family care and work outside the home are at risk for inactivity and susceptible to NCD. Promoting active lifestyles among women is a significant role of community nurses because it will not only reduce the risk of NCD and health care expenditures but also improve the health of women and their families. Therefore, a better understanding of factors influencing LTPA among these women is needed.

The purpose of this study was to develop a causal model to explain LTPA behavior among middle-aged Thai women. The model used in the study, WPAPM, was based on the HPM (Pender, 1996) and Self-Efficacy Theory (Bandura, 1997). A descriptive, cross-sectional research design was used to examine the relationships among selected behavior-specific cognitions (i.e. interpersonal influences, perceived benefits, perceived barriers, and perceived self-efficacy) and LTPA among middle-aged Thai women.

The sample of 300 women aged 40-59 years living in Bangkok Metropolis was randomly selected using multistage random sampling. The majority of the sample was married and housewives. Almost haft of the sample had 4-7 years of formal education. Most reported a household income of 5,001-30,000 Baht per month.

Almost 90% of the sample reported at least one health symptom. The most frequently reported activities during leisure time were watching television, talking with friends or family members, and gardening. Approximately 30% of the subjects reported they did not walk at least 10 minutes without stopping and 11% reported they did not climb stairs in the past week.

Of the sample, one fourth reported no LTPA in the past week. Among the women reporting participation in LTPA, the most frequent type of LTPA was walking for exercise, reported by 41% of the subjects. The next most frequent type of LTPA was aerobic dance followed by calisthenics (stretching exercise) and jogging. Of the subjects, 43.3% met the recommendations of CDC-ACSM, 30.7% met the criterion of SGR, and 47.3% met the criterion of 600 kcal/week defined in this study.

The pertinent findings for each of the research questions investigated in this study were as follows.

1. Does the hypothesized model of factors contributing to LTPA among middle-aged Thai women adequately fit the data?

The SEM analysis indicated that the proposed model fit the data well (i.e. χ^2 [20, N = 300] = 19.64, p = 0.48; GFI = 0.99; AGFI = 0.97; and RMR = 0.02). The model accounted for 55% of the variance in LTPA participation among the middle-aged Thai women.

2. What are the relationships among selected behavior-specific cognitions and LTPA among middle-aged Thai women?

Interpersonal influences including social support, social norms, and modeling had statistically significant indirect effects on the middle-aged Thai women's LTPA through perceived benefits, perceived barriers, and perceived self-efficacy. Namely, interpersonal influences had a positive direct effect on perceived benefits and perceived self-efficacy and a negative direct effect on perceived benefits. Perceived benefits positively affected LTPA indirectly through perceived self-efficacy while perceived barriers negatively affected LTPA indirectly through perceived self-efficacy. Perceived self-efficacy was influenced by interpersonal influences directly and indirectly via perceived benefits and perceived barriers. Only perceived self-efficacy influenced LTPA directly. Perceived self-efficacy, therefore, is an important

mediating variable explaining the effects of interpersonal influences, perceived benefits, and perceived barriers on the women's LTPA.

The results of this study did not support direct effects of perceived benefits and perceived barriers on LTPA. These findings revealed that perceived self-efficacy is the strongest predictor of the middle-aged Thai women's LTPA followed by interpersonal influences, perceived barriers, and perceived benefits. Perceived adequate and appropriate interpersonal influences, perceived high benefits of LTPA and perceived low barriers to LTPA may be necessary to initiate or maintain the behavior but are certainly not sufficient. Strengthening one's self-efficacy for participation in LTPA is important for success in promoting the activity.

Implications and Recommendations

Developing Theoretical explanations for promotion, maintenance, and restoration of human health is an essential role of nurses. Implications of the current study for the health sciences, nursing practice, and nursing research and related recommendations are presented in this section.

Implications for Science

Since little is known regarding the determinants that influence LTPA among middle-aged Thai women, this study proposed a causal model which explained 55% of the variance of the women's LTPA. The results of this study increase nursing knowledge by explaining the important roles of interpersonal influences, perceived benefits, perceived barriers, and perceived self-efficacy on LTPA behavior among middle-aged Thai women. This study also contributes to nursing's body of knowledge by developing a middle-range theory to explain and guide LTPA promoting behavior among these women.

Implications for Nursing Practice

The results of this study indicated the proportion of women who met the CDC-ACSM recommendations as well as demonstrated LTPA assessment. These findings can be used to guide nurses for evaluating LTPA behaviors of people in communities. It is suggested that using the CDC-ACSM recommendations is the most practical. That is, the accumulation of 30 minutes of moderate-intensity physical activity (e.g. brisk walking and aerobic dance) for 5 days per week. Two or three short

bouts (8-10 minutes per bout), totaling 30 minutes or more per day would obtain health benefits. Those who prefer lower-intensity activities (e.g. yoga and Tai-Chi) should perform them more often (e.g. 7 day per week), for longer period of time (45-60 minutes), or both (Pate et al., 1995).

Although it has been suggested that LTPA is important, other types of physical activity also should be promoted. Nurses should encourage women to be active whenever possible, for instance, walking instead of driving and climbing stairs instead of taking elevators. Moreover, nurses should play a role in promoting LTPA through teaching such as informing patients of the physiological (e.g. hypertension prevention) and psychosocial (e.g. mental health improvement) benefits of physical activity. Nurses also should promote organizations (e.g. working places and school) to provide facilities for being active, for example, aesthetic and convenient places to walk or perform LTPA.

Because perceived self-efficacy was the strongest predictor for LTPA and friend, family, and health care professional support were important among the women, nurses should promote self-efficacy based physical activity programs. The LTPA programs should increase perceived self-efficacy by enhancing the benefits, limiting the barriers, and including social support, social norms, and modeling. Followings are examples of strategies to strengthen LTPA efficacy beliefs.

Nurses should provide women motivation to achieve performance along with verbal encouragement and reinforcement of advantages of the LTPA. Interdisciplinary physical activity programs should also be developed and include friends, family members, particularly husbands, and health care providers. These programs should be advertised widely and involve influential role models. Nurses as well as other health care providers can be important role models for LTPA. Providing information regarding appropriate physical activity, preventing or lowering negative consequences of performing LTPA, and facilitating convenient time and places for doing physical activity may decrease possible barriers. These strategies are important for community health nurses as well as nurses working in hospitals and clinics.

According to study results, middle-aged Thai women received support for LTPA least frequently from health care providers who seldom were role models of LTPA. Thus, it is important for nursing administrators or educators to improve nurses'

ability to promote LTPA. A physical activity promotion course should be included in nursing curriculum. Nurses also should be encouraged to role model active lifestyles.

Implications for Future Research

Future studies are needed to validate the WPAPM in different population subgroups such as women of low and high income and education status as well as in different contexts such as rural areas. In addition, future studies should include quasi-experimental investigations to replicate these findings. The findings revealed that the relationships among perceived benefits, perceived barriers, and LTPA were not as expected in that perceived benefits had a nonsignificant negative direct effect on LTPA and perceived barriers had a nonsignificant positive direct effect on LTPA. This may be due to the effect of stage of physical activity; therefore, future research should focus on women in the different stages of change in LTPA behavior such as contemplation and maintenance.

Summary

This study demonstrated the usefulness of a behavior-specific and culture-specific model in explaining LTPA among middle-aged Thai women in the community. Nurses should conduct further research to test this model, the WPAPM, in diverse Thai populations. The long-term goal of nursing research is to develop effective nursing interventions to promote active and healthy lifestyles in all segments of the population.

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APPENDIX

APPENDIX A

List of Experts for Face Validity

1. Associate Professor Dr. Chounchom Charoenyooth
   Faculty of Nursing, Mahidol University
2. Associate Professor Dr. Linchong Pothiban
   Faculty of Nursing, Chiang Mai University
3. Dr. Somchai Leetongin
   Director of Division of Physical Activity and Health,
   Department of Health, Ministry of Public Health

APPENDIX B

Personal Data Sheet

คำชี้แจง โปรดให้ข้อมูลปัจจุบันเกี่ยวกับตัวท่าน โดยเติมคำหรือตัวเลข ลงในช่องว่าง หรือ ทำเครื่องหมาย √ หรือ วงกลมล้อมรอบข้อที่เป็นคำตอบ

1. อายุ _____ ปี
2. ความสูง _____ เซนติเมตร
3. น้ำหนัก _____กิโลกรัม
4. ระดับการศึกษาสูงสุด

1)	ไม่ได้เรียนหนังสือ	5)	ปริญญาตรี
2)	ประถมศึกษา	6)	ปริญญาโท
3)	มัธยมศึกษา/ปวช.	7)	ปริญญาเอก
4)	ปวส./อนุปริญญา	8)	อื่นๆ โปรดระบุ _____

5. อาชีพหลัก

1) แม่บ้าน
2) ค้าขาย
3) นักวิชาการ/ครู-อาจารย์
4) รับจ้างทั่วไป (เช่น เย็บผ้า, ช่างเสริมสวย)
5) ทำงานโรงงาน
6) ทำงานบริษัท/สำนักงาน
7) ทำงานราชการ/รัฐวิสาหกิจ
8) ทำการเกษตร (ทำไร่ ทำนา ทำสวน)
9) ว่างงาน (ไม่มีงานทำ)
10) อื่น ๆโปรดระบุ _____

6. สถานภาพสมรส

1) โสด

2) คู่

3) หม้าย/หย่า/แยก

7. ท่านเป็นหัวหน้าครอบครัวใช่หรือไม่

1) ไม่ใช่

2) ใช่

8. รายได้ของครอบครัว

1) รายได้ส่วนตัวของท่าน ประมาณเดือนละ_____บาท

2) รายได้ของสมาชิกคนอื่นในครอบครัวรวมกัน ประมาณเดือนละ _____บาท

9. ท่านมีภาระในการดูแลเด็กอายุต่ำกว่า 7 ปี ผู้สูงอายุ คนเจ็บป่วย หรือ ผู้พิการที่ช่วยเหลือตัวเองไม่ได้ หรือไม่

1) ไม่มี

2) มี จำนวน _____ คน

10. ภาวะประจำเดือนของท่านในรอบ 12 เดือนที่ผ่านมา

1) มาปกติ

2) มาไม่ปกติ

3) ไม่มาเลย หมดเมื่ออายุ _____ ปี

11. ขณะนี้ท่านกินฮอร์โมนทดแทนอยู่หรือไม่

1) ไม่ได้กิน

2) กิน

Please describe yourself.

1. What is your age? _____years.
2. What is your height? _____centimeters.
3. What is your weight? _____kilograms.
4. What is the highest level of school you have completed? Please check one.
    1) Never attended school
    2) Elementary school
    3) High school
    4) Vocational education
    5) Bachelor's degree
    6) Master's degree
    7) Ph.D.
5. What is your occupation?
    1) Housewife
    2) Storekeeper
    3) Academic or professional
    4) Services (e.g. dressmakers)
    5) Factory employee
    6) Company employee
    7) Civil or state enterprise servant
    8) Unemployed
    9) Others Please specify_____
6. What is your present marital status?
    1) Never married
    2) Married
    3) Separated/divorced/widowed
7. Do you head your family?
    1) No
    2) Yes

8. What is your total family monthly income?
   1) yourself _____Baht
   2) others _____Baht

9. Do you have to take care of children younger than 7 or family members who are ill, old or disability?
   1) No
   2) Yes How many people? _____

10. How do you describe your menstrual period during the past 12 months?
   1) Regular
   2) Irregular
   3) None since _____ years old

11. Do you currently use hormone replacement therapy for menopause?
   1) No
   2) Yes

APPENDIX C

Thai Women Leisure-Time Physical Activity Questionnaire

คำชี้แจง

“การออกกำลังกาย” หมายถึง **การเคลื่อนไหวร่างกายที่ตั้งใจปฏิบัติในเวลาว่าง เพื่อให้เกิดการใช้พลังงาน** ซึ่งไม่ได้ทำเพื่อเป็นการประกอบอาชีพ การศึกษา การเดินทาง การทำงานบ้าน การดูแลสมาชิกในครอบครัวหรือการดูแลตัวเอง เช่นกิน นอน และดูแลสุขวิทยาส่วนบุคคล

ตัวอย่างของกิจกรรมการออกกำลังกาย เช่น ไทเก็ก โยคะ เต้นแอโรบิก วิ่งเหยาะ เล่นกีฬา และเต้นรำ(ลีลาศ) หรือ กิจกรรมพักผ่อนหย่อนใจอื่นๆ ที่ตั้งใจทำในช่วงเวลาว่าง เพื่อให้เกิดการใช้พลังงาน

ขอให้ท่านพิจารณาว่า ใน 7 วันที่ผ่านมา ท่านได้ปฏิบัติกิจกรรมเหล่านี้บ้างหรือไม่ หากท่านปฏิบัติขอได้โปรดระบุ**ระยะเวลาที่ปฏิบัติ** (ไม่นับรวมเวลาที่ใช้เดินทาง หรือ เตรียมตัวเพื่อกิจกรรมนั้นๆ เช่นการเปลี่ยนเสื้อผ้า อาบน้ำ หรือเวลาพัก) **จำนวนครั้ง ระดับความเหนื่อย และความต่อเนื่อง**

ขอให้ท่านได้โปรดอ่านข้อความต่อไปนี้ทุกข้อ แล้วกรุณา **ตอบตามความเป็นจริง** อนึ่งหากท่านปฏิบัตินอกเหนือไปจากนี้ขอได้โปรดระบุลงในข้อถัดไปด้วย

กิจกรรม	ใน 7 วันที่ผ่านมาท่านได้ปฏิบัติหรือไม่		ระยะเวลาที่ปฏิบัติโดยเฉลี่ยต่อครั้ง		ระดับความเหนื่อย				ปกติปฏิบัติเป็นประจำทุกสัปดาห์หรือไม่		หากปฏิบัติเป็นประจำทุกสัปดาห์ ท่านปฏิบัติมานานเท่าไร (เดือน/ปี)
	ไม่ได้ปฏิบัติ	ปฏิบัติ (ระบุจำนวนครั้งทั้งหมดใน 7 วัน)	ชั่วโมง	นาที	ไม่เหนื่อยหรือเหนื่อยเล็กน้อย	เหนื่อยปานกลาง	เหนื่อยมากจนไม่สามารถพูดกับคนอื่นได้จบประโยค		ไม่ได้ปฏิบัติ	ปฏิบัติ	
1. เดินเพื่อออกกำลังกาย											
2. วิ่งเหยาะ (จ๊อกกิ้ง)											
3. โยคะ											
4. เต้นแอโรบิก											
5. เต้นรำ(ลีลาศ)											
6. บริหารร่างกาย (เช่น ซิดอัพ)											
7. ปั่นจักรยานอยู่กับที่											
8. ไทเก๊ก											
9. เปตอง											
10. ว่ายน้ำ											
11. ปิงปอง											
12. แบดมินตัน											
13. อื่นๆ โปรดระบุ.....											
14. อื่นๆ โปรดระบุ.....											

Direction

In the past 7 days, did you perform the following activities (please see in the box below)? Please mark how many times in the past 7 days you did this activity. On the average, how long did you perform this activity for each time? How would you rate your level of exertion? Do you perform this every week? And if yes, how long have you performed this activity?

Activity	In the past 7 days, did you do the following activities?		About how many minutes did you do the activity each time?		How would you rate your level of exertion (degree of effort)?				Do you perform this every week?		If yes, how long have you performed this activity? (months/ years)
	No	Yes How many times in the past 7 days did you do this activity?	Hours	Minutes	Light	Moderate	Hard (made you breathe harder or puff and pant)		No	Yes	
1. Walking for exercise											
2. Jogging											
3. Yoga											
4. Aerobic dancing											
5. Ballroom dancing											
6. Calisthenics (e.g. sit-up)											
7. Stationary bicycling											
8. Tai-Chi											
9. Pe'tanque											
10. Swimming											
11. Ping-Pong											
12. Badminton											
13. Other please specify.....											

APPENDIX D

Leisure-Time Physical Activity Self-efficacy Questionnaire

คำชี้แจง คำถามต่อไปนี้ต้องการจะทราบว่า ถ้าหากมีสถานการณ์ต่อไปนี้เกิดขึ้น ท่านมีความมั่นใจมากน้อยเพียงใด ที่จะออกกำลังกาย สะสม วันละ 30 นาที เป็นประจำสัปดาห์ละ อย่างน้อย 3 วัน โดยในตารางต่อไปนี้ ด้านซ้ายจะเป็น สถานการณ์ที่อาจขัดขวางการออกกำลังกายได้ ด้านขวาจะเป็น ระดับความมั่นใจ ซึ่งเรียงลำดับตั้งแต่ "ไม่มั่นใจเลยว่าจะทำได้" หรือ 0 เปอร์เซ็นต์ ไปจนถึง "มั่นใจว่าจะทำได้อย่างแน่นอน" หรือ 100 เปอร์เซ็นต์

โปรดทำเครื่องหมาย √ ลงในช่องตามระดับความมั่นใจของท่านในแต่ละสถานการณ์

สถานการณ์	ระดับความมั่นใจที่จะออกกำลังกายอย่างสม่ำเสมอ อย่างน้อยสัปดาห์ละ **3** วันๆละ **30** นาที										
	ไม่มั่นใจเลยว่าจะทำได้		ค่อนข้างไม่มั่นใจ			ไม่ค่อยมั่นใจว่าจะทำได้หรือไม่ได้		ค่อนข้างมั่นใจ			มั่นใจว่าทำได้อย่าง แน่นอน
	0%	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
1. เมื่อรู้สึกเหน็ดเหนื่อยเมื่อยล้าจากการทำงาน											
2. เมื่อมีงานยุ่ง											
.											
.											
.											
15.เมื่อต้องดูแล สมาชิกในครอบครัว ที่เจ็บป่วย											

Please rate how sure you are that you can get yourself to perform your LTPA routines regularly (accumulating at least 30 minutes each day, for at least 3 days per week). Place a check (√) in the box for your answer.

Situations	Degree of confidence Cannot do at all Moderately certain can do Certain can do										
	0%	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
1. When I am feeing tired											
2. When I am feeing under pressure from work											
.											
.											
.											
15. When I have to take care of family members who are ill											

APPENDIX E

Leisure-Time Physical Activity Benefits/Barriers Questionnaire

คำชี้แจง คำถามต่อไปนี้ต้องการทราบเกี่ยวกับ ประโยชน์ที่ท่านได้รับหรือคาดว่าจะได้รับจากการออกกำลังกายและอุปสรรคที่ขัดขวางการออกกำลังกายของท่าน ขอให้ท่านโปรดตอบตามความเป็นจริง **ตามที่ท่านรู้สึกหรือพบด้วยตัวของท่านเอง** โดยทำเครื่องหมาย √ ลงในช่องที่ตรงกับคำตอบ

	ข้อความ	***เห็นด้วยอย่างยิ่ง***	***เห็นด้วย***	***ไม่แน่ใจ***	***ไม่เห็นด้วย***	***ไม่เห็นด้วยอย่างยิ่ง***
1	ฉันรู้สึกสนุกกับการออกกำลังกาย					
2	การออกกำลังกายช่วยให้ความตึงเครียดของฉันลดลง					
.						
.						
44	การเล่นกีฬา การออกกำลังกาย หรือทำกิจกรรมพักผ่อนหย่อนใจในยามว่าง ไม่เหมาะสมสำหรับผู้หญิง					

Below are statements that relate to ideas about LTPA. Please indicate the degree to which you agree or disagree with the statements by placing a check (√) in the box for your answer. Please check the box (es) to <u>All</u> that apply.

	Statements	***Strongly agree***	***agree***	***unsure***	***disagree***	***Strongly disagree***
1	I enjoy LTPA.					
2	LTPA decreases feeling of stress and tension for me.					
.						
.						
44	Women should not perform sport, exercise or recreational activities.					

APPENDIX F

Social Support for Leisure-Time Physical Activity Questionnaire

คำชี้แจง คำถามต่อไปนี้ต้องการทราบว่า **ในระยะ 3 เดือนที่ผ่านมา** ท่านได้รับความสนใจ ความช่วยเหลือหรือการสนับสนุนในเรื่องที่เกี่ยวข้องกับการออกกำลังกาย จากสมาชิกในครอบครัว เพื่อน เพื่อนร่วมงาน และบุคลากรที่เกี่ยวข้องกับสุขภาพ (เช่น แพทย์ พยาบาล อาสาสมัคร หรือผู้นำชุมชน) บ้างหรือไม่ **โดยตอบว่า ภายใน 3 เดือนที่ผ่านมาบุคคลดังกล่าวได้พูดหรือปฏิบัติสิ่งต่อไปนี้กับท่านหรือไม่ และบ่อยเพียงใด** โปรดตอบทุกข้อ ทุกบรรทัด

1) **ออกกำลังกายเป็นเพื่อนกับฉัน**

	ไม่เคยเลย	*นานๆ ครั้ง*	*บางครั้ง บางคราว*	*บ่อยๆ*	*บ่อยมาก*
สมาชิกในครอบครัว					
เพื่อน/เพื่อนร่วมงาน					
บุคลากรที่เกี่ยวกับสุขภาพ					

2) ……..

	ไม่เคยเลย	*นานๆ ครั้ง*	*บางครั้ง บางคราว*	*บ่อยๆ*	*บ่อยมาก*
สมาชิกในครอบครัว					
เพื่อน/เพื่อนร่วมงาน					
บุคลากรที่เกี่ยวกับสุขภาพ					

18) **ชมว่าฉันรูปร่างดีขึ้น หรือ หน้าตาสดใสขึ้น หลังจากออกกำลังกาย**

	ไม่เคยเลย	*นานๆ ครั้ง*	*บางครั้ง บางคราว*	*บ่อยๆ*	*บ่อยมาก*
สมาชิกในครอบครัว					
เพื่อน/เพื่อนร่วมงาน					
บุคลากรที่เกี่ยวกับสุขภาพ					

Please rate how often the following people has said or done in order to support you to perform LTPA during the last three months. Please check the box (es) to All that apply.

1) Performed LTPA with me.

	None	***rarely***	***a few times***	***often***	***very often***
Family members					
Friends					
Professional/volunteer					

2) .....

	none	***rarely***	***a few times***	***often***	***very often***
Family members					
Friends					
Professional/volunteer					

18) Made positive comments about my physical appearance.

	none	***rarely***	***a few times***	***often***	***very often***
Family members					
Friends					
Professional/volunteer					

APPENDIX G

Social Norms for Leisure-Time Physical Activity Questionnaire

คำชี้แจง คำถามต่อไปนี้ต้องการทราบว่า บุคคลต่างๆต่อไปนี้ได้แก่ สมาชิกในครอบครัว เพื่อนชาย เพื่อน เพื่อนร่วมงาน ผู้บังคับบัญชา คนที่ท่านเคารพนับถือ และบุคลากรที่เกี่ยวข้องกับสุขภาพ (เช่น แพทย์ พยาบาล อาสาสมัคร หรือ ผู้นำชุมชน) มีความรู้สึกหรือความคิดเห็นอย่างไรต่อการที่ท่านออกกำลังกายอย่างสม่ำเสมอ หรือจะออกกำลังกายอย่างสม่ำเสมอ อย่างน้อยสัปดาห์ละ 3 วันๆละ 30 นาที ภายใน 1 เดือนข้างหน้านี้

โปรดทำเครื่องหมาย √ ลงในช่องที่ตรงกับความคิดเห็นของท่าน

	ความรู้สึกหรือความคิดเห็นของบุคคลอื่นต่อการออกกำลังกายของท่าน					
	เห็นด้วยอย่างยิ่ง	***เห็นด้วย***	***เฉยๆ***	***ไม่เห็นด้วย***	***ไม่เห็นด้วยอย่างยิ่ง***	***ไม่ทราบว่าจะรู้สึกหรือคิดอย่างไร***
สมาชิกในครอบครัว						
เพื่อนชาย/เพื่อน/เพื่อนร่วมงาน						
ผู้บังคับบัญชา/ผู้ที่ท่านเคารพนับถือ						
บุคลากรที่เกี่ยวกับสุขภาพ						

How much do you think the following people: boy friends or spouse, family members, friends, boss or respectable persons, health professions, health volunteers, and community leaders would feel if you will perform LTPA regularly at least 3 days a week, for at least 30 minutes by next month? Please check the box (es) to All that apply.

	Expectations of others					
	Strongly agree	***Agree***	***Neutral***	***Disagree***	***Strongly disagree***	***I don't know***
Family members						
Friends						
Boss/ respectable persons,						
Professional						

APPENDIX H

Modeling for Leisure-Time Physical Activity Questionnaire

คำชี้แจง ขอให้ท่านโปรดระบุว่า บุคคลต่อไปนี้มีใครบ้างที่ท่านรู้สึกว่าเป็น**แบบอย่างที่ดี**ในการออกกำลังกาย อย่างสม่ำเสมอ อย่างน้อยสัปดาห์ละ 3 วันๆละ 30 นาที

ก สมาชิกในครอบครัวที่เป็นแบบอย่างที่ดีในการออกกำลังกาย (ไม่นับตัวท่าน)

1) ไม่มี
2) มี จำนวน _____คน โปรดระบุ_____

ข เพื่อน/เพื่อนร่วมงานที่เป็นแบบอย่างที่ดีในการออกกำลังกาย

1) ไม่มี
2) มี จำนวน_____ คน โปรดระบุ _____

ค บุคคลอื่นๆที่ท่านชื่นชอบ (นอกจากข้อ ก และ ข) ที่เป็นแบบอย่างที่ดีในการออกกำลังกาย

1) ไม่มี
2) มี จำนวน _____คน โปรดระบุ_____

Direction Not counting yourself, is there adult in your family members, boy friends or friends, and others that impressed you as role models of performing LTPA regularly at least 3 days a week, for at least 30 minutes?

a. Family members
   1) No
   2) Yes. How many people?…… Please identify ……

b. Friends
   1) No
   2) Yes. How many people?……Please identify ……..

c. Others
   1) No
   2) Yes. How many people?.....Please identify .....

APPENDIX I

MET Score *

	LTPA	Light effort	Moderate effort	Vigorous effort
1	Walking for exercise	3	4	5
2	Jogging	4.5	6	7
3	Yoga	2.5	4	5
4	Aerobic dancing	5	6.5	7
5	Ballroom dancing	3	4.5	5.5
6	Calisthenics/stretching exercises	3.5	5	8
7	Stationary bicycling	3	5.5	7
8	Tai-Chi, Bamboo stick exercises	2.5	4	5
9	Pe'tanque	2.5	3.5	5
10	Swimming	4	6	10
11	Ping-Pong	3	4	5
12	Badminton	3	4.5	7
13	Bicycling	4	6	8
14	Tennis	4	5	7
15	Rope jumping	8	10	12
16	Walking Upstairs	5	6	8
17	Gardening	2	3.5	5

* Adapted from Ainsworth compendium (2000) with assistance from Dr. Somchai Leethongin.

APPENDIX J

Table 21 Spread, Mean, Standard Deviation, and R^2 for Study Variables

Variable (n = 300)	Spread	*M*	*SD*	R^2
Social support [a]	30-76	46.28	11.25	
Gave me helpful reminders to do LTPA	1-5	2.62	1.14	0.59
Gave me encouragement to stick with my LTPA program	1-5	2.59	1.10	0.63
Offered to do LTPA with me	1-5	2.55	1.01	0.55
Gave me information regarding benefits, places, schedule, or how to perform LTPA	1-5	2.42	1.03	0.59
Talked about how much they like LTPA	1-5	2.42	1.14	0.53
Performed LTPA with me	1-5	2.22	0.99	0.44
Made positive comments about my physical appearance	1-5	2.18	1.14	0.54
Asked my feeling or consequences after LTPA	1-5	2.12	1.02	0.65
Asked me for ideas on how they can get more LTPA	1-5	1.97	1.03	0.53
Gave me a ride to the LTPA place	1-5	1.93	0.95	0.59
Planned for LTPA on recreational outings	1-5	1.92	0.97	0.43
Took over chores so I had more time to do LTPA	1-5	1.78	0.93	0.48
Changed their schedule or helped plan activities around my LTPA	1-5	1.76	0.96	0.43
Provided equipments, clothes, and money for my LTPA	1-5	1.60	0.80	0.44
Gave me rewards for LTPA	1-5	1.56	0.82	0.43
Criticized me or made fun of me for LTPA [b]	1-5	1.15	0.41	0.03
Complained about the time I spend doing LTPA[b]	1-5	1.15	0.41	0.04
Got angry at me for LTPA [b]	1-4	1.07	0.24	0.01
Social Norms [a]	4-20	15.43	3.43	
Social norms (family)	1-5	4.24	0.77	0.52
Social norms (health care providers)	1-5	4.13	0.75	0.42
Social norms (friends)	2-5	4.01	0.70	0.26
Social norms (bosses)	1-5	3.94	0.79	0.24
Modeling [a]	0-174	5.94	13.80	0.90

Table 21 Spread, Mean, Standard Deviation, and R^2 for Study Variables (continued)

Variable (n = 300)	Spread	*M*	*SD*	R^2
Physiological benefits [a]	34-60	51.02	5.72	
LTPA increases my level of physical fitness	1-5	4.39	0.66	0.46
LTPA helps me sleep better at night	1-5	4.36	0.62	0.54
My disposition is improved by LTPA	1-5	4.33	0.63	0.51
LTPA increases my muscle strength and tone	2-5	4.32	0.73	0.36
LTPA improves functioning of my cardiovascular system	2-5	4.29	0.64	0.51
LTPA improves my flexibility	1-5	4.29	0.68	0.49
I have improved feeing of well-being from LTPA	2-5	4.28	0.63	0.55
LTPA helps me look fresh	2-5	4.28	0.60	0.58
I will live longer if I do LTPA	2-5	4.20	0.74	0.42
LTPA improves the way my body looks	1-5	4.14	0.74	0.28
LTPA increases my stamina and allows me to carry out normal activities without becoming tired	2-5	4.11	0.69	0.44
LTPA will keep me from having high blood pressure	1-5	4.03	0.81	0.23
Psychosocial benefits [a]	31-60	48.57	6.19	
LTPA decreases feeling of stress and tension for me	2-5	4.34	0.68	0.36
LTPA improves my mental health	1-5	4.33	0.69	0.46
I enjoy LTPA	1-5	4.28	0.75	0.32
LTPA is good entertainment for me	1-5	4.05	0.78	0.43
LTPA lets me have contact with friends/persons I enjoy	1-5	4.04	0.86	0.26
LTPA is a good way for me to meet new people	1-5	4.04	0.83	0.27
LTPA improves my self-concept	1-5	4.03	0.71	0.41
LTPA improved the quality of my work	1-5	4.00	0.70	0.41
LTPA helps me decrease fatigue	2-5	3.95	0.79	0.45
LTPA increases my mental alertness	2-5	3.92	0.73	0.44
LTPA gives me a sense of personal accomplishment	1-5	3.83	0.86	0.31
LTPA increases my acceptance of others	1-5	3.75	0.84	0.51

Table 21 Spread, Mean, Standard Deviation, and R^2 for Study Variables (continued)

Variable (n = 300)	Spread	*M*	*SD*	R^2
Personal barriers [a]	14-63	31.55	8.45	
I don't know how to do LTPA that fit my age and health conditions	1-5	3.11	1.09	0.15
I am fatigued by LTPA	1-5	2.52	1.00	0.21
I had no company to do LTPA with	1-5	2.42	1.10	0.29
Family members or significant other do not encourage me to perform LTPA	1-5	2.38	1.26	0.17
I am not in good health to do LTPA	1-5	2.32	1.03	0.28
I am afraid I might injure myself or have a heart attack by LTPA	1.5	2.26	0.92	0.29
LTPA takes too much of my time	1-5	2.19	0.90	0.28
I am too embarrassed to perform LTPA	1-5	2.16	0.99	0.35
I am too old to do LTPA	1-5	2.16	1.02	0.46
LTPA takes too much time from family relationships	1-5	2.11	0.93	0.44
LTPA takes too much time from my family responsibilities	1-5	2.11	0.95	0.35
I think people in LTPA clothes look funny	1-5	1.97	0.83	0.45
LTPA tires me	1-5	1.96	0.85	0.44
Women should not perform sports, exercises or recreational activities	1-5	1.89	0.97	0.41
Environmental barriers [a]	6-30	15.23	3.80	
LTPA facilities do not have convenient Schedules for me	1-5	3.21	1.11	0.10
There are too few places for me to do LTPA	1-5	2.82	1.13	0.08
Place for me to do LTPA is not beautiful or attractive	1-5	2.52	1.08	0.21
Places for me to do LTPA are too far away	1-5	2.51	1.11	0.24
Places for me to do LTPA are unsafe	1-5	2.25	0.94	0.33
It costs too much money to perform LTPA	1-5	1.91	0.76	0.44

Table 21 Spread, Mean, Standard Deviation, and R^2 for Study Variables (continued)

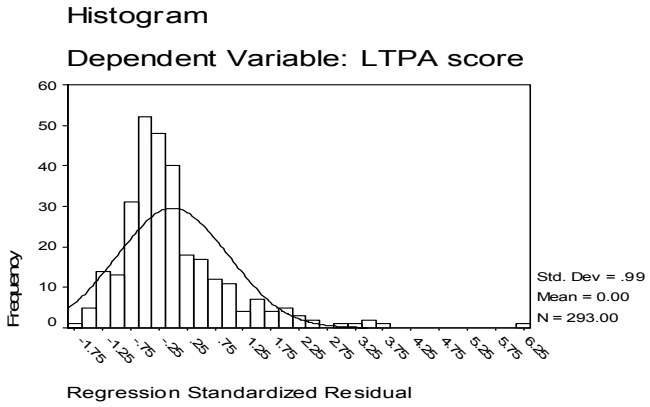
Variable (n = 300)	Spread	*M*	*SD*	R^2
Self-efficacy [a]	0-1500	501.70	349.46	
During vacation	0-100	49.80	35.63	0.43
If I have to perform at night	0-100	47.87	36.92	0.58
If I have to perform alone	0-100	44.50	36.32	0.49
If I have to pay more	0-100	44.23	36.44	0.58
If I have to perform in early morning	0-100	40.23	35.68	0.37
When I am feeing tired	0-100	39.57	35.00	0.46
If I have to get up very early or go to bed late	0-100	35.67	33.85	0.59
When I am feeing sad or anxious	0-100	34.70	34.33	0.52
When I am tied up with family chores	0-100	31.80	34.23	0.61
When I am feeing under pressure from work	0-100	27.20	30.32	0.49
When visitors are present	0-100	26.80	31.51	0.49
When I am ill	0-100	23.17	28.29	0.41
When it rains	0-100	22.57	30.42	0.32
When I have to take care of family members who are ill	0-100	17.63	26.75	0.25
During family problems	0-100	15.97	26.04	0.21

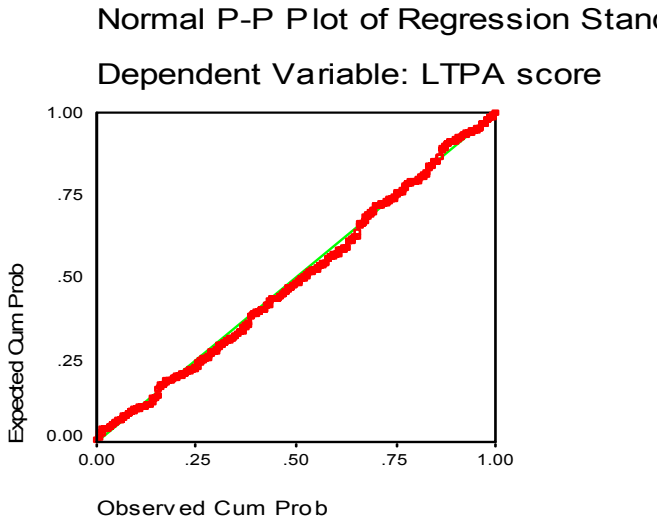
Note: [a] Total sum

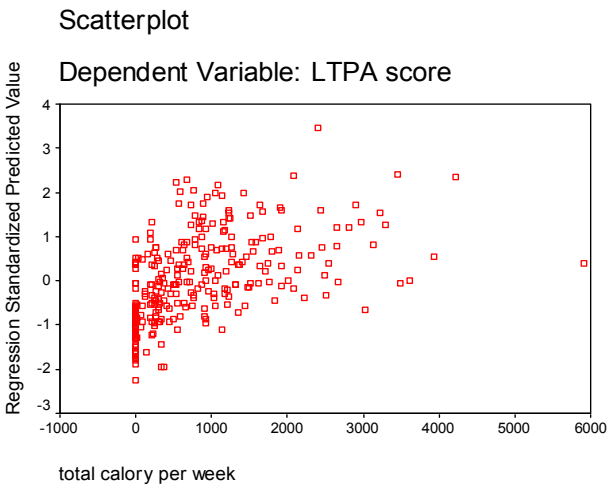
Note: [b] Items were not reverse coded

APPENDIX K

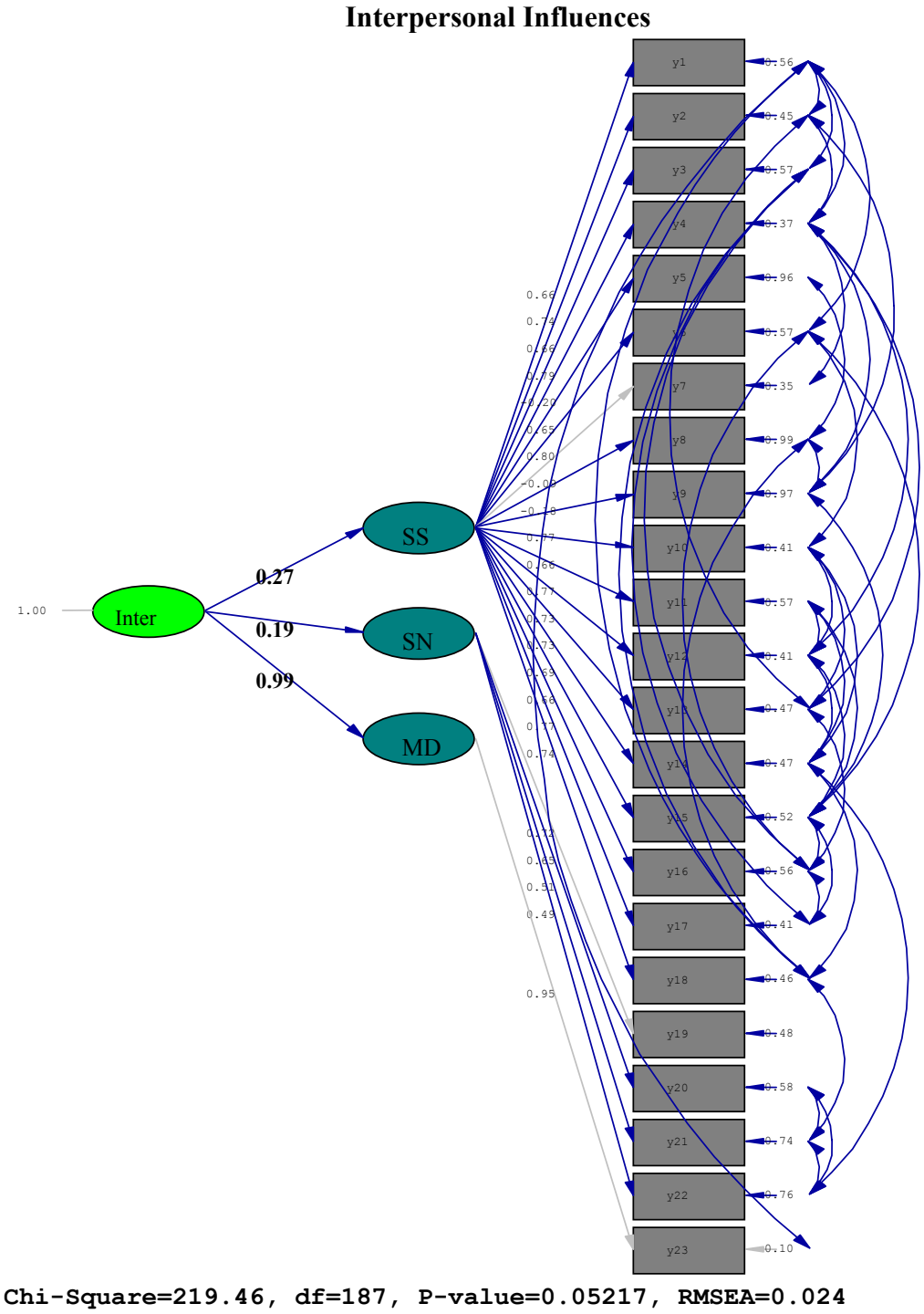
Assumptions Testing: Normality, Linearity, and Homoscedasticity



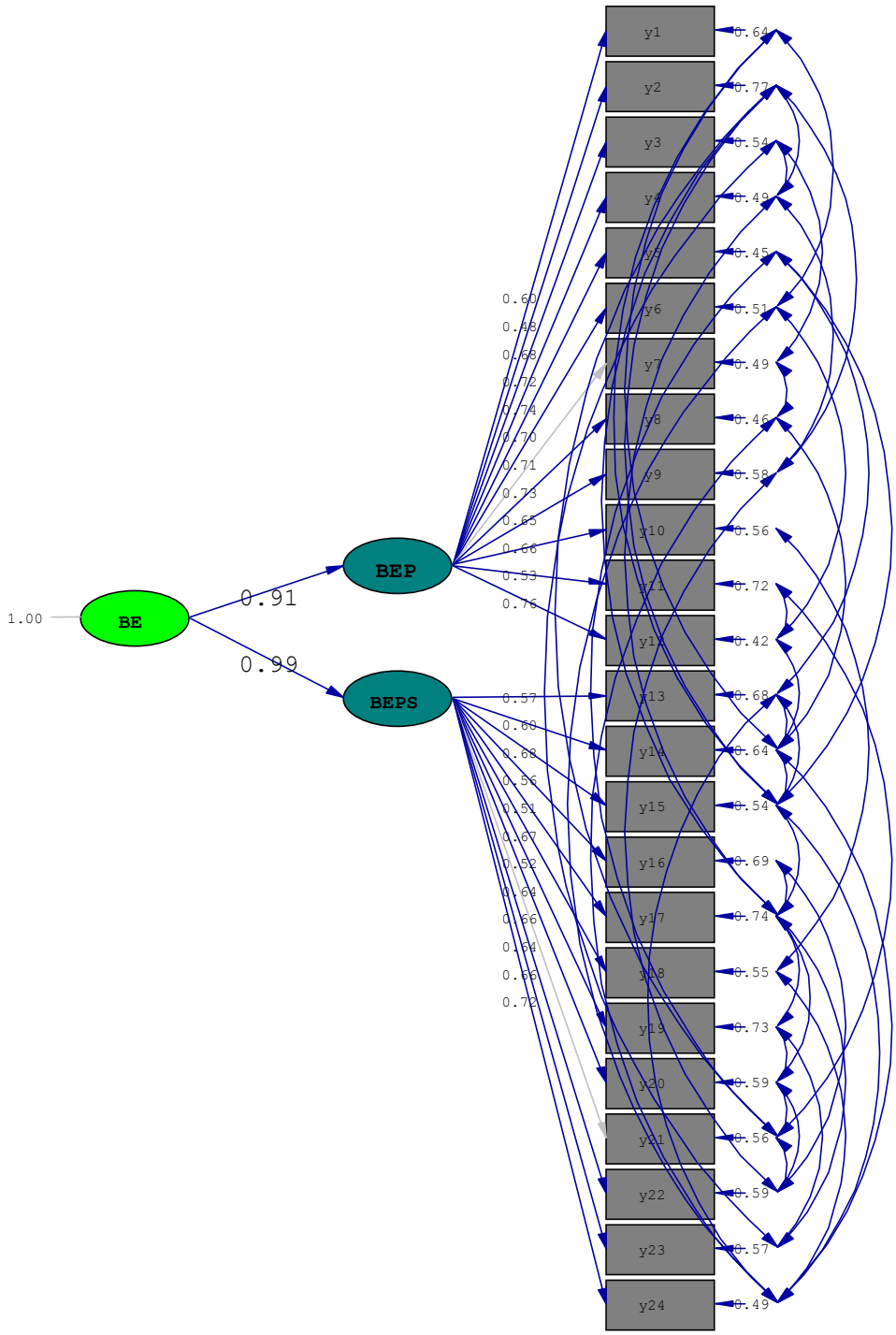




APPENDIX L
Second-Order Factor Models

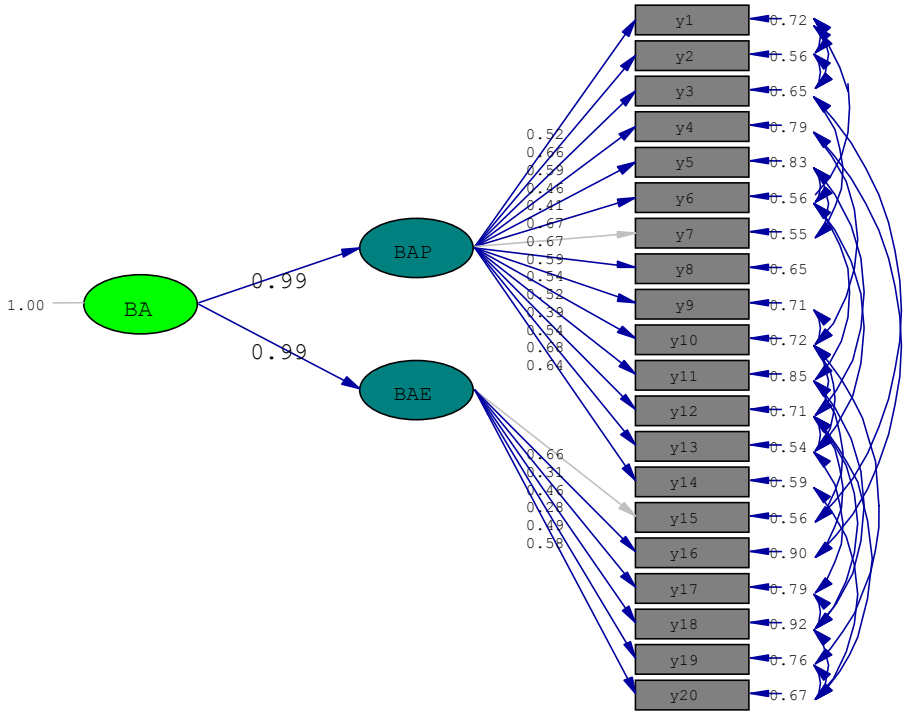


Perceived Benefits



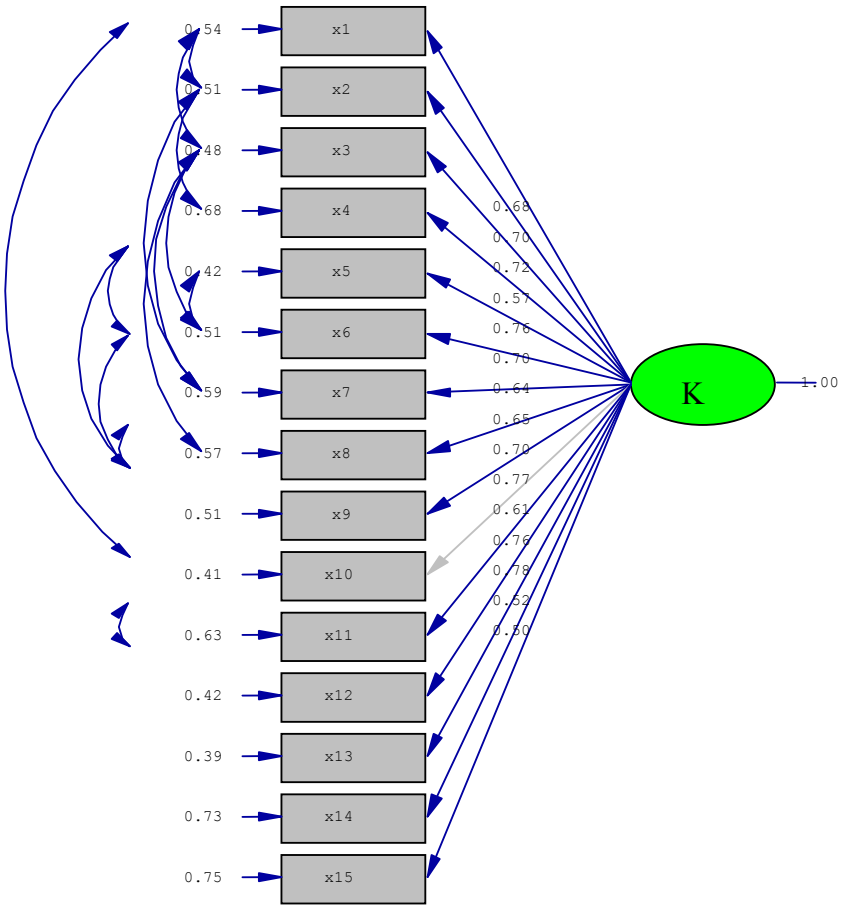
Chi-Square=259.35, df=207, P-value=0.00786, RMSEA=0.029

Perceived Barriers



Chi-Square=167.90, df=142, P-value=0.06792, RMSEA=0.025

Perceived Self-Efficacy



Chi-Square=93.30, df=76, P-value=0.08659, RMSEA=0.028

BIOGRAPHY

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