Social-Cognitive Factors and Exercise Behavior among Thais

BY

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THESIS

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DEDICATION

This dissertation is dedicated to my mother, Mrs. Thongsee Poomsrikaew, and my father, Mr. Prasong Poomsrikaew, without whom it would never have been accomplished

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LIST OF ABBREVIATIONS

AIC	Akaike Information Criterion
ANOVA	Analysis of Variance
CFI	Comparative Fit Index
EM	Expectation Maximization
GFI	Goodness of Fit Index
HAPA	Heath Action Process Approach
HPLP II	Health Promotion Lifestyle Profile II
IN	Intention Variable
NOEE	Negative Exercise Outcomes
OEE	Outcome Expectation for Scale
OEE-2	Outcome Expectation for Scale-2
POEE	Positive Exercise Outcomes
PRHDS	Perception of Risk of Heart Disease Scale
RMSEA	Root-Mean-Square Error of Approximation
SE	Standard Error
TEX	Exercise Behavior Variable
TOE	Outcome Expectancies Variable
TRP	Perceived Risk Variable
TSE	Self-Efficacy Variable

SUMMARY

A study of the effects of social-cognitive factors on exercise behavior among Thai people was carried out using a descriptive, cross-sectional approach. The Health Action Process Approach model was applied in the study. A 660-convenience sample who was 18 years or older was recruited from public locations in Thailand. Information on demographics, perceived risk of heart disease, outcome-expectancies for exercise, perceived self-efficacy for exercise, intention to exercise, and exercise behavior was collected by a self-administrated questionnaire.

The main findings found that only outcome expectancies and perceived self-efficacy were significant predictors of intention to exercise. Outcome expectancies and perceived self-efficacy for exercise explained 39% of the total variance in intention. Unexpectedly, in this study, perceived risk of heart disease was not a significant predictor of intention to exercise. Intention to exercise, as a mediator in the hypothesized model, was a significant predictor of exercise behavior in public Thais. Also, perceived self-efficacy was a direct significant predictor of exercise behavior. In this study, exercise behavior among Thai people was explained 16% by the hypothesized model.

Differences across age and gender groups in the relationships between social-cognitive predictors and exercise behavior were found in this study. The modified model for exercise showed a better fit in the middle-aged/older group than the younger group. The modified model for exercise showed a better fit in women than men.

The modified Health Action Process Approach model is more applicable for middle-aged/older adults and women rather than younger adults and men. The beliefs about outcome expectancies for exercise perceived self-efficacy for exercise, and intention to exercise are predictors of exercise behavior. Interventions should target intention to exercise through enhancing knowledge of benefits of exercise as well as increasing individuals' ability to overcome barriers of exercise. Interventions may be more effective if they target particular age and gender groups.

I. INTRODUCTION

A. **Background**

In Thailand, heart disease is the fourth leading cause of death following cancer, accidents, and stroke (Bureau of Policy and Strategy, 2009; Wibulpolprasert, 2007). Heart attack in particular is a critical problem for Thai people. The heart attack death rate per 100,000 people has increased from 59.9 in 1998 to 297.1 in 2007. The heart attack incidence rate per 100,000 people has increased from 3.6 in 1998 to 20.4 in 2007 (Bureau of Non Communicable Disease, 2009). It is clear that the heart attack incidence rate increased *five* fold but death rate was *six* fold so the death rate was increasing faster in the same period. In 2007, 149,510 Thais suffered a heart attack, and 11,053 (7.4%) of these events were fatal (Bureau of Non Communicable Disease, 2009).

The National Household Education Surveys in Thailand found that the prevalence rate of the two highest heart attack risk factors among the Thai population are smoking (21.5%) and high serum total cholesterol (20.5%; (Bureau of Non Communicable Disease, 2009; Ministry of Public Health, 2008). The survey also reported that the prevalence rate of heart attack risk factors has increased from 2005 to 2007: overweight (16.1 to 19.1%), obesity (3 to 3.7%), hypertension (8.3 to 9.4%), and diabetes (3.7 to 3.9%). The rate of moderate and intensive exercise behavior in the Thai population is also low (37.5%; (Ministry of Public Health, 2008).

These data indicate a need for changing health behaviors to promote and protect health among the Thai population which is a critical goal. One particular health behavior that would be beneficial for the majority of Thai individuals is increasing exercise behavior to reduce the modifiable risk factors of heart attack; high serum total cholesterol, hypertension, overweight or obesity, and diabetes.

Exercise is a key behavior for healthy people to prevent cardiac disease and for cardiac patients to control their chronic conditions. Exercise is known to reduce the progression of coronary artery disease (Anderson, Mizzari, Kain, & Webster, 2006; Arao et al., 2007; Carels, Darby, Cacciapaglia, & Douglass, 2004; Ross et al., 2000; Sesso, Paffenbarger, & Lee, 2000). Exercise also contributes to improved physical fitness by stabilizing mood (Li et al., 2004), improving quality of sleep (Li et al., 2004; Payne, Held, Thorpe, & Shaw, 2008), and reducing depressive symptoms (Chou et al., 2004; Lloyd, Tsang, & Deane, 2009). In order to understand how to increase the adoption and maintenance of exercise behavior, the determinants of exercise need to be investigated among Thais.

Research in countries outside of Thailand has found that a number of factors influence the adoption and maintenance of exercise behavior including environmental, social, cognitive, physiological and other personal factors (Sallis & Hovell, 1990). According to social cognitive theory (Bandura, 1986; Bandura, 1989; Bandura, 1997), health behavior is governed by expectations and incentives. The likelihood that individuals will adopt a health behavior depends on three sets of cognitions: (a) the expectancy that the person is at risk (perceived risk); (b) the expectancy that behavioral change will reduce the threat (outcome expectancies); and (c) the expectancy that one is sufficiently capable of adopting a positive behavior or refraining from a risky habit (self-efficacy). A number of studies in the United States and Western countries found that outcome expectancies (Clark, 1999; Conn, 1998; Resnick, Palmer, Jenkins, & Spellbring, 2000; Resnick & Nigg, 2003; Schneider, 1997) and self-efficacy (Choi, Wilbur, Miller, Szalacha, & McAuley, 2008; Conn, 1998; McAuley, 1993; Resnick et al., 2000; Resnick & Nigg, 2003; Rovniak, Anderson, Winett, & Stephens, 2002; Wilbur, Vassalo, Chandler, McDevitt, & Miller, 2005) directly influenced exercise behavior. Although perceived risk of cardiovascular disease did not directly influence exercise behavior, this variable indirectly influenced exercise via intention (Renner, Spivak, Kwon, & Schwarzer, 2007; Scholz, Sniehotta, & Schwarzer, 2005; Sniehotta, Scholz, & Schwarzer, 2005). However, there is little known about the effects of social-cognitive factors, including outcome expectancies, self-efficacy, perceived risk, and intention in changing exercise behavior across various countries including Thailand.

The health action process approach (HAPA) model is the most recent model of the social-cognitive health behavior models. The HAPA model is composed of two phases; (a) pre-intentional motivation phase that leads to a behavioral intention; and (b) post-intentional volition phase that leads to the actual health behavior (Renner, Universitat, & Shwarzer, 2003; Schuz, Sniehotta, Mallach, Wiedemann, & Shwarzer, 2009; Schwarzer, 1992). The HAPA model performs with a parsimonious set of predictors for forming intention. Outcome expectancies and perceived self-efficacy, including perceived risk, are considered to play a major role in the intention formation processes (Renner et al., 2003; Schwarzer, 1992; Schwarzer, 2001). A number of previous studies using the HAPA model conducted in Western countries found that perceived self-efficacy and intention are important predictors of exercise behavior (Scholz et al., 2005; Schwarzer et al., 2007; Schwarzer, Ziegelmann, Luszczynska, Scholz, & Lippke, 2008; Sniehotta, Scholz, & Schwarzer, 2005). The HAPA model has never been used in an explanation of adoption and maintenance of exercise behavior among the Thai population.

In addition, many previous studies based on the HAPA model found that age and gender influence the strength of the empirical relations of social-cognitive factors and behavior, including exercise behavior (Renner, Knoll, & Schwarzer, 2000; Renner et al., 2007; Schwarzer & Renner, 2000). Thus, age and gender differences were examined in this study of relationships between social-cognitive determinants and exercise behavior in order to understand the effects of these determinants on exercise behavior.

B. **Statement of the Problem**

The effects of perceived risk, outcome expectancies, perceived self-efficacy, and intention (mediator) on exercise behavior are not known among the general Thai population. It is important to identify the determinants of exercise in order to design effective exercise programs. Therefore, the relationship between social-cognitive factors and exercise behavior were explored among the general Thai population. Moreover, age and gender differences were included in examining the empirical relationships of social-cognitive factors and exercise behavior.

C. **Purpose of the Study**

The purpose of the study was to explore the relationship of perceived risk, outcome expectancies, perceived self efficacy, and intention (mediator) on exercise behavior. In the HAPA model, perceived risk, outcome expectancies, and perceived self-efficacy influence intention, and this in turn influences exercise behavior. Secondarily, the effects of age and gender (moderators) on the direction or strength of the relationship between social-cognitive factors (independent variables) and exercise behavior (dependent variable) were examined. The following research questions were posed.

1. How do perceived risk, outcome expectancies, perceived self-efficacy and intention (mediator) influence exercise behavior among Thais?

2. Are the effects of perceived risk, outcome expectancies, perceived self efficacy and intention (mediator) on exercise behavior moderated by age and gender among Thais?

D. **Definitions of Terms**

The following definitions of terms were used in this study.

a. Exercise behavior: Exercise behavior is an individual's self-report of performing exercise in leisure time.

b. Intention: Intention is the willingness to perform exercise behavior in the future.

c. Perceived self-efficacy: Perceived self-efficacy is an individual's belief about his or her capability to overcome barriers to perform exercise.

d. Outcome expectancies: Outcome expectancies are specific beliefs about the positive and negative outcomes of exercise behavior.

e. Perceived risk: Perceived risk is the individual's beliefs about the personal likelihood of having heart disease in the future.

f. Social-cognitive factors: Social-cognitive factors in the pre-intentional motivation processes of the HAPA model are composed of perceived self-efficacy, outcome expectancies, perceived risk, and intention.

E. **Significance of the Study**

The results of this research will further the understanding of the relationship of social-cognitive factors on exercise behavior across Thai people by identifying gaps in the current knowledge base. Understanding the influences of perceived risk, outcome expectancies, perceived self-efficacy, and intention on adoption of exercise behavior is vitally important in developing public education exercise programs, reducing heart attack risk factors of the Thai people, and guiding future research. Before attempting to change others' exercise behavior, it is important to understand what social-cognitive factors are affecting exercise behavior in the Thai population. The relationship of social-cognitive factors and exercise behavior was therefore investigated through a survey of a sample of the general Thai population.

II. CONCEPTUAL FRAMEWORK AND RELATED LITERATURE

A. Conceptual Framework

1. Health action process approach model (HAPA)

The central focus of the HAPA model is the process of health behavior change. The theory is used to explain how people adopt and maintain desired health behaviors (Schwarzer, 1992). Inasmuch as the concepts and propositions of the HAPA model are written at a relatively concrete level, the HAPA model is a middle-range predictive theory that specifies the effects of adopting and maintaining desired behaviors.

The HAPA model was established by Schwarzer, a German psychologist, in 1992. The HAPA model is derived from the social cognitive theory postulated by Bandura in 1986. The antecedent knowledge from social-cognitive factors was used in developing the HAPA model. The HAPA model involves three types of expectancies: (a) situational outcome expectancies, consequences produced by environmental events; (b) action-outcome expectancies, outcomes flow from personal action; and (c) perceived self-efficacy, the belief that one's capabilities will lead to a desired outcome (Schwarzer, 1992; Schwarzer & Fuchs, 1995).

The HAPA model is divided into the motivation phase and the volition phase. The motivation phase, or decision-making stage, describes what people choose to do. In the motivation phase, there are three major cognitions that establish intention: perceived risk, outcome expectancies, and perceived self-efficacy. In contrast to the motivation phase, the action or volition phase describes how hard a person tries to perform an action. The action phase involves self-efficacy and planning (Schwarzer, 1992; Schwarzer, 1999). The motivation phase (pre-intentional motivation phase) and volition phase (post-intentional volition/action phase) are illustrated as causal processes in Figure 1.

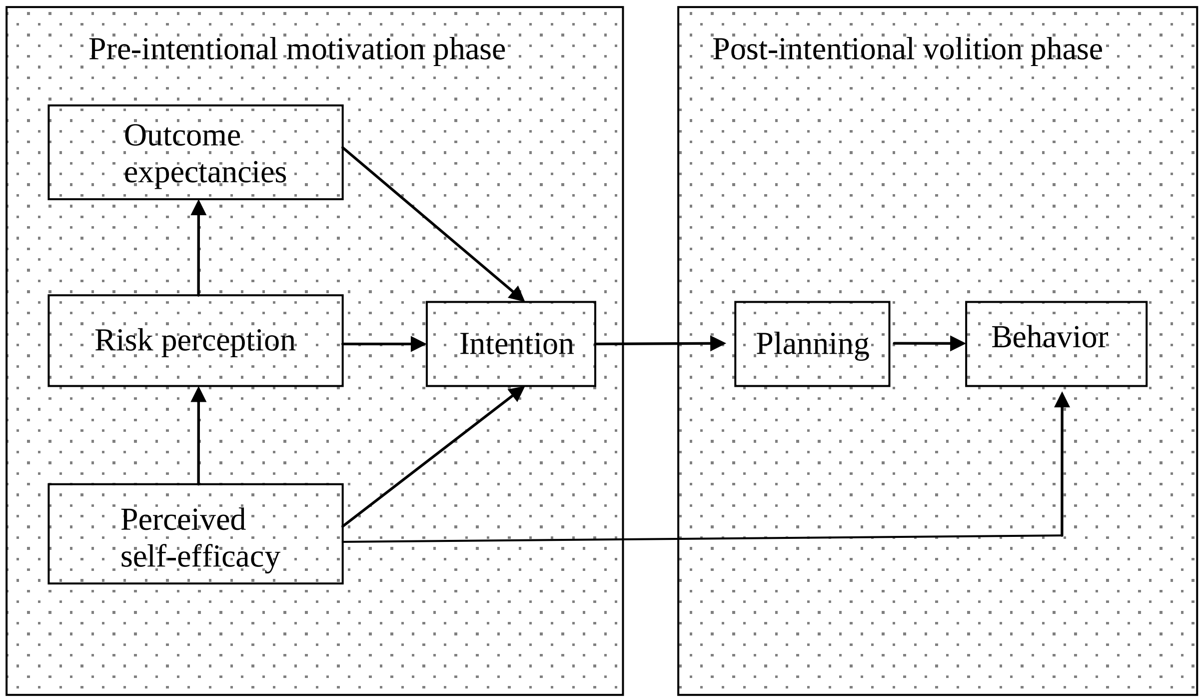

Figure 1. The health action process approach model

From "*Self-efficacy: Thought control of action* (p. 233)," by R. Schwarzer, 1992, Washington: Hemisphere.

a. **Pre-intentional motivation phase**

People need to become motivated before initiating a new behavior; this is called behavioral intention. Three social-cognitive variables play a major role in behavioral intention: perceived risk, outcome expectancies, and perceived self-efficacy.

In the pre-intentional motivation phase of the HAPA model, the hypothesized causal order is from perceived risk to outcome expectancies to perceived self-efficacy (Schwarzer, 1992). Perceived risk, including perceived severity of possible health threats and individual's personal vulnerability, sets the stage for individuals' contemplation, which puts them on track for developing the motivation to change. (Luszczynska & Schwarzer, 2003; Schwarzer, 1992; Schwarzer, 2008). Individuals who see themselves as vulnerable to disease are likely to engage in a healthy life (Renner et al., 2000; Schwarzer, 1994; Weinstein, 1982). In addition, people also need to understand the difference between a new action and the possible health outcomes. Outcome expectancies help a person balance the pros and cons of a certain behavior. Outcome expectancies are seen as precursors of perceived self-efficacy (Schwarzer, 1992; Schwarzer, 2008), which is required before making a decision to perform a desired behavior. Perceived self-efficacy describes individuals' beliefs in their capabilities to perform a new action. Perceived self-efficacy, outcome expectancies, and perceived risk significantly contribute to an intention (Renner et al., 2003; Schwarzer, 1992).

b. **Post-intentional volition phase**

The post-intentional volition phase describes how hard people try to take action and how long they persist. After intention is established, intention has to transform into detailed instructions on how to perform the desired behavior. Planning included in the model will guide individuals with specific *when*, *where*, and *how* of a new action (Renner et al., 2003; Schwarzer, 1992).

To initiate and maintain an action, the action has to be protected from distraction and from premature disengagement while people develop the new habit. Perceived self-efficacy establishes the amount of effort to invest and persist in performing behaviors. Individuals with self-doubts are more likely to anticipate failure and to abort their attempts prematurely. People with optimistic self-efficacy beliefs envision success scenarios leading them to perform action (Schwarzer, 1992).

The HAPA model has been used in a variety of studies: cross-sectional, longitudinal, and interventional studies to study five health behaviors, which include physical exercise, breast self-examination, seat belt use, dietary behaviors, and dental flossing. One cross-sectional study of the differences of age and body weight with health beliefs and nutrition found that older and overweight people perceive higher perceived risk of cardiovascular disease than younger and average weight people.(Renner et al., 2000).

The constructs of the HAPA model have been used with cognitive interventions to help people initiate and maintain behaviors (Luszcynska, 2004; Luszczynska, Tryburcy, & Schwarzer, 2007; Scholz, Sniehotta, Burkert, & Schwarzer, 2007; Sniehotta et al., 2005). For example, an optimistic self-belief intervention enhanced self-efficacy among women who had never performed or who irregularly performed breast-self examination and helped them to increase the number of breast-self examinations performed (Luszcynska, 2004).

Sniehotta, Scholz, Schwarzer, and colleagues (2005) conducted an intervention focused on planning for a behavior change among coronary heart disease patients and found that the planning intervention was useful for increasing physical activity and adherence in the target population. A planning intervention may help individuals to transform their intentions into physical activity and to cope effectively with barriers (Sniehotta et al., 2005).

The HAPA model was also used as a stage model to distinguish between persons who have not yet decided to change their behavior (non-intender) and those who have decided to change (post-intention; (Lippke, Ziegelmann, & Schwarzer, 2005; Schwarzer, 2008). The stage construct of the HAPA model helps to improve the understanding of the process of health behavior change. The specific stage also suggests implications for theory-based interventions to promote health behavior change (Lippke et al., 2005; Schuz et al., 2009; Weidemann et al., 2009).

In this cross-sectional study, the investigator focused on the relationships among perceived self-efficacy, outcome expectancies, perceived risk, and intention on exercise behavior. In this study, age and gender were also used as additional variables to explain the effects of these constructs on exercise behavior. Thus, the theoretical framework based on the HAPA model was applied in the study as depicted in Figure 2.

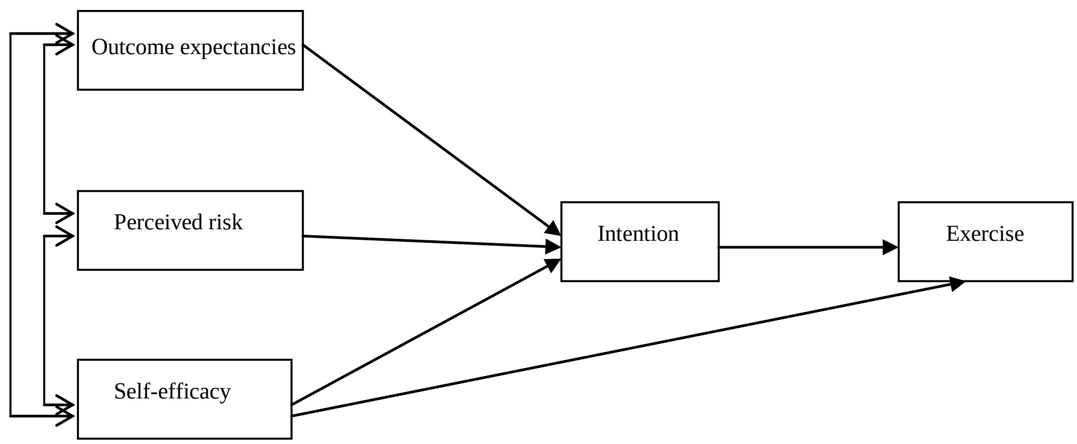

Figure 2. The modified version of the health action process approach model

B. **Review of Related Literature**

1. **Social-cognitive factors and exercise behavior**

In the last two decades, the HAPA model was used in a number of longitudinal studies to examine the adoption and maintenance of exercise behavior. Of the ten exercise studies, nine studies were conducted in Germany and Poland (Lippke et al., 2005; Scholz et al., 2005; Scholz, Schuz, Ziegelmann, Lippke, & Schwarzer, 2008; Schwarzer et al., 2007; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005; Sniehotta, Schwarzer, Scholz, & Schuz, 2005; Wiedemann, Schüz, Sniehotta, Scholz, & Schwarzer, 2009; Ziegelmann, Lippke, & Schwarzer, 2006b). Only one study was conducted in Asia and that took place in South Korea (Renner et al., 2007). The HAPA model has not been used to explain exercise behavior among Thai people in Thailand.

Based on the HAPA model, several studies have provided evidence for the relationship among perceived self-efficacy, outcome expectancies, perceived risk, intention, and exercise behavior in different samples. Of the ten studies, seven were conducted among cardiac and orthopedic patients (Lippke et al., 2005; Scholz et al., 2005; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005; Sniehotta, Schwarzer et al., 2005; Wiedemann et al., 2009; Ziegelmann, Lippke, & Schwarzer, 2006b) . Three studies were conducted with general populations (Renner et al., 2007; Scholz et al., 2008; Schwarzer et al., 2007). These three studies were conducted with samples with ages that ranged from16 to 90 years, both men and women. The following sections provide the evidence to support the relationships of perceived risk, outcome expectancies, perceived self-efficacy, and intention on exercise behavior.

In a study of 307 cardiac rehabilitation patients in Germany (Sniehotta, Scholz, & Schwarzer, 2005) exercise was associated with outcome expectancies (r = .21, p < .01), self-efficacy (r = .28, p < .05), and intention (r = .30, p < .05). Similarly, in a study of exercise adherence in a sample of orthopedic rehabilitation patients, exercise was associated with self-efficacy (r = .30, p < .01) and intention (r = .39, p < .01; (Schwarzer et al., 2008)(Schwarzer et al., 2008). Another study among 114 cardiac rehabilitation patients in Poland found exercise was related to intention (r = .32, p < .01), self-efficacy (r = .24, p < .05), and risk perception (r = .30, p < .01; (Schwarzer et al., 2008). Schwarzer and colleagues (2007) examined physical activity in a sample of 365 internet users, ages 16 to 64 in Germany. The study found that physical activity was associated with self-efficacy (r = .41, p < .01) and intention (r = .15, p < .05). These data supported the relationship of exercise behavior with intention, perceived self-efficacy, outcome expectancies and risk perception, although the strength of the relationship between exercise and intention was variable (r’s ranging from .15 to .41).

In addition, intention was positively correlated with outcome expectancies (r = .13 to .62, $p < .05$), and perceived self-efficacy (r = .22 to .77, $p < .05$; (Renner et al., 2007; Scholz et al., 2008; Schwarzer et al., 2007; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005). These results showed that the strength of the relationship between the variables varied widely. Renner and colleagues (2007) examined physical activity among 1,359 residents of South Korea; the correlations of intention with outcome expectancies (r = .13, $p < .05$) and perceived self-efficacy (r = .22, $p < .01$) were low. Perhaps these low correlations could be a result of translating instruments from German into Korean. A poor translation may have affected the validity of these variables. Interestingly, reliability coefficients of perceived risk (α = .89), outcome expectancies (α = .91), and perceived self-efficacy (α = .86) were good. The subjects who completed this longitudinal study (n = 697) had a lower intention to be physically active than the subjects who dropped out early (n = 662); consequently, the association of intention with outcome expectancies and perceived self-efficacy was low in this study (Renner et al., 2007).

There are some findings supporting the association between perceived self-efficacy and outcome expectancies. Five studies showed that perceived self-efficacy and outcome expectancies (r = .32 to .55, $p < .05$) were moderately associated (Renner et al., 2007; Scholz et al., 2008; Schwarzer et al., 2007; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005). However, perceived risk was less likely to be associated with other variables. In four other studies, the correlation of perceived risk with outcome expectancies (r = .13 to .20, $p < .05$) was small (Scholz et al., 2008; Schwarzer et al., 2007; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005). Unexpectedly, two studies reported a negative correlation between perceived risk and perceived self-efficacy (r = -.15 to -.28, $p < .05$; (Scholz et al., 2008; Schwarzer et al., 2007; Schwarzer et al., 2008). Likewise, only one study found that perceived risk was slightly associated with intention ($r = .10$, $p < .05$) and moderately correlated to exercise behavior ($r = .30$, $p < .01$; (Schwarzer et al., 2008). It remains unclear why there have been unexpectedly low correlations (and a negative relationship) between perceived risk and self-efficacy, and exercise behavior. It is possible this is due to measurement error or perceived risk may be less relevant in determining exercise behavior (Schwarzer et al., 2007).

Perceived self-efficacy was also directly predictive of exercise behavior in the HAPA model (Renner et al., 2007; Scholz et al., 2005; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005). Similarly, previous studies in the United State reported that perceived self-efficacy was a significant predictor of exercise behavior among women (Choi et al., 2008; Wilbur, Miller, Chandler, & McDevitt, 2003; Wilbur et al., 2005) and older adults (Conn, 1998; Conn, Burks, Pomeroy, Ulbrich, & Cochran, 2003; Resnick & Nigg, 2003).

Several studies have provided evidence to support that intention was predicted by perceived self-efficacy, outcome expectancies, and perceived risk. Three studies confirmed that perceived self-efficacy is the best predictor of intention ($\beta = .60$ to $.68$, $p < .01$; (Scholz et al., 2008; Schwarzer et al., 2007; Sniehotta, Scholz, & Schwarzer, 2005). In turn, the effects of outcome expectancies ($\beta = .18$ to $.29$, $p < .05$) and perceived risk ($\beta = .09$ to $.19$, $p < .05$) were only slightly predictive of intention (Renner et al., 2007; Scholz et al., 2005; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005). Three studies also strongly supported that perceived risk, outcome expectancies, and perceived self-efficacy jointly accounted for 52 - 80% of the variance in intention (Scholz et al., 2008; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005).

In addition, American and Canadian studies based on the theory of planned behavior reported that behavioral beliefs of exercise (Conn, Tripp-Reimer, & Maas, 2003; Courneya, 1995) and perceived behavioral control (Blanchard, Courneya, Rodgers, Daub, & Knapik, 2002; Blanchard et al., 2008; Blue, Wilbur, & Marston-Scott, 2001; Conn, Tripp-Reimer et al., 2003; Courneya, Plotnikoff, Hotz, & Birkett, 2000; L. W. Jones, Courneya, Fairey, & Mackey, 2005) were predictors of exercise intention. In other words, the effect of behavioral beliefs of exercise on intention to exercise is consistent with the effect of outcome expectancies on intention to exercise. The effect of perceived behavioral control on intention to exercise is consistent with the effect of perceived self-efficacy on intention to exercise.

A number of studies based on the HAPA model also reported that intention directly influenced exercise behavior. Three studies showed that exercise behavior was reasonably predicted by intention (β = .33 to .41, $p < .01$: (Scholz et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005; Ziegelmann, Lippke, & Schwarzer, 2006b). In addition, intention explained 11- 46 % of the variance in exercise behavior (Lippke et al., 2005; Scholz et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005; Ziegelmann, Lippke, & Schwarzer, 2006b). Also, American and Canadian studies based on the theory of planned behavior supported that intention could significantly contribute to exercise behavior (Blanchard, Courneya, Rodgers, Daub et al., 2002; Blanchard et al., 2008; Blue et al., 2001; Conn, Tripp-Reimer et al., 2003; Courneya et al., 2000; Hoyt, Rhodes, Hausenblas, & Giacobbi, 2009; Rhodes, Courneya, & Jones, 2004).

In sum, the empirical studies indicate that perceived risk, outcome expectancies, and perceived self-efficacy significantly influenced intention. In turn, intention was a direct predictor of exercise behavior. Perceived self-efficacy was also directly predictive of exercise behavior.

Even though no study has utilized the HAPA model among Thai people, some Thai studies have reported on the relationship between exercise behavior and cognitive factors, such as, perceived self-efficacy, perceived benefits, and perceived barriers. For instance, Kaewthummanukul and colleagues (2008) reported that exercise among practical nurses (n = 335) was predicted by perceived self-efficacy, perceived social support, and motivation to exercise. However, the variables together only explained 15.2% of the variance in exercise behavior. This finding may be a consequence of the particular sample of practical nurses studied because they were fairly homogeneous in term of exercise behavior. Similarly, reinforcing factors (exercise information and social support), single marital status, and middle-aged group together only accounted for 20.6% of the variance in exercise behavior among 260 health care providers (Khumthong, 2005).

Also, Srichaisawat (2006) reported that exercise behavior among undergraduate students (n = 900) was influenced by perceived self-efficacy ($\beta = .35$, $p < .01$), gender ($\beta = .13$, $p < .01$), information support ($\beta = .11$, $p < .01$), social support ($\beta = .08$, $p < .05$), and perceived barriers ($\beta = -.07$, $p < .05$) and accounted for 23.40% of the variance in exercise behaviors. Among nursing students, Voraroon (2005) found that perceived self-efficacy, perceived benefits, perceived barriers, and interpersonal influence only accounted for 10.4% of the variance in exercise behavior. Similarly among health group members, knowledge of exercise, attitude of exercise, income, education, and gender only explained 12.4% of the variance of exercise (Ngamjaroen, 2005). These studies within healthy samples indicated only small amount of variance in exercise behavior could be explained. However, Surakit (2007) indicated that among personnel of the provincial public health officers (n = 310) perceived health status ($\beta = .48$, $p < .01$), attitude towards exercise ($\beta = .27$, $p < .01$), reinforcing factors (exercise information and social support;

$\beta = .25$, $p < .01$) were predictive of exercise behavior and together explained 54.5% of the variance in exercise behavior.

Asawachaisuwikrom (2003) conducted physical activity studies by using simple random sampling of 112 non-institutionalized Thai men and women aged 60 and older living in Nongkankok and Bangsai sub-districts, Chonburi province. The findings revealed that perceived barriers ($\beta = -.16$, p < .05), neighborhood environment ($\beta = .18$, p < .05), convenient facilities ($\beta = .25$, $p < .05$), and income ($\beta = .35$, $p < .05$) influenced the amount of physical activity. These variables accounted for 40% of the variance in physical activity. Unexpectedly, perceived benefits and perceived self-efficacy were not predictors of physical activity.

In 2005, Asawachaisuwikrom designed another study to examine physical activity among 259 non-institutionalized Thai women and men selected by simple random sampling aged 60 and older living in Saensuk sub-district, Chonburi province. The determinants of physical activity were perceived environment of physical activity ($\beta = .36$, $p < .05$), perceived benefits ($\beta = .14$, $p < .05$), perceived barriers ($\beta = -.16$, $p < .05$), income ($\beta = .23$, $p < .05$), and education ($\beta = .12$, $p < .05$). Personal factors, perceived benefits, perceived barriers and perceived environments of physical activity explained 68% of the variance in physical activity (Asawachaisuwikrom, 2005). In this study, perceived benefits did predict physical activity. This finding may have been due to the larger number of subjects, thus increasing the power to detect differences. However, perceived self-efficacy was not examined in this study.

A study predicting exercise among 300 older adults found that perceived self-efficacy ($\beta = .33$, $p < .01$), perceived barriers ($\beta = -.19$, $p < .01$), social support ($\beta = .20$, $p < .01$), age ($\beta = -.15$, $p < .01$), and male gender ($\beta = .11$, $p < .05$) significantly predicted exercise behavior and explained 39.9% of the variance in exercise (Anunsuksawat, 2006). Sukrasorn (2008) supported that perceived self-efficacy (odds ratio = 10.87) and positive outcome expectancies (odds ratio = 7.98) increased exercise among the elderly (n = 320). Only one study in Thailand examined the effect of intention as a mediator on exercise behavior (Jitramontree, 2003). This study was based on the Theory of Planned Behavior. In this study of 150 adults 60 years or older, perceived self-efficacy ($\beta = .29$, $p < .01$), perceived benefits ($\beta = .21$, $p < .05$), and perceived barriers ($\beta = -.25$, $p < .05$) were significant predictors of intention to exercise. Exercise was also predicted by perceived self-efficacy, ($\beta = .12$, $p < .05$), perceived barriers ($\beta = .28$, $p < .01$), and intention ($\beta = .57$, $p < .01$; (Jitramontree, 2003).

Namphonkrung, Jitpanya, and Lueboonthavatchai (2005) conducted a study with coronary artery disease patients (n = 180) selected by simple random sampling from outpatient departments at Police Hospital and Chest Disease Institute, Bangkok. Previous exercise behavior ($\beta = .61$, $p < .05$), perceived self-efficacy ($\beta = .22$, $p < .05$), and interpersonal influences ($\beta = .14$, $p < .05$) explained 70% of the variance in exercise behavior. Similarly, exercise was predicted by perceived self-efficacy ($\beta = .29$, $p < .01$), perceived benefits ($\beta = .37$, $p < .01$), and perceived barriers ($\beta = .18$, $p < .05$) and explained 35.4% of the variance of exercise among 180 hypertensive patients (Tantayothin, 2004). The recent study in patients (n = 200) with coronary artery disease also found that readiness to exercise ($\beta = .28$, $p < .01$), past exercise ($\beta = .24$, $p < .01$), perceived self-efficacy ($\beta = .19$, $p < .05$), and interpersonal factors (social support; $\beta = .14$, $p < .05$) predicted exercise and explained 31.4% of the variance of exercise (Sornpirom, 2009). These results indicated that in adults with health problems a larger amount of variance in exercise behavior could be explained when compared to healthy adults.

In addition, a number of intervention studies have found that improved perceived self-efficacy and social support could increase exercise behavior among elderly patients with heart failure (Ratchapun, Nanasilp, & Lasuka, 2008), knee osteoarthritis (Phairungsakul, Sucamvang, & Lasuka, 2007), hypertension (Kanthamalee, Panuthai, & Chaiwan, 2007), and diabetes mellitus (Panyoyai, Panuthai, & Chaiwan, 2007).

In summary, research in Thailand suggests that social-cognitive variables, including perceived self-efficacy, outcome expectancies (perceived benefits and barriers), and social support, play a major role in exercise behavior among Thai people. However, no empirical studies have examined the relationship between perceived risk of heart disease and exercise behavior among Thai people. Only one Thai study reported a relationship between intention and exercise behavior among older adults (Jitramontree, 2003).

2. **<u>The effects of age and gender on relationship between social-cognitive factors and exercise behavior</u>**

Age differences should be considered when social-cognitive determinants of exercise behavior are studied. Studies have supported that older age is associated with increased perceived self-efficacy, outcome expectancies and health behaviors, including exercise (Conn, 1998; Meland, Mæland, & Lærum, 1999; Resnick & Nigg, 2003; Scholz et al., 2007; Ziegelmann, Lippke, & Schwarzer, 2006a). Age also affected the direction or strength of empirical relationships of social-cognitive variables with exercise behavior (Renner et al., 2007) and dietary behavior (Renner et al., 2000; Schwarzer & Renner, 2000). Older adults perceived themselves as being more vulnerable for cardiovascular disease and had greater perceived self-efficacy of exercise and eating healthy food than younger adults (Renner et al., 2000; Renner et al., 2007; Schwarzer & Renner, 2000). Older adults also had a stronger intention to be physically active (Renner et al., 2007) and to eat healthy food (Renner et al., 2000; Schwarzer & Renner, 2000) than younger adults. In addition, in the younger group, perceived risk did not affect the intention formation, whereas in the older group, perceived risk, outcome expectancies, and perceived self-efficacy simultaneously facilitated intention formation (Renner et al., 2000; Renner et al., 2007; Schwarzer & Renner, 2000). This evidence suggests that advancing age may increase perceived risks that lead to a higher intention of health promoting behaviors, such as, physical exercise and having a healthy diet.

Some researchers have found that the effects of social-cognitive factors on exercise behavior occur between young and middle-aged/older adults with a cut-off point of 35 years (Renner et al., 2007). Middle aged/older adults (36 and older) perceived themselves as being more vulnerable to cardiovascular diseases than did younger adults. They also demonstrated a higher intention to be physically active and perceived higher self-efficacy for exercise than younger adults (Renner et al., 2007). Hence, the investigator will use the cut-off value of 35 years for the current study as well.

Gender differences also play an important role in the relationship between social-cognitive factors and health behaviors. Renner, Knoll, and Schwarzer (2000) reported that women perceived a lower risk of cardiovascular disease for themselves than men did. In turn, women had greater positive outcome expectancies of healthy diet and intention to adopt low-fat nutrition compared to men. Women also displayed healthier dietary behavior than men (Renner et al., 2000; Renner et al., 2008). In addition, Renner and colleagues (2008) found that in women, objective risks (level of cholesterol, blood pressure, and body mass index) influenced dietary intention, whereas no relationship was found between objective risks and dietary intention in men. Interestingly, intention was influenced by perceived self-efficacy in both men and women. In women, objective risks, outcome expectancies, and perceived self-efficacy accounted for 28% of the variance in intention, but no relationship was found in men (Renner et al., 2008). These data indicate that gender differences may provide a different pattern of behaviors. Hence, the study of the effect of gender role in exercise behavior should be investigated.

III. METHODS

This chapter describes the methods used, including the research design, setting, characteristics of the study population, data collection procedures, and ethical considerations for human subjects. The psychometric properties of the instruments are described. The statistical techniques for data analysis are also presented.

A. Research Design

The design of the study was a cross-sectional study to survey the general Thai population regarding social-cognitive influences of exercise behaviors. The variables to be studied were (1) perceived risk, (2) outcome expectancies, (3) perceived self-efficacy, (4) intention, and (5) exercise behaviors. Self-administrated questionnaires were used to obtain data at one point in time.

B. Research Setting

The investigator purposively selected Udon Thani, located in Northeastern Thailand, with a population of approximately 1.5 million. The settings selected for this study were the division of Civil Registration and Identification Card at Udon Thani Municipality and a public park. The division of Civil Registration and Identification Card at Udon Thani Municipality was utilized for registering one’s birth, death, and domicile. In addition, identification cards must be renewed every 5 years for Udon Thani urban citizens at the setting. Selection of these settings was purposive to assure that participants reside within a certain geographic area but are heterogeneous related to education, income, and age. It was expected that the population would reflect the gender mix of the area. It was also expected that the diversity of the study population would provide different perspectives on social-cognitive factors of exercise behaviors.

C. **Sampling Procedure**

1. **Selection criteria**

The participants were eligible if they were (1) 18 years of age or older, (2) able to understand Thai and able to read the materials, and (3) alert and oriented to person, place and time. An attempt was made to select a similar number of men and women. The goal was to have approximately 50% of the participants to be women and 50% men.

2. **Sample size**

The sample size was estimated using statistical power analysis (Cohen, 1988; Cohen, 1992). In the statistical power analysis, the sample size is determined with three parameters (a) the significance criterion (α) or the probability of committing a type I error, (b) the desired statistical power, and (c) the population effect size. The power of .80, a medium effect size and alpha of .05 are generally considered acceptable (Cohen, 1988; Cohen, 1992; Murphy, Myors, & Wolach, 2009). Cohen (1992) defines effect size index for multiple regression analysis as f^2 or R^2 for a small, medium, or large effect size index as .02, .15, and .35 respectively. The investigator used path analysis and correlation in this study. The power analysis in path analysis, multiple regression, and correlation are the same procedures (Cohen, 1988; Munro, 2005; Norris, 2005). Since path analysis involves more than one regression analysis, the power analysis should be calculated with a small effect size. Therefore, the investigator selected power of .80, a small effect size index (f^2) of .02, an alpha of .05, and three independent variables to determine appropriate sample size. According to G* Power 3.0.10 (Faul, Erdfelder, Lang, & Buchner, 2007; Faul, Erdfelder, Buchner, & Lang, 2009), the total sample based on these parameters is 550 subjects. An additional twenty percent was included for incomplete questionnaires based on the recent survey study of knowledge of heart attack symptoms and risk factors among Thais (Poomsrikaew, Ryan, & Zerwic, 2010). Thus, the total sample targeted for this study was 660 subjects to ensure that the study had enough power to detect the significance of important paths.

D. **Instrumentation**

The following section describes the operationalization of the study variables as well as measurements. Variables measured were demographic variables, perceived self-efficacy, outcome expectancies, perceived risk, intention, and exercise behavior.

1. **Demographic variables**

The investigator developed the demographic-data sheet, which included age, gender, education, occupation, marital status, income, and daily job physical activity.

2. **Perceived self-efficacy for exercise**

The Physical Exercise Self-efficacy Scale was developed by Schwarzer in a German version to measure perceived self-efficacy for physical exercise in the “Berlin Risk Appraisal and Health Motivation Study” in 1994 (Renner & Schwarzer, 2008; Schwarzer & Renner, 2008). The general stem for all items is “How certain are you that you could overcome the following barriers?” The measure consists of five indicators: “I can manage to carry out my exercise intention (1)…even when I have worries and problems, (2)…even if I feel depressed, (3)…even when I feel tense, (4)…even when I am tired, and (5)…even when I am busy.” Responses are given using a 4-point scale ranging from very uncertain (1) to very certain (4). Scores are summed and range from of 5 to 20, with higher scores indicating a higher perceived self-efficacy of exercise.

The psychometric properties of the Physical Exercise Self-efficacy Scale were originally examined in 2,549 inhabitants of Berlin from four different locations (two universities and two city halls; (Schwarzer & Renner, 2008). The average age of the participants was 39 (range: 14 to 90 years). The internal consistency reliability (Cronbach's alpha) coefficient was .88. To investigate discriminant validity of the Physical Exercise Self-efficacy Scale, principal components analysis (PCA) was used to determine which of the items best represent the unique dimension that is statistically distinct from other scales: Nutrition Self-Efficacy and Alcohol Resistance Self-Efficacy Scales. The five items of the Physical Exercise Self-efficacy Scale loaded onto only one factor. The correlation of factor loading for these items ranged from .75 to .86, confirming that the tool has the capability to exclusively measure the concept that is theoretically related to perceived self-efficacy.

According to the health action process approach (HAPA; (Schwarzer, 1992; Schwarzer, 1999), perceived self-efficacy is a good predictor of exercise intention and exercise behavior. Pearsons' correlation coefficients were calculated to determine if the Physical Exercise Self-efficacy Scale was correlated with exercise intention and exercise behavior scales. The Physical Exercise Self-efficacy Scale was moderately correlated with the exercise intention scale (r = .33, p < .01). This finding supports concurrent validity of the measure. The predictive validity of the measure was supported in that the exercise self-efficacy scale was moderately correlated to exercise behavior scales (r = .39, p < .01) at six months later (Schwarzer & Renner, 2008).

Brown (2005) used the scale to examine exercise self-efficacy among 398 undergraduate students from Midwest State University in the United States. Participants were 18 to 35 years old. The Physical Exercise Self-efficacy Scale was slightly correlated with the Seven-Day Physical Activity Recall (PAR; r = .29, p< .05). The benefits and barriers were moderately correlated with the measure of self-efficacy (r = .35 and -.39, p < .05, respectively). These data support concurrent validity of this instrument.

The Physical Activity Self-Efficacy Scale was also used in Maglione and Hayman's (2009) study among low income college students (n = 416) in New Jersey. The internal consistency reliability coefficient was .85. The Physical Activity Self-Efficacy Scale was correlated with the International Physical Activity Questionnaire ($r = .22$, $p < .05$) which supports concurrent validity. This scale was also used in an intervention study with 25 Type 2 diabetes patients but reliability and validity were not reported (Shen et al., 2007).

The Physical Exercise Self-efficacy Scale has been used with a wide range of age groups (14 to 90 years) and with both men and women as well as in different countries, such as Germany (Schwarzer & Renner, 2008) and the United States (Brown, 2005; Shen et al., 2007). Therefore, the Physical Exercise Self-efficacy Scale may be appropriate to generalize to other populations, including Thai people even though the numbers of studies using this scale were limited. In this study, the internal consistency reliability coefficient was .88. This instrument was reliable with the general Thai sample.

3. **<u>Outcome expectancies for exercise</u>**

The Outcome Expectation for Exercise Scale-2 (OEE-2) was developed by Resnick (2005). The OEE-2 included both positive outcome expectations and negative outcomes associated with exercise. The OEE-2 is composed of 2 subscales: positive exercise outcomes (POEE) and negative exercise outcomes (NOEE). The POEE subscale consisted of the 9 items derived from the Outcome Expectation for Exercise (OEE) (Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000). The nine items of the POEE focused on benefits related to exercise. Five of the nine focused on physical benefits: (1) exercise makes me feel better physically; (2) exercise helps me feel less tired; (3) exercise improves my endurance in performing my daily activity; and (4) exercise helps to strengthen my bones; and (5) exercise makes my muscles stronger. Four items included mental health benefits: (6) exercise makes my mood better in general; (7) exercise is an activity I enjoy doing; (8) exercise gives me a sense of personal accomplishment; and (9) exercise makes me more alert mentally (Resnick, Zimmerman, Orwig, & Magaziner, 2000). Scores were summed with higher scores indicating more positive outcome expectations for exercise.

The NOEE subscale included four items: Exercise…(1) causes me to feel short of breath, (2) causes me to have pain, (3) makes me fearful that I will fall or get hurt, and (4) places too much stress on my heart. Responses of items are given from strongly agree (1) to strongly disagree (5). After reverse scoring of the four negative items, scores were summed with higher scores indicating more positive outcome expectations for exercise.

Content validity of the positive exercise outcomes (POEE) was demonstrated in the original development of the OEE scale (Resnick, Zimmerman et al., 2000) supported by a group of four experts on issues related to motivation and exercise adherence in older adults; these experts agreed with the items identified but proposed a few revisions. The instrument was then sent to two geriatric nurse practitioners and two researchers who were familiar with the issues of the benefits of exercise for older adults. All four reviewers were asked to rate the relevancy of the items using a scale of 1 (not relevant) to 4 (very relevant). The finding found that all items were rated as either relevant or very relevant. However no content validity of negative exercise outcomes (NOEE) was reported.

The reliability and validity of the OEE-2 was investigated in 161 residents living in a continuing-care retirement community. The average age of participants was 88.6 years. The discriminant validity found in a principle-components factor analysis supported the two separate subscales. The POEE and NOEE subscales accounted for 44% and 15% of the variance in outcome expectations respectively. The results of a Rasch analysis showed that three items of the NOEE subscales had INFIT and OUTFIT values ranging from 1.6 to 2.3: (1) is something I avoid because it causes me to be short of breath, (2) is something I avoid because it may cause me to have pain, and (3) makes me fearful that I will fall or get hurt. An INFIT and OUTFIT value of greater than 1.4 indicates that these items do not fit in the same construct and can be loaded on both the POEE and NOEE subscales. These results revealed that the two constructs overlap.

However, the evidence of convergent validity was found by the reasonable significant correlation of the POEE subscale, the NOEE subscale, and the total OEE-2 (The total score of OEE-2 is sum of POEE and NOEE scores after NOEE scores were reversed) with exercise subscale of the Yale Physical Activity (r = .32, .34, and .38 respectively, p < .05). Also, the POEE subscale, the NOEE subscale, and the total OEE-2 were significantly correlated with self-efficacy (r = .69, .61, and .71 respectively, p < .05). Besides, the POEE subscale was significantly related to the NOEE (r = .50, p < .05). The internal consistency of the POEE and NOEE subscale were good with alpha coefficients of .93 and .80 respectively.

The generalization of the OEE-2 is limited because the majority of the participants were women, white and elderly. However, the existing OEE-2 scale may be an appropriate tool for measuring outcome expectations for exercise among Thais. The reason for selecting the OEE-2 was that it was the only existing scale found that combined both subscales of benefits and barrier of exercise. In the current study, the internal consistency reliability coefficient was .87 for POEE, .83 for NOEE, and .81 for the total OEE-2. These Cronbach's alpha values indicate a great evidence of internal consistency among the general Thai sample.

4. **<u>Perceived risk of heart disease</u>**

The Perception of Risk of Heart Disease Scale (PRHDS) developed by Ammouri and Neuberger (2008) was used to assess perceived risk of heart attack. The 20-item instrument is composed of three subscales: dread risk (7 items), risk (7 items), and unknown risk (6 items). Dread risk reflects perceived lack of control, dread, catastrophic potential, and fatal consequences. Risk reflects a vulnerability that has few, moderate, known outcomes and consequences. Unknown reflects vulnerability judged to be unobservable, unknown, new, and delayed in their appearance of harm. An example of an item of the dread risk subscale is; "there is a possibility that I have heart disease". Responses are rated on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). After reverse scoring of 12 items, scores are summed, with higher scores representing a higher perception of risk of heart disease.

The PRHDS was initially evaluated with face validity and content validity (Ammouri & Neuberger, 2008). The original 38 items of the PRHDS were examined for face validity by 8 people who were not diagnosed with heart disease. The 8 participants were asked whether (1) the items correctly measured the theoretical concept of interest, (2) the items appropriately stated the intention of the tool, and (3) the items matched the individual's conditions. The items were revised based on suggestions from the 8 respondents. Content validity was also investigated by a panel of 10 experts who were specialists in instrument development, item writing, public health, heart disease, and psychometric analysis. The content validity index (CVI) was used to examine items for clarity, homogeneity of content and representativeness of construct. After these procedures, the original 38 items of the PRHDS were reduced to 32 items.

A psychometric evaluation was conducted with a convenience sample recruited from hospital, outpatient clinics, a community center, and universities in Jordan. The 295 participants were both men and women with range of age from 15 to 75 years. Initially, item analysis was conducted and it was found that more than 60% of item-to-item correlations exceeded .30. The correlation of item-to-subscale and item-to-total ranged from .02 to .50. Some items with correlations below .30 were deleted because these items may not contribute information to the construct of interest. Thus, the 32-item PRHDS was cut to 20 items with three subscales.

Internal consistency reliability for each subscale was examined. The Cronbach's alpha coefficients of the dread risk, risk, and unknown risk subscales were .80, .72, and .68 respectively. The Cronbach's alpha coefficient of the total scale was .80. These estimates of reliability coefficients were acceptable. However, the reliability of risk and unknown risk subscale was lower than .80. An explanation may be that the tool was used in the English language with Jordan people. The English questionnaire version might be a barrier for some Jordanian people and lead to low reliability scores.

To capture stability of the instrument, the two-week test-retest reliability coefficients of the dread risk, risk, and unknown risk subscales were .76, .70, and .61 respectively. The estimates of stability coefficient were satisfactory even though the test-retest reliability was conducted with a small sample on 100 participants.

Dimensionality was assessed by exploratory factor analysis with eigenvalues and a varimax rotation. Discriminant validity of three different subscales was supported with eigenvalues of more than 1, which accounted for 43% of variance. The items loaded in each factor from .40 to .77, which was acceptable. These data showed that the PRHDS was a unidimensional measure. To establish concurrent validity, a positive correlation between the PRHDS scores and healthy lifestyles would be found. The Health Promotion Lifestyle profile II (HPLP II) scale was used to measure health promoting behaviors, which consists of six subscales intended to measure healthy lifestyles, including health responsibility, physical activity, nutrition, spiritual growth, internal relations, and stress management. Concurrent validity was supported by the positive correlations between these subscales and the Health Promotion Lifestyle profile II subscales (*r* = .20 to.39, *p* < .01). The evidence of low to moderate correlations between these subscales empirically supports the idea that individuals, who perceived themselves at risk of getting heart disease, engage in health promoting behaviors.

In sum, the total internal consistency coefficient was good. Concurrent validity was documented with a positive correlation between the PRHDS and the HPLP II. These data provide sufficient psychometric properties of the PRHDS. The PRHDS was chosen for this study because it was the only existing tool designed to measure perceived risk of heart disease. . In the current study, the internal consistency reliability coefficient was .90 for dread risk subscale, .55 for risk subscale, 50 for unknown risk subscale and .71 for the total PRHDS. Subscales reflect low to acceptable internal consistency.

5. **<u>Intention to exercise</u>**

The exercise intention scale was established by Sniehotta, Schwarzer, Scholz, and Schuz (2005) to assess intention to exercise. The scale is composed of six items. The general stem for all items is “I intend to…” and followed by (1) “…exercise several times a week.”, (2) “… work up a sweat regularly.”, (3) “… exercise regularly.”, (4) “…be physically active regularly for a minimum of 30 minutes at least 3 times a week”, (5) “… increase my leisure time activity”, and (6) “… adhere to the exercise regime prescribed to me during the rehabilitation”. Responses are given using a 4-point scale ranging from completely disagree (1), disagree (2), agree (3), to totally agree (4). Scores are summed, with high scores representing positive intention to exercise.

The psychometric properties of the exercise intention scale were examined in a longitudinal study with 352 cardiac patients recruited during rehabilitation treatment and followed up at two and four months after discharge in Germany (Sniehotta, Schwarzer et al., 2005). The average age of the participants was 58 (range: 31 to 86 years). The internal consistency reliability (Cronbach's alpha) coefficient was .82. The two-month test-retest reliability coefficient was .84. To investigate discriminant validity of the exercise intention scale, principal components analysis (PCA) was used to determine which of the items best represent the unique dimension. The six items loaded onto only one factor. The factor loadings were .61 to .79, confirming that the tool has the capability to exclusively measure the concept that is theoretically related to exercise intention. The predictive validity of the measure showed that the exercise intention scale was slightly correlated to exercise behavior scale ($r = .25$, $p < .01$) four months later.

The exercise intention scale was reported as a unidimensional measure and provided sufficient predictive validity. The stability of the scale with two-month test-retest reliability was excellent. These data support that the exercise intention scale is a reliable and valid measure. This scale with six items is also a parsimonious instrument to assess exercise intention. However, to generalize to general population in the community, the item of "I intend to adhere to the exercise regime prescribed to me during the rehabilitation" was removed because this item is inappropriate to ask a general population. This scale was also used in several exercise studies (Renner et al., 2007; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005; Wiedemann et al., 2009). The alpha coefficient in the current study was .85. In the Thai sample, scale was reliable.

6. **Exercise behavior**

Godin, Jobin, and Bouillion (1986) developed The Leisure Time Exercise Behavior by Self-Report as one question to assess exercise behavior in order to provide a very simple and easy to use instrument for psychosocial studies. Participants were asked "How often did you participate in active sports or vigorous physical activities long enough to get sweaty, during leisure time within the past four months?". The responses given are: (1) not at all; (2) less than once a month; (3) about once a month; (4) about 2 or 3 times a month; (5) 1 to 2 times a week; and (6) 3 or more times a week. The scales are: "not at all" is designated as 0; "less than once a month" equal to 2; "about once a month" equal to 4; "about 2 or3 times a month" equal to 10; "1 to 2 times a week" equal to 24; and "3 or more times a week" equal to 48.

The psychometric properties of the Leisure Time Exercise Behavior by Self-Report were examined by Godin, Jobin, and Bouillon (1986). Test-retest reliability was conducted among 29 men randomly selected from the Quebec metropolitan telephone directory in Canada. The mean age was 38 years (range 21 to 62). The two week test-retest reliability coefficient was sufficient at 0.64. Concurrent validity was examined in 61 volunteers. The range of age was 19 to 66 years, both men and women were recruited from newspaper and radio announcements. Values of maximum oxygen intake, body fat, and muscular endurance were used as criteria of validity for the self-reported measurement because the level of regular exercise affects the level of these three criteria. The usual duration of time for recording these benefits is between two to four months. The Pearson product-moment correlation showed that the score on the Leisure Time Exercise Behavior by Self-Report was significantly associated with maximum oxygen intake (r = 0.38, p <0.001), body fat (r = 0.43, p <0.01), and muscular endurance (r = 0.38, p <0.001). Contrasting groups were also used to support concurrent validity. An ANOVA test showed significant differences in level of exercise behavior between those groups as high and low in exercise behavior of maximum oxygen intake ($F = 6.83$, $p < 0.05$), body fat ($F = 9.51$, $p < 0.01$), and muscular endurance ($r = 12.89$, $p < 0.001$).

The evidence of validity of the Leisure Time Exercise Behavior by Self-Report was also reported in Gionet and Godin's study (1989). The validity study was conducted among 477 employees who were both men and women, with a mean age of 36 years in New Brunswick, Canada. The subjects were asked the following slightly modified question: "How often did you participate in one or more physical activities of 20-30 minutes duration per session during your leisure time within the past 6 months?". The responses given were: (1) not at all; (2) less than once a month; (3) about once a month; (4) about 2 or3 times a month; (5) 1 to 2 times a week; and (6) 3 or more times a week. The level of exercise behavior of men and women was significantly related to maximum oxygen intake (Men: $r = 0.22$; Women: $r = 0.40$, $p < 0.001$) and muscular endurance (Men: $r = 0.25$; Women: $r = 0.32$, $p < 0.01$).

These data indicate that the self-report measurement of leisure time exercise behavior is a reliable and valid method for assessing level of exercise behavior. Unlike the Yale Physical Activity Survey (DiPietro, Caspersen, Ostfeld, & Nadel, 1993), and the Seven-Day Physical Activity (Sallis, 1997), the Leisure Time Exercise Behavior by Self-Report uses a simple question and does not require high self-reporting skills from subjects. In addition, the scale does not convert scores into corresponding energy expenditures. Thus, this scale is easy to use to measure level of exercise behavior of individuals in the community. The Leisure Time Exercise Behavior by Self-Report has been widely used in psychological research (Blanchard, Courneya, Rodgers, & Murnaghan, 2002; Roberts, Vaziri, & Barnard, 2002; Smith, Doyle, Pascoe, Douglas, & Jorgensen, 2007)

The question in the current study was modified from both previous studies (Gionet & Godin, 1989; Godin et al., 1986). Participants were asked “How often did you participate in physical exercise of 20 to 30 minutes duration per session during your leisure time within the past 4 months?”. The responses given are: (1) not at all; (2) less than once a month; (3) about once a month; (4) about 2 or 3 times a month; (5) 1 to 2 times a week; and (6) 3 or more times a week. The scales allocate as: 0 for “not at all”; 2 for “less than once a month”; 4 for “about once a month”; 10 for “about 2 or3 times a month”; 24 for “1 to 2 times a week”; and 48 for “3 or more times a week”.

E. **Data Collection**

1. **Phase I: Instrument translation**

The English questionnaires were translated into Thai language using an expert bilingual panel. Back-translation was used in this study because it is the most common method and highly recommended procedure for translating instruments from one language to another language to assure accuracy (Brislin, 1970; E. G. Jones & Kay, 1992). In the back-translation technique, one bilingual expert translates the instrument from the source to the target language and a second bilingual expert who has not seen the original version translates it back from the target to the source language. Then, the back-translated version is compared with the source version. The target version will be identical if the back-translated version is equivalent to the source version (Brislin, 1970). However, if the source and back-translated versions are not identical, the researcher will discuss with the two bilingual translators to minimize discrepancies. Modification of some items in the original questionnaires may be employed if some content in the source language is not included in the target language (Brislin, 1970). A consensus was reached on the final version when items were clear and non-ambiguous and had the same meaning.

In this study, the questionnaires were translated by two bilingual translators. The first individual, Ms. Pimwalunn Aryuwat, is a nurse scholar. She was born in Thailand and is fluent in the Thai langauge. She graduated with a masters degree from UK and lived in the UK for 6 years. Also, she has been in the US for 6 months and is fluent in written English. She translated the questionnaire from the English version into the Thai version.

The second individual, Dr. Amnuayporn Rasamimari, graduated with a PhD in Nursing from the University of Illinois at Chicago. She was born in Thailand and is fluent in the Thai langauge. She has been in the US for 20 years and is fluent in speaken and written English. She translated the questionnaire from the Thai version into the English version.

2. **Phase II: Procedures of data collection**

Data were collected after Institutional Review Board (IRB) approval was obtained from the University of Illinois at Chicago. The mayor of Udon Thani Municipality received the research proposal and he was asked to support the collection of data within his institution. Data were collected from May to June 2010. The investigator met the director of the division of Civil Registration and Identification Card at Udon Thani Municipality to verify the dates for data collection.

To recruit participants in the division of Civil Registration and Identification Card at Udon Thani Municipality, the information sheet was distributed to participants at the information desk by a facilitator. The investigator approached all eligible participants who were in the setting for registering one's birth, death, domicile, and identification cards during the time of data collection. In the public park, the researcher also invited eligible participants to participate in the study. The information sheet in lieu of a subject consent form described the purpose of the study and invited them to participate in the study.

The investigator also informed the participants that data were being collected using a confidential, self-administrated questionnaire. Subjects who decided to participate in the study went to the designated area to complete the questionnaires. They completed a questionnaire that included 51 items assessing demographic characteristics, perceived risk for heart disease, outcome expectancies for exercise, perceived self-efficacy for exercise, intention to exercise, and exercise behavior.

After completing the questionnaires, the participants received a multipurpose cloth bag valued at $1.00 (American), as a token of appreciation. The questionnaire took approximately 10 minutes. To ensure privacy, no personal information (e.g., names, address, telephone, etc.) was collected from the subjects. The completed questionnaires were kept in a locked cabinet to enhance confidentiality.

F. **Data Analysis**

The data were analyzed using the Statistical Package for Social Sciences programs (SPSS) version 17.0 for windows (SPSS Inc., 2007). Descriptive statistics were used to describe the variables. Chi-square and t-test were utilized to assess the differences between demographics and main variables. Pearson product-moment coefficient of correlation was used to evaluate simple correlations of variables. All statistical tests were based on two-tailed distribution with alpha at 0.05.

Path analysis by structural equation modeling using Amos 18 (Arbuckle, 2009) was conducted to examine the effect of variables. Theoretically, the investigator hypothesized that perceived risk, outcome expectancies, perceived self-efficacy, and intention (mediator) would have an effect on exercise. Perceived self-efficacy would also have a direct effect on exercise behavior.

A path model of the hypothesized model was specified with exercise behavior as the endogenous variable; intention as the mediator; and perceived risk, outcome expectancies, and self-efficacy as the exogenous variables. The model fit was assessed by examining the χ^2 statistic with a p-value larger than 0.05 accepting the null hypothesis. However, the χ^2 statistic is sample-size dependent; therefore, the comparative fit index (CFI), the goodness of fit index (GFI), and the root-mean-square error of proximate (RMSEA) were also used to evaluate fit (Bollen & Long, 1993; Maruyama, 1998; Tabachnick & Fidell, 2001). A model is judged to have a good fit if CFI and GFI indices have values higher than 0.95, and the value of RMSEA is less than 0.05 (Tabachnick & Fidell, 2001). The χ^2/df ratio is used as a further goodness-of-fit criterion with a χ^2 not larger than 2-5 times the degrees of freedom (Bollen & Long, 1993).

To determine age and gender as moderators, first, the effects of outcome expectancies, self-efficacy, and intention (mediator) on exercise behavior were estimated with four subsamples separately; younger adults (18-35 years old) and middle-aged/older adults (36 years or older), and for men and women. Subjects aged 18 to 35 were classified as younger adults and 36 or older for middle-aged/older adults. The second step estimated whether the hypothesized model differed between age or gender groups, the researcher pursued multiple group analyses or a nested model with equality constraints between two groups: younger and middle-aged/older adults; and men and women (Byrne, 2010; Keith, 2006; Tabachnick & Fidell, 2001).

Before running multiple group analyses, the single group models have to fit well (Tabachnick & Fidell, 2001). With a nested model, the χ^2 difference value ($\Delta\chi^2$), which is estimated by the subtraction of χ^2 value of constrained model from the unconstrained model, is used as the index for comparing models across two groups (Byrne, 2010; Keith, 2006; Maruyama, 1998; Tabachnick & Fidell, 2001). If the $\Delta\chi^2$ value is statistically significant, it indicates that the two models are not equivalent (Byrne, 2010; Keith, 2006; Tabachnick & Fidell, 2001).

G. **Missing Value Analysis**

Prior to analysis, all 51 variables were examined using SPSS 17 for accuracy of data entry, missing values, and fit between their distributions and assumptions of multivariate analysis. The minimum and maximum values, means, and standard deviations of each variable were examined. After inspecting univariate descriptive statistics for accuracy of data, inverse scores were calculated for negative items. Of the total sample (660 subjects), 53 cases (8%) had missing data. Five cases (0.75%) had missing data on demographics, and 48 cases (7.25%) had missing data on 44 items of perceived risk, outcome expectancies, self-efficacy, intention, and exercise. For these 44 items, missing value analysis was used with expectation maximization (EM) to determine the percentage of missing values for each case. Any case with more than 5% missing values was deleted from the data set. However, cases with less than 5% missing values were retained in the data set.

In the missing value analysis, it was found that 10 cases had 6.8 - 34.1% missing values (3 - 15 missing items). These subjects were deleted from the data set. Thirty-eight cases had less than 5% missing values (1 - 2 missing items). Among these 38 cases, 5 cases were also deleted because they did not have data for the exercise variable which was the main variable. Therefore, in this data set, 15 subjects were deleted.

Missing data in this data set was assumed as missing at random (MAR) because subjects accidentally omitted an answer on a questionnaire. The researcher used thin paper (70 gram of 4

A paper) for the questionnaire so that some subjects might have skipped some items on that page.

The researcher decided to estimate missing values with expectation maximization (EM) for the 33 cases with < 5% missing values. Expectation maximization (EM) methods are appropriate for randomly missing data because the procedures of EM have the advantage of avoiding impossible matrices, avoiding overfitting (making the solution look better than it actually is), and producing practical estimates variances (Tabachnick & Fidell, 2001). EM shapes a missing data correlation (or covariance) matrix by assuming the shape of distribution (such as normal) for the partially missing data and basing inferences about missing values on the likelihood under that distribution (Tabachnick & Fidell, 2001). There are two steps for each iteration; (a) expectation (E step) and (b) maximization (M step): (1) the E step finds the "missing" data, estimate of the parameters, and then substituted values; (2) the M step performs maximum likelihood estimation to impute the replacement for the missing values (Tabachnick & Fidell, 2001). Finally, after convergence is achieved, the imputed values are saved in the data set. After imputing values of missing data, the 44 items were summed to be 5 main variables as exercise behavior (TEX), self-efficacy (TSE), intention (TIN), perceived risk (TRP), and outcome expectancies (TOE).

IV. RESULTS

The purpose of this study was to examine the determinants proposed by the Health Action Process Approach model (HAPA) on exercise behavior among Thais. The specific aims of the study were to; (1) examine the effects of perceived risk, outcome expectancies, perceived self-efficacy, and intention (mediator) on exercise behavior among Thais; (2) determine the effect of age (moderator) on the relationship of perceived risk, outcome expectancies, perceived self-efficacy, and intention (mediator) with exercise behavior among Thais; (3) determine the effect of gender (moderator) on the relationship of perceived risk, outcome expectancies, perceived self-efficacy, and intention (mediator) with exercise behavior among Thais. This chapter presents the path analysis assumption, psychometric properties of the instruments, the descriptive statistics for all variables, and the statistical analyses for the three specific aims in chapter 1.

A. <u>**Path Analysis Assumption**</u>

The assumptions of path analysis should be met with normality, linearity, and homoscedasticity of all main variables. Thus, with 645 subjects, univariate and multivariate outliers with ungrouped data would be detected. Univariate outliers are cases with an extreme value on one variable. Therefore, we used the combination of the following criteria to verify normality of each variable, (a) the values of skewness and kurtosis should be close to zero, and (b) z scores (alpha .01, two tails) of each variable should not exceed ± 2.58 (Mertler & Vannatta, 2010; Tabachnick & Fidell, 2001). We found 27 cases were univariate outliers because of their extremely low z scores on perceived risk (TRP), outcome expectancies (TOE), or intention (TIN); these cases were deleted. After the deletion of univariate outliers of TRP, the value of skewness was reduced from -0.375 (SE = 0.096) to -0.109 (SE = 0.098) and kurtosis was reduced from 0.543 (SE = 0.192) to -0.134 (SE = 0.196). The skewness of TOE was improved from -0.548 (SE = 0.096) to 0.000 (SE = 0.098) and kurtosis was reduced from 0.975 (SE = 0.192) to -0.434 (SE = 0.196). The skewness of TIN was improved from -0.219 (SE = 0.096) to 0.161 (SE = 0.098) and kurtosis was reduced from 0.895 (SE = 0.192) to .172 (SE = 0.196) as well. The skewness and kurtosis of TRP, TOE, and TIN were close to zero. This indicates that the distributions were normal.

Bivariate scatterplots were also used to examine univariate normality and linearity. If the variable is normally distributed, scatterplots will display an elliptical shape (Mertler & Vannatta, 2010). A subjective examination of the bivariate scatterplots found them to be acceptable. The nonlinearity associated with nonnormality of the three variables (TRP, TOE, and TIN) was resolved by deletion of the outlying cases.

Tabachnick and Fidell (2001) posit that “multivariate outliers are best detected by Mahalanobis distance. Mahalanobis distance is the distance of a case from the centroid of the remaining cases where the centroid is the point created at the intersection of the means of all the variables” (p. 68). The criteria for multivariate outliers is Mahalanobis distance as χ^2 at $p< 0.001$ and degrees of freedom equal to the number of variables (Tabachnick & Fidell, 2001). In this study, we had five variables: TEX, TSE, TIN, TRP, and TOE; therefore, Mahalanobis distance is evaluated with χ^2 (5 df, $\alpha = 0.001$) of 20.515. Any case with Mahalanobis distance greater than χ^2 (5 df, $\alpha = 0.001$) of 20.515, then is a multivariate outlier. After deletion of 42 cases for missing data or outliers, no multivariate outliers were found. Consequently, the total sample size used in main analysis for this study was 618 subjects.

Outlier analysis for the 27 cases deleted showed that 21 of the outlying cases were recruited from the Municipality and 6 subjects from the public park. Fifteen men and 12 women were found to be outliers. Mean age was 36.33 ± 10.41 (range 21- 60). Average age between outlying cases (27) and total sample (618) was not significantly different (Mean = 36.33 vs 36.82, t (641) = 0.226, p = 0.821). No significant differences were found with regard to exercise behavior (Mean = 19.26 vs 25.30, t (643) = 1.639, p = 0.102) and perceived risk of heart disease (Mean = 46.03 vs 48.02, t (26.48) = 0.835, p = 0.411). However, perceived self-efficacy (Mean = 11.70 vs 13.53, t (27.22) = -2.98, $p < 0.05$), intention (Mean = 12.85 vs 15.55, t (26.60) = 3.147, $p < 0.01$), and outcome expectancies (Mean = 43.00 vs 53.05, t (26.45) = 3.976, $p < 0.01$) were significantly different between the outlying cases and the total sample. Perceived self-efficacy, intention, and outcome expectancy scores in the outlying cases (27) were lower than those in the total sample (618). This is expected because we intended to delete outlying cases which were the lowest z scores of perceived risk, outcome expectancies, and intention. The small numbers of deletion, 27 outlying cases, would not affect generalizability of the major findings of the total sample.

The final step to evaluate the data for departures from assumptions was an evaluation of multicollinearity by regression. The collinearity diagnostic output found no dimension (row) had more than one variance proportion greater than 50; therefore, no multicollinearity was found in this data set. Therefore, this data set would not have problems with a large standard error which might affect the significance of the regression coefficients (Tabachnick & Fidell, 2001). Consequently, all main variables met the assumptions of path analysis with normality, linearity, homoscedasticity, and no multicollinearity.

B. **Psychometric Properties of the Instruments**

1. **Reliability**

Internal consistency reliability was estimated using Cronbach’s alpha and the values of each scale ranged from 0.706 to 0.883 (see Table I). The internal consistency reliability coefficient alpha of the Perception of Risk of Heart Disease Scale (PRHDS) was: 0.902 for the dread risk subscale with7 items; 0.549 for the risk subscale with 6 items; and 0.495 for the unknown risk subscale with 7 items. The total reliability of the PRHDS with 20 items was 0.706. The internal consistency of the Outcome Expectations for Exercise Scale-2 (OEE-2) was: 0.868 for the positive OEE with 9 items; 0.826 for the negative OEE with 4 items. The total reliability of the OEE-2 with 13 items was 0.811. The internal consistency of the Physical Exercise Self-efficacy scale was 0.883. The Exercise Intention scale had an alpha coefficient of 0.854. These findings indicated that Cronbach’s alpha coefficients of the OEE-2 (0.811), the Physical Exercise Self-efficacy (.883), and Exercise Intention scale (0.854) were acceptable, whereas the reliability of the PRHDS (0.706) was marginally acceptable (Nunnally & Berstein, 1994).

TABLE I
INTERNAL CONSISTENCY RELIABILITY OF THE INSTRUMENTS[a]

Instruments	Number of items	Response Scale	α	*M*	*SD*
The Perception of Risk of Heart Disease Scale	20	4	.706	48.02	5.66
Dread risk subscale	7	4	.902	15.19	3.99
Risk subscale	6	4	.549	15.04	2.35
Unknown risk subscale	7	4	.495	17.79	2.67
The Outcome Expectancies for Exercise Scale-2	13	5	.811	53.05	5.82
Positive OEE subscale	9	5	.868	38.68	4.08
Negative OEE subscale	4	5	.826	14.36	3.50
The Physical Exercise Self-efficacy scale	5	4	.883	13.53	2.98
The Exercise intention scale	5	4	.854	15.55	2.28

[a]n = 618

2. Construct validity assessment via factor analysis

a. The perception of risk of heart disease scale

Principal axis factor analysis with varimax rotation was conducted to assess the underlying structure for the 20 items of the Perception of Risk of Heart Disease Scale (see Table II). Three factors were required, based on the fact that the items were designed into three constructs: dread risk, risk, and unknown risk subscales. After rotation, the first factor accounted for 21.15% of the variance, the second factor accounted for 8.95%, and the third factor accounted for 8.4%. The factor of the dread risk subscale had strong loading from .68 to .84 on the first 7 items. However, the items of the risk subscale (6 items) and the unknown risk subscale (7 items) were loaded on both factors. These results indicated that the two constructs overlapped and did not fit in the one single construct. Also, seven items loaded with lower than

.40: items of 3, 11, and 12 for the risk subscale; items of 6, 18, 19, and 20 for the unknown risk subscale. The low correlation of factor loading for these items confirms that the tool has not the capability to exclusively measure the concept that is theoretically related to perceived risk of heart disease.

TABLE II
FACTOR LOADINGS FOR THE PERCEPTION OF RISK OF HEART DISEASE SCALE

Items	Subscales	Factor 1 (Dread risk)	Factor 2 (Risk)	Factor 3 (Unknown risk)
7. It is likely that I will get heart disease	Dread risk	.84		
9. It is possible that I will get heart disease	Dread risk	.80		
2. There is a good chance I will get heart disease during the next 10 years	Dread risk	.75		
8. I am at risk for getting heart disease	Dread risk	.74		
5. I feel sure that I will get heart disease	Dread risk	.73		
4. I have a high chance of getting heart disease because of my past behaviors	Dread risk	.68		
1. There is a possibility that I have heart disease	Dread risk	.68		
6. Healthy lifestyle habits are unattainable	Unknown risk	.32		
16. People my age do not get heart disease.	Risk		.76	
15. People my age are too young to get heart disease.	Risk		.64	
20. The causes of heart disease are unknown.	Unknown risk		.28	
3. A person who gets heart disease has no chance of being cured	Risk		.25	
18. No matter what I do, if I am going to get heart disease, I will get it.	Unknown risk		.25	
17. My life habits do not put me at risk for heart disease.	Unknown risk			.60
14. I am not worried that I might get heart disease.	Risk			.60
13. I am very healthy so my body can fight off heart disease.	Unknown risk			.56
10. I’m not doing anything now that is unhealthy to my heart.	Unknown risk			.46
11. I am too young to have heart disease	Risk			.39
12. People like me do not get heart disease.	Risk			.35
19. People who don’t get heart disease are just plain lucky.	Unknown risk			.32

b. **<u>The outcome expectations for exercise scale-2</u>**

Principal axis factor analysis with varimax rotation was conducted to assess the underlying structure for the 13 items of the Outcome Expectations for Exercise Scale-2 (see Table III). Two factors were required, based on the fact that the items were designed into two constructs: positive and negative outcome expectations. After rotation, the first factor accounted for 30.21% of the variance and the second factor accounted for 17.42%.The construct of positive outcome expectation had strong loadings from .55 to .77 on the first 9 items. The construct of negative outcome expectation had also strong loading from .59 to .87 with 4 items. These findings indicate that the original factor structure of the measure was replicated.

TABLE III
FACTOR LOADINGS FOR THE OUTCOME EXPECTATION FOR EXERCISE SCALE-2

Items	Subscales	Factor 1 (Positive)	Factor 2 (Negative)
2. Exercise makes my mood better in general.	Positive	.77	
4. Exercise makes my muscles stronger.	Positive	.72	
7. Exercise makes me more alert mentally.	Positive	.72	
8. Exercise improves my endurance in performing my daily activity.	Positive	.68	
3. Exercise helps me feel less tired.	Positive	.64	
1. Exercise makes me feel better physically.	Positive	.62	
6. Exercise gives me a sense of personal accomplishment.	Positive	.60	
5. Exercise is an activity I enjoy doing.	Positive	.57	
9. Exercise helps to strengthen my bones.	Positive	.55	
11. Exercise is something I avoid because it may cause me to have pain.	Negative		.87
10. Exercise is something I avoid because it causes me to be short of breath.	Negative		.79
12. Exercise makes me fearful that I will fall or get hurt.	Negative		.71
13. Exercise places too much stress on my heart.	Negative		.59

C. **Demographic Characteristics**

A convenience sample of 618 Thais participated in this study. The sample was recruited from public places such as the Municipality (n = 484) and public park (n = 134). The average age for the sample was 36.82 years (SD = 10.88), with a range from 18 to 68 years (2 participants (0.3%) did not give their age). The total sample included 51.6% women and 48.2% men (1 participant (0.2%) did not indicate gender). The majority of the sample (55.5%) was married, while 43.8% were single. Twelve percent had less than high school education, 29% had completed high school, and 60% had either completed or were studying in college or university degree. Most of the sample was working (86.1%). The greatest proportion of subjects had individual income between $157 and $312 per month (approximately 33 baht per 1 USD). The physical activity in daily job of the majority of the sample (81.8%) was moderately active or better. Table IV presents the demographic characteristics of the sample.

TABLE IV
DEMOGRAHIC CHARACTERISTICS OF PARTICIPANTS[a]

Characteristics	*n*	%
Age (years)		
18-35 (*M* = 27.39, *SD* = 4.87)	293	47.4
36 or older (*M* = 45.36, *SD* = 7.12)	323	52.3
Total sample *M* = 36.82, *SD* = 10.88, Range (18-68)		
Gender		
Men	298	48.2
Women	319	51.6
Marital status		
Single (Never married)	215	34.8
Married	343	55.5
Separated	18	2.9
Divorced	28	4.5
Widowed	13	2.1
Education		
None	5	.8
Elementary school	70	11.3
High school	177	28.6
Vocational school	133	21.5
College	201	32.5
Post-college	30	4.9
Work status		
Working	532	86.1
Unemployed	37	6.0
Retired	15	2.4
Student	32	5.2
Individual income (per month)		
None	43	7.0
≤ $31	6	1.0
$32-$156	88	14.2
$157-$312	266	43.0
$313-$781	144	23.3
$782-$1562	55	8.9
≥ $1563	13	2.1
Physical activity (in daily job)		
None	2	0.3
Minimally activity	23	3.7
Somewhat active	85	13.8
Moderately active	295	47.7
Very active	211	34.1

[a]n = 618

In terms of demographic characteristics between the two settings, the results were that participants from the public park ($n = 134$) were older than those from the Municipality ($n = 484$; $m = 40.95$ vs. $m = 35.68$, t (df = 614) = -5.042, $p < 0.01$). Participants from the Municipality were more likely to have higher monthly family income than those from the public park (χ^2 (df = 6) = 14.386, $p < 0.05$). However, gender, marital status, education, working status, and physical activity in daily job were not significantly different between the two settings (see Table V).

TABLE V
DEMOGRAPHIC CHARACTERISTICS BETWEEN MUNICIPALITY AND PUBLIC PARK

Characteristics	Municipality[a] *n*	Municipality[a] %	Public Park[b] *n*	Public Park[b] %	χ^2 *(df)*	*p*
Age (years)					17.38(1)	<.01
18-35	251	40.7	42	6.8		
36 or older	232	37.7	91	14.8		
Gender					1.756(1)	.185
Men	227	36.8	71	11.5		
Women	257	41.7	62	10.0		
Marital status					4.60(4)	.331
Single	177	28.7	38	6.2		
Married	263	42.6	80	13.0		
Separated	15	2.4	3	0.5		
Divorced	19	3.1	9	1.5		
Widowed	10	1.6	3	0.5		
Education					8.352(5)	.138
None	4	0.6	1	0.2		
Elementary	49	8.0	21	3.4		
High school	148	24.0	29	4.7		
Vocational	97	15.7	36	5.8		
College	161	26.1	40	6.5		
Post-college	24	3.9	6	1.0		
Work status					3.506(3)	.320
Working	419	68.0	113	18.3		
Unemployed	28	4.5	9	1.5		
Retired	9	1.5	6	1.0		
Student	27	4.4	5	0.8		
Individual income (per month)					14.386(6)	.026
None	39	6.3	4	0.7		
≤ $ 31	5	0.8	1	0.2		
$32-$156	74	12.0	14	2.3		
$157- $312	212	34.5	54	8.8		
$313-$781	105	17.1	39	6.3		
$782-$1562	36	5.9	19	3.1		
≥ $1563	11	1.8	2	0.3		
Physical activity (in daily job)					3.755(4)	.440
None	1	0.2	1	0.2		
Minimally active	18	2.9	5	0.8		
Somewhat active	72	11.7	13	2.1		
Moderately active	232	37.7	63	10.2		
Very active	160	26.0	51	8.3		

[a]n = 484
[b]n = 134

D. **Descriptive Statistics of Social-Cognitive Variables and Exercise Behavior**

Table VI shows the mean, standard deviation, and range for each variable.

TABLE VI
DESCRIPTIVE STATISTICS OF SOCIAL-COGNITIVE VARIABLES AND EXERCISE BEHAVIOR[a]

Variable	*M*	*SD*	Possible range	Actual range
Perceived Risk	48.02	5.66	20 - 80	32 - 63
Outcome Expectancies	53.05	5.82	13 - 65	37 - 65
Self-efficacy	13.53	2.98	5 - 20	5 - 20
Intention	15.55	2.28	5 - 20	10 - 20
Exercise Behavior	25.30	18.72	0 - 48	0 - 48

[a]n = 618

E. Group Differences for Social-cognitive Variables and Exercise Behavior

In order to examine age group differences, mean scores in health cognitions and exercise behavior were investigated between younger adults (18 – 35 years old) and middle-aged/older adults (36 or older) (Renner et al., 2007). The findings showed that middle-aged/older adults (n = 323) perceived greater benefits of exercise and fewer barriers of exercise than younger adults (n = 293; m = 53.80 vs. m = 52.25, t (614 df) = -3.315, $p < 0.01$). The middle-aged/older adults also had a higher perceived self-efficacy to overcome barriers of exercise (m = 13.73 vs. m = 13.27, t (611.72 df) = -1.976, $p < 0.05$) and stronger intention to exercise than younger adults (m = 15.85 vs. m = 15.22, t (614 df) = -3.466, $p < 0.01$). Moreover, the middle-aged/older adults reported more frequent exercise than younger adults (m = 28.39 vs. m = 22.03, t (613.83 df) = -4.292, $p < 0.01$). Younger and middle-aged/older adults did not differ in term of perceived risk of heart disease (see Table VII).

TABLE VII
GROUP DIFFERENCES FOR SOCIAL-COGNITIVE VARIABLES AND EXERCISE BEHAVIOR BETWEEN YOUNGER AND MIDDLE-AGED/OLDER ADULTS

	Younger adults[a]		Middle-aged/older adults[b]			
Variable	*M*	*SD*	*M*	*SD*	*t* (*df*)	*P*
Perceived Risk	47.71	5.81	48.29	5.53	-1.267 (614)	.206
Outcome Expectancies	52.25	5.95	53.80	5.61	-3.315 (614)	<.01
Self-efficacy	13.27	2.71	13.73	3.17	-1.976 (611.72)	<.05
Intention	15.22	2.23	15.85	2.28	-3.466 (614)	<.01
Exercise Behavior	22.03	17.68	28.39	19.16	-4.292 (613.84)	<.01

[a]n = 293
[b]n = 323

Gender differences were also examined. Mean scores in health cognitions and exercise behavior were investigated between men (n = 298) and women (n = 319). The findings showed that no gender differences were found for social-cognitive variables and exercise behavior (see Table VIII).

TABLE VIII
GROUP DIFFERENCES FOR SOCIAL-COGNITIVE VARIABLES AND EXERCISE BEHAVIOR BETWEEN MEN AND WOMEN

Variable	Men[a]		Women[b]		*t* (*df*)	*P*
	M	*SD*	*M*	*SD*		
Perceived Risk	48.27	5.58	47.77	5.73	1.093 (615)	.275
Outcome Expectancies	52.70	5.95	53.38	5.68	-1.434 (615)	.152
Self-efficacy	13.41	2.78	13.61	3.14	-.848 (615)	.397
Intention	15.49	2.30	15.60	2.24	-.630 (615)	.529
Exercise Behavior	26.24	18.26	24.49	19.13	1.162 (615)	.246

[a]n = 298
[b]n = 319

F. **Correlations Between Social-Cognitive Variables and Exercise Behavior**

Correlations between social-cognitive variables and exercise behavior were investigated. Table IX presents the intercorrelations for perceived risk of heart disease, outcome expectancies, perceived self-efficacy, intention, and exercise behavior. The correlations demonstrated that outcome expectancies (r = 0.473, p < 0.01) and perceived self-efficacy (r = 0.535, p < 0.01) were positively associated with intention. Outcome expectancies (r = 0.220, p < 0.01), perceived self-efficacy (r = 0.330, p < 0.01), and intention (r = 0.367, p < 0.01) were positively associated with Exercise behavior. Perceived self-efficacy was positively associated with outcome expectancies (r = 0.304, p < 0.01). Unexpectedly, perceived risk for heart disease was negatively associated with outcome expectancies (r = -0.121, p < 0.01), intention (r = -0.091, p < 0.05), and exercise (r = -0.222, p < 0.01). Perceived risk of heart disease was not associated with self-efficacy (r = -0.074, p = 0.068).

TABLE IX
INTERCORRELATIONS AMONG SOCIAL-COGNITIVE VARIABLES
AND EXERCISE BEHAVIOR[a]

Variable	1	2	3	4	5
1. Perceived Risk	1	-.121**	-.074	-.091*	-.222**
2. Outcome Expectancies		1	.304**	.473**	.220**
3. Self-efficacy			1	.535**	.330**
4. Intention				1	.367**
5. Exercise Behavior					1

* p < .05. ** p < .01.
[a]n = 618

G. <u>The Effects of Perceived risk, Outcome Expectancies, Perceived Self-Efficacy, and Intention on Exercise Behavior</u>

A structural equation model of the hypothesized model was specified with exercise behavior as the endogenous variable; intention as the mediator; and perceived risk, outcome expectancies, and self-efficacy as the exogenous variables. The model fit was assessed by examining the χ^2 statistic with a p-value larger than 0.05 indicating that the null hypothesis should be accepted. However, the χ^2 statistic is sample-size dependent; therefore, the comparative fit index (CFI), the goodness of fit index (GFI), and the root-mean-square error of proximate (RMSEA) were also used to indicate a good fit (Bollen & Long, 1993; Maruyama, 1998; Tabachnick & Fidell, 2001). A model is judged to have a good fit if CFI and GFI indices have values higher than 0.95, and the value of RMSEA is less than 0.05 (Tabachnick & Fidell, 2001). The χ^2/df ratio is used as a further goodness-of-fit criterion with a χ^2 not larger than 2-5 times the degrees of freedom (Bollen & Long, 1993).

The baseline (5 variable) version of the hypothesized model (see Figure 3), composed of exercise behavior as an endogenous variable; intention to exercise as a mediator; and perceived risk of heart disease, outcome expectancies, and perceived self-efficacy as exogenous variables, was estimated with the total sample (n = 618). The baseline model had GFI and CFI indices which were higher than 0.95 (GFI = 0.984 and CFI = 0.952). However, in the baseline model, the χ^2/df ratio was larger than 5 times the degrees of freedom and RMSEA higher than 0.05 (χ^2/df = 12.99; RMSEA = 0.139). Therefore, the baseline model was not a good fit.

The findings demonstrated that the path of perceived risk of heart disease on intention was not significant in the baseline model (β = -0.02, p < 0.573). Also, the internal consistency reliability of the perceived risk measure was low (α = 0.706). Therefore, perceived risk of heart disease with a marginal reliability and lack of contribution to the model was removed from the future models. The modified model was constructed and the model fit and parameters were re-estimated. The modified model was composed of exercise behavior as an endogenous variable; intention as a mediator; and outcome expectancies and perceived self-efficacy as exogenous variables. The modified model fit the data well: χ^2 (1) = 1.288, p = 0.256; χ^2/df = 1.288; GFI = 0.999; CFI = 0.999; RMSEA = 0.022. A chi-square difference test revealed a significant improvement in the fit of the modified model: $\Delta\chi^2(1)$ = 24.691, $p < 0.001$ (see Table X). Thus, with perceived risk of heart disease removed, the modified model was more parsimonious and a better fit than the baseline model.

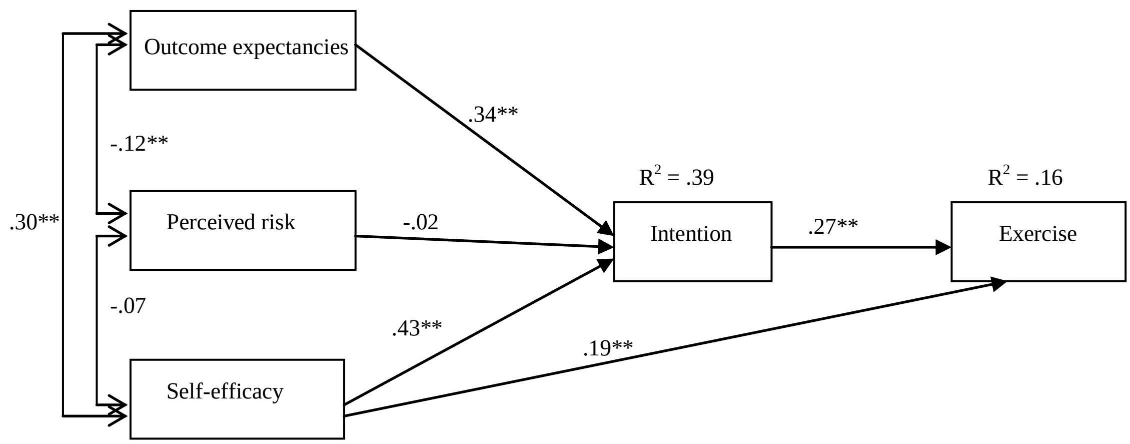

Figure 3. The baseline model for exercise behavior among Thais in Thailand.

* *p* < .05. ** *P* < .01.

TABLE X
GOODNESS-OF-FIT INDICES OF BASELINE AND MODIFIED MODELS[a]

Model	$\Delta\chi^2$ (*df*, *p*)	χ^2	*df*	*p*	χ^2/df	GFI	CFI	AIC	RMSEA
Baseline model		25.979	2	.001	12.990	.984	.952	51.979	.139
Modified model	24.691 (1, .001)	1.288	1	.256	1.288	.999	.999	19.288	.022

[a]n = 618
GFI = Goodness of Fit Index.
CFI = Comparative Fit Index.
AIC = Akaike Information Criterion.
RMSEA = root mean square error of approximation.

Figure 4 shows the modified model, including correlation and path coefficients. The correlation of perceived self-efficacy with outcome expectancies (r = 0.30, p < 0.01) was positive and significant. Perceived self-efficacy (β = 0.43, p < 0.01) and outcome expectancies (β = 0.34, p < 0.01) were significant predictors of intention. Perceived self-efficacy and outcome expectancies accounted for 39% of the variance in intention. In turn, intention significantly predicted exercise behavior (β = 0.27, p < 0.01), and explained 16% of the variance in exercise behavior. Perceived self-efficacy was also a significant direct predictor of exercise behavior (β = 0.19, p < 0.01).

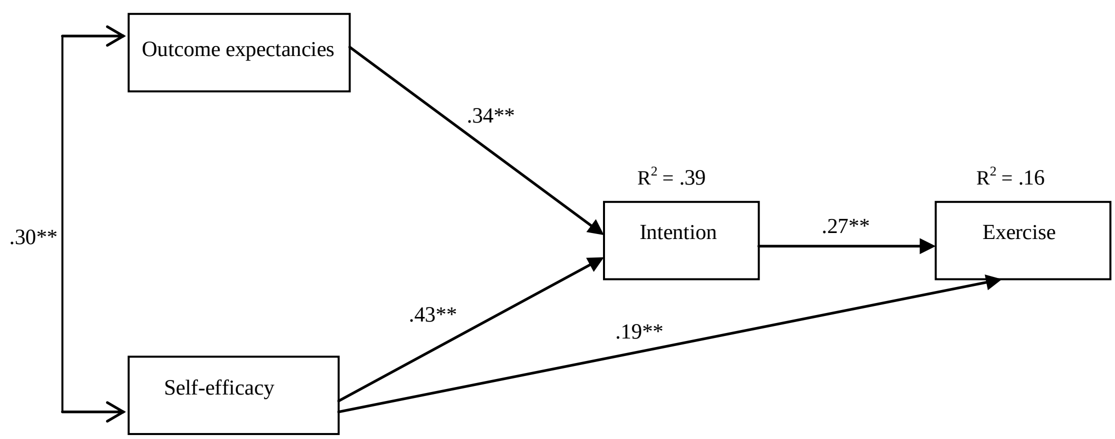

Figure 4. The modified model for exercise behavior among Thais in Thailand.

* p < .05. ** P < .01.

H. The Effects of Age and Gender on the Relationship of Outcome Expectancies, Perceived Self-efficacy, and Intention with Exercise Behavior

To determine the effect of age and gender as moderators, first, the effects of outcome expectancies, perceived self-efficacy, and intention on exercise behavior were estimated separately for younger adults and middle-aged/older adults, and for men and women. The second step examined age group and gender group differences with multiple group analysis (Byrne, 2010; Keith, 2006; Tabachnick & Fidell, 2001).

1. The effects of outcome expectancies, perceied self-efficacy, and intention on exercise behavior between younger and middle-aged/older adults

Overall, the model for younger adults (see Figure 5) was a good fit for the data (χ^2 (1) = 1.529, p = 0.216; χ^2/df = 1.529; GFI = 0.997; CFI = 0.997; RMSEA = 0.043). The correlation of perceived self-efficacy with outcome expectancies (r = 0.20, p < 0.01) was significant. Perceived self-efficacy (β = 0.48, p < 0.01) and outcome expectancies (β = 0.24, p < 0.01) were significant predictors of intention. Perceived self-efficacy and outcome expectancies accounted for 33% of the variance in intention. In turn, intention significantly predicted exercise behavior (β = 0.28, p < 0.01), and explained 12% of the variance in exercise behavior. Perceived self-efficacy (β = 0.11, p = 0.099) was not a direct predictor of exercise behavior within the younger group.

The model for middle-aged/older adults (also in Figure 5) had a good fit for the data as well (χ^2 (1) = 0.281, p = 0.596; χ^2/df = 0.281; GFI = 1.000; CFI = 1.000; RMSEA = 0.000). The correlation of perceived self-efficacy with outcome expectancies (r = 0.39, p < 0.01) was significant. Perceived self-efficacy (β = 0.36, p < 0.01) and outcome expectancies (β = 0.44, p < 0.01) were significant predictors of intention. Perceived self-efficacy and outcome expectancies together accounted for 45% of the variance in intention. Exercise behavior was significantly predicted by intention ($\beta = 0.24$, $p < 0.01$) and by perceived self-efficacy ($\beta = .26$, $p < 0.01$), and together these two variables accounted for 19% of the variance in exercise behavior.

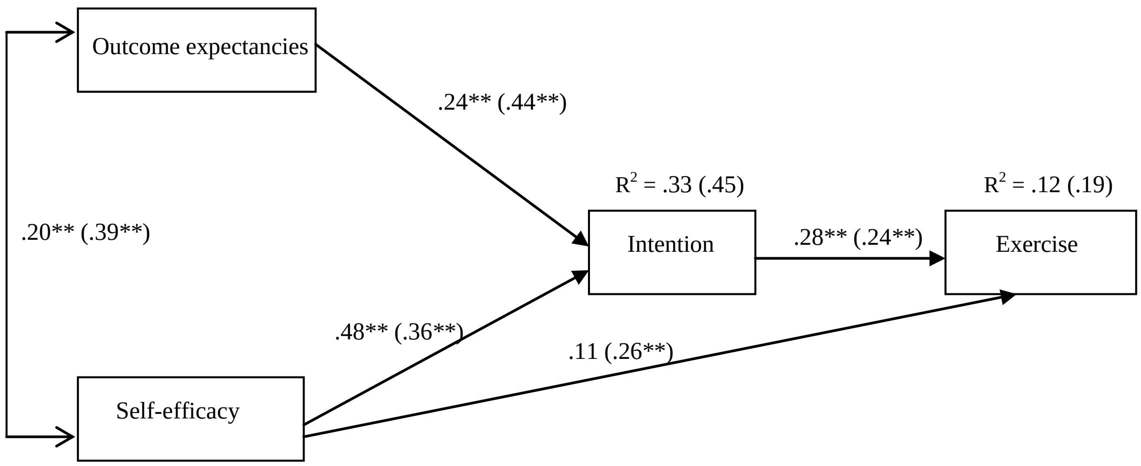

Figure 5. The comparison of the model for exercise behavior between younger and middle-aged/older adults in Thailand (coefficients for middle-aged adults in parentheses).

* $p < .05$. ** $P < .01$.

2. The effects of outcome expectancies, perceived self-efficacy, and intention on exercise behavior between men and women

The model for men (see Figure 6) was a good fit for the data (χ^2 (1) = 1.249, p = 0.264; χ^2/df = 1.249; GFI = 0.998; CFI = 0.999; RMSEA = 0.029). The correlation of perceived self-efficacy with outcome expectancies (r = 0.27, p < 0.01) was significant. Perceived self-efficacy (β = .44, p < 0.01) and outcome expectancies (β = 0.33, p < 0.01) were significant predictors of intention. Perceived self-efficacy and outcome expectancies accounted for 38% of the variance in intention. Exercise behavior was significantly predicted by intention (β = 0.26, p < 0.01) and accounted for 10% of the variance in exercise behavior. Perceived self-efficacy (β = .08, p = 0.198) was not a direct predictor of exercise behavior for men.

The model for women (also in Figure 6) also had a good fit with the data (χ^2 (1) = 0.040, p = 0.841; χ^2/df = 0.040; GFI = 1.000; CFI = 1.000; RMSEA = 0.000). The correlation of perceived self-efficacy with outcome expectancies (r = 0.34, p < 0.01) was significant. Perceived self-efficacy (β = 0.41, p < 0.01) and outcome expectancies (β = 0.37, p < 0 .01) were significant predictors of intention. Perceived self-efficacy and outcome expectancies accounted for 41% of the variance in intention. Exercise behavior was significantly predicted by intention (β = 0.29, p < 0.01) and perceived self-efficacy (β = 0.27, p < 0.01), and together these two variables accounted for 25% of the variance in exercise behavior.

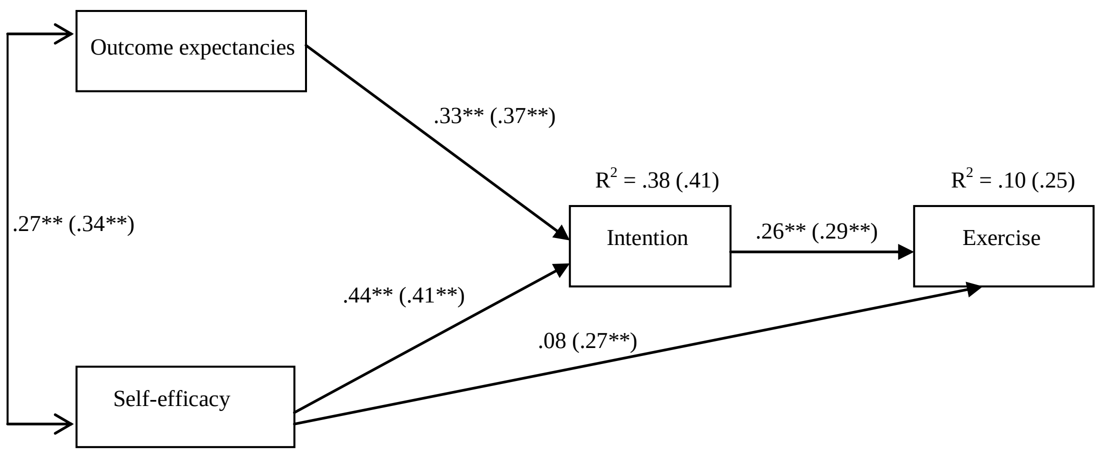

Figure 6. The comparison of the model for exercise behavior between men and women in Thailand (coefficients for women in parentheses).
* $p < .05$. ** $P < .01$.

3. <u>Moderation of age and gender effects on the modified model</u>

To estimate whether the modified model differed between age or gender groups, the researcher pursued multiple group analyses or a nested model with equality constraints between two groups: younger and middle-aged/older adults; and men and women. Before running multiple group analyses, the single group models have to fit well (Tabachnick & Fidell, 2001). With nested model, the χ^2 difference value ($\Delta\chi^2$), which is estimated by the subtraction of χ^2 value of constrained model from the unconstrained and, is used as the index for comparing models across two groups (Byrne, 2010; Keith, 2006; Maruyama, 1998; Tabachnick & Fidell, 2001). If $\Delta\chi^2$ value is statistically significant, it indicates that the two models are not equivalent (Byrne, 2010; Keith, 2006; Tabachnick & Fidell, 2001).

The modified model for exercise behavior was significantly different ($\Delta\chi^2(4) = 17.352$, $p < 0.01$) between the younger and middle-aged/older groups (see Table XI). By examining group differences in single paths, this was done by setting equality constraints on each single path between the two groups. Significant differences between the younger and middle-aged/older adults were found in the regression weights: outcome expectancies on intention ($\Delta\chi^2(1) = 15.734$, $p < 0.01$; see Table XII).

TABLE XI
GOODNESS-OF-FIT INDICES FOR NESTED MODELS BETWEEN YOUNGER AND MIDDLE-AGED/OLDER ADULTS

Model	$\Delta\chi^2$ (df, p)	χ^2	*df*	*p*	χ^2/df
Unconstrained model		1.81	2	.405	.905
Constrained model	17.352 (4, .002)	19.162	6	.004	3.194

TABLE XII
SINGLE PATHS OF VARIABLES BETWEEN YOUNGER AND MIDDLE-AGED/OLDER ADULTS

Paths	$\Delta\chi^2$	*df*	*p*
Outcome expectancies on intention	15.734	1	.001
Self-efficacy on intention	.804	1	.370
Self-efficacy on exercise behavior	2.081	1	.149
Intention on exercise	.816	1	.366

Between men and women, the modified model for exercise behavior was significantly different ($\Delta\chi^2(5) = 10.155$, $p < 0.05$) (see Table XIII). The single paths of perceived self-efficacy on exercise behavior ($\Delta\chi^2(1) = 5.782$, $p < 0.05$); and intention on exercise behavior ($\Delta\chi^2(1) = 4.620$, $p < 0.05$) were significantly different between men and women (see Table XIV).

TABLE XIII
GOODNESS-OF-FIT INDICES FOR NESTED MODELS BETWEEN MEN AND WOMEN

Model	$\Delta\chi^2$ (df, *p*)	χ^2	df	*p*	χ^2/df
Unconstrained model		1.289	2	.525	.645
Constrained model	10.155 (4, .038)	11.444	6	.076	1.907

TABLE XIV
SINGLE PATHS OF VARIABLES BETWEEN MEN AND WOMEN

Paths	$\Delta\chi^2$	*df*	*p*
Outcome expectancies on intention	1.040	1	.308
Self-efficacy on intention	1.170	1	.279
Self-efficacy on exercise behavior	5.782	1	.016
Intention on exercise behavior	4.620	1	.032

V. DISCUSSION

The major purposes of the study were to (1) examine the effects of perceived risk of heart disease, outcome expectancies, perceived self-efficacy, and intention (mediator) on exercise behavior among Thais; and (2) determine the effects of age and gender (moderator) on the relationship of perceived risk of heart disease, outcome expectancies, perceived self-efficacy, and intention (mediator) on exercise behavior among Thais. This section provides discussion of demographic information, the major findings, and relevance of the findings to those of similar or contrastable studies. This section also addresses limitations, implications, and conclusions.

A. **Demographic Characteristics**

Most of the previous Thai exercise studies were conducted with specific samples, including nurses, undergraduate students, older people, middle-aged adults, and patients with cardiovascular disease. This study expanded knowledge about the effects of social-cognitive factors on exercise behavior by including a variety of ages, gender, occupations, incomes, and education levels. The average age of the sample was 36.82 years, with a range from 18 to 68 years. The sample had a similar number of men and women: 51.6% women and 48.2% men.

Twenty-nine percent of the sample had completed high school and 60% had either completed university degree or were studying in college. This sample's level of education was higher than the Thai population. In Thailand 50% have less than a high school education, 29% have completed high school, and only 17% have greater than high school education (Ministry of Public Health, 2008). The monthly income of the largest proportion of the sample ($313 - $781) was higher than the Thai population in which 59% have monthly incomes of only $31 - $ 312 (Ministry of Public Health, 2008). Compared to the Thai population, the sample in this study was well educated and had higher monthly income because all of the subjects were recruited from the urban area. It is likely that individuals living in urban areas of Thailand have a higher educational level as well as higher income than individuals outside of the urban areas. The physical activity in daily job of the majority of the sample (82%) was moderate and very active, which was similar to the 92% of Thai population (Ministry of Public Health, 2008).

B. The Effects of Perceived Risk, Outcome Expectancies, Perceived Self-Efficacy, and Intention on Exercise Behavior

This study focused on the effects of perceived risk of heart disease, outcome expectancies, perceived self-efficacy, and intention on exercise behavior among Thais. The overall hypothesized model indicated that only outcome expectancies and perceived self-efficacy were significant predictors of intention to exercise. Outcome expectancies and perceived self-efficacy for exercise explained 39% of the total variance in intention. This finding is consistent with three previous studies among 353 cardiac patients in Germany, 114 cardiac patients in Poland, and 368 orthopedic patients (Schwarzer et al., 2008). Among these samples, outcome expectancies and perceived self-efficacy together accounted for 36 to 80% of the variance in intention.

1. Perceived risk of heart disease

The HAPA model hypothesized that individuals who see themselves at risk to get disease are more likely to form an intention to perform a healthy behavior including exercise behavior (Renner et al., 2007; Scholz et al., 2005; Schwarzer, 1992; Sniehotta, Scholz, & Schwarzer, 2005). Unexpectedly, in this study, as well as prior studies, perceived risk of heart disease was not a significant predictor of intention to exercise (Scholz et al., 2008; Schwarzer et al., 2007; Schwarzer et al., 2008).

Schwarzer and colleagues (2007) addressed why perceived risk did not contribute to exercise intention. It is possible this is due to measurement error or possibly that perceived risk may be less relevant in determining exercise intention or exercise behavior. Interestingly, a study among Thai elders (n = 24,664) found that perceived good health was positively associated with exercise (Thanakwang, 2009). The present finding may also be due to measurement error. The Perception of Risk of Heart Disease Scale (PRHDS) which was used to measure perceived risk of heart disease was developed for Jordanian people in English. The measurement might not be universal across to the Thai culture. In this present study, the internal consistency reliability of the two subscales of the PRHDS was lower than .70; risk subscale (α =.55) and unknown risk subscale (α =.50). Seven items loaded with lower than .40: items 3, 11, and 12 for the risk subscale; items 6, 18, 19, and 20 for the unknown risk subscale. The items of the risk and unknown risk subscales were loaded on both subscales. These results indicated that the two constructs overlapped and did not fit in the one single construct. These data could not establish a unidimensional measure; therefore, could not measure the perceived risk correctly. Thus, perceived risk of heart disease in this study could not contribute to intention to exercise and may be due to measurement error. Another explanation may relate to the difficulty of the translation of this measure into the Thai language. The verb tenses were particularly challenging since the Thai language does not include the multilevel future tenses, for example, “I feel that I will get heart disease”; “It is likely that I will get heart disease”; and “It is possible that I will get heart disease”. Therefore, these items have a duplicate meaning in Thai language. This study suggests that a culturally and linguistically appropriate instrument measuring perceived risk of heart disease specific to general Thai people might need to be developed.

Unfortunately, no empirical studies in Thailand have focused on the relationship between perceived risk of heart disease and intention. Thus, this is the first study to pursue the effect of perceived risk of heart disease on intention in Thailand. Therefore, it is premature to conclude that perceived risk of heart disease did not play a role in contributing to intention to exercise among general Thais. Further studies with a culturally appropriate tool need to capture this concept among Thai people.

2. **Outcome expectancies for exercise**

Outcome expectancy was a significant predictor of intention among Thai people. This result is consistent with previous western studies (Scholz et al., 2005; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005) and one prior study in South Korea (Renner et al., 2007). The magnitude of the effect of outcome expectancies on intention among Thais ($\beta = .34$, $p < .01$) is greater than the Western sample ($\beta = .15$ to $.29$, $p < .05$) and the South Korean sample ($\beta = .18$, $p < .05$). A possible explanation for the difference in the path coefficient of outcome expectancies on intention is the different measures used in the present study and the previous studies. The Outcome Expectation for Exercise Scale-2 (OEE-2) measuring outcome expectancies for exercise in the current study was composed of positive and negative consequences of exercise, while the instrument used in the previous studies measured only positive consequences of exercise. Interestingly, the internal consistency reliability of the instrument used in the three previous studies ($\alpha = .86$ to $.92$) was higher than it was in the present study ($\alpha = .81$). This indicates that the construct of outcome expectancies may play a more important role in contributing to exercise intention in Thai people than it did in the Western or South Korean people. However, contrasting findings were reported by Schwazer and colleagues (2007) of 365 internet users in Germany: outcome expectancy was not significantly predictive of exercise intention.

Although no study in Thailand has thoroughly studied the relationship between outcome expectancies and intention based on the HAPA model, one previous Thai study based on the theory of planned behavior showed that perceived benefits ($\beta = .21$, $p < .05$) and barriers ($\beta = -.29$, $p < .05$) were significant predictors of exercise intention among 150 Thai older people (Jitramontree, 2003). In addition, the effect of outcome expectancies on intention is consistent with American and Canadian studies reporting an effect of behavioral beliefs of exercise on exercise intention (Conn, Tripp-Reimer et al., 2003; Courneya, 1995).

3. **Perceived self-efficacy for exercise**

This study, as well as previous studies of both patient and general sample, reported that perceived self-efficacy was a significant predictor of intention to exercise in Western countries (Scholz et al., 2005; Scholz et al., 2008; Schwarzer et al., 2007; Schwarzer et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005) and in South Korea (Renner et al., 2007). The magnitude of effect of perceived self-efficacy on intention among Thais ($\beta = .43$, $p < .01$) is in the range of the level of path coefficients of the previous studies ($\beta = .20$ to 68, $p < .05$).

However, when comparing to a similar culture, the South Korean sample, the effect of perceived self-efficacy on intention in Thai adults ($\beta = 43$, $p < .01$, $n = 618$) was higher than it was for the South Korean adults ($\beta = .27$, $p < .01$, $n = 697$). A possible explanation for the difference in the strength of the relationship between self-efficacy and intention is that self-efficacy in the south Korean study was measured with an instrument that focused on the ability to perform exercise, whereas in this study self-efficacy focused on the ability to overcome barriers to exercise. Unfortunately, in Thailand, there is no prior empirical study of the relationship between perceived self-efficacy and intention based on the HAPA model. However, one previous Thai study based on the theory of planned behavior revealed that exercise self-efficacy was a significant predictor of exercise intention among Thai older people (Jitramontree, 2003). Also, the effect of perceived self-efficacy on exercise intention is consistent with American and Canadian studies reporting an effect of perceived behavioral control on exercise intention (Blanchard, Courneya, Rodgers, Daub et al., 2002; Blanchard et al., 2008; Blue et al., 2001; Conn, Tripp-Reimer et al., 2003; Courneya et al., 2000; L. W. Jones et al., 2005). The effect of perceived behavioral control on exercise intention is consistent with the effect of perceived self-efficacy in intention to exercise.

The finding of this study supports the previous Thai studies that perceived self-efficacy was a direct significant predictor of exercise behavior in Thai heart disease and hypertensive patients (Buarapha, 2004; Namphonkrung et al., 2005; Tantayothin, 2004) undergraduate students (Srichaisawat, 2006; Voraroon, 2005), older adults (Anunsuksawat, 2006), and people recruited at a fitness center (Wongvilai, 2004). However, the amount of the effect of perceived self-efficacy on exercise behavior in the present study ($\beta = .19$, $p < .01$) was somewhat lower than it was in the previous Thai studies ($\beta = .20$ to $.39$, $p < .05$). The difference may be explained that in the previous Thai studies only direct effects of perceived self-efficacy on exercise behavior were examined. Those studies did not include intention to exercise, a mediator, in their studies. Hence, intention to exercise, included in this present study, may diminish the direct effect of perceived self-efficacy on exercise behavior.

This result is also similar to the previous studies in the United States reporting that perceived self-efficacy was a significant predictor of exercise behavior among women (Choi et al., 2008; Wilbur et al., 2003; Wilbur et al., 2005) and older adults (Conn, 1998; Conn et al., 2003; Resnick & Nigg, 2003). The review of the literature of correlates of physical activity among American women by Eyler and colleagues (2002) also supports this present finding.

Nevertheless, this finding is in contrast with two prior studies of predicting physical activity among Thais. Perceived self-efficacy was not a predictor of physical activity among 112 older Thai adults (Asawachaisuwikrom, 2003) and 335 practical nurses (Kaewthummanukul et al., 2008). This is possibly explained in that the small sample of older adults and practical nurses were fairly homogenous in term of ability to perform exercise and frequency of exercise behavior. Contrasting findings were also reported by Maglione and Hayman (2009) in the United States: perceived self-efficacy did not contribute to exercise behavior among 416 college students. This suggests that in younger groups, exercise behavior was not predicted by perceived self-efficacy.

4. **Intention to exercise**

The present study reported that intention to exercise, as a mediator in the HAPA model, was a significant predictor of exercise behavior in public Thais. This result is consistent with one prior study in South Korea (Renner et al., 2007) and many previous Western studies (Lippke et al., 2005; Scholz et al., 2008; Sniehotta, Scholz, & Schwarzer, 2005; Sniehotta, Schwarzer et al., 2005; Wiedemann et al., 2009; Ziegelmann, Lippke, & Schwarzer, 2006b).

Even though no study in Thailand has thoroughly studied the relationship between intention to exercise and exercise behavior based on the HAPA model, one previous Thai study based on the theory of planned behavior reported that exercise intention was a significant predictor of exercise behavior among Thai elderly adults (Jitramontree, 2003). Also, American and Canadian studies, based on the theory of planned behavior, supported that exercise intention could significantly contribute to exercise behavior (Blanchard, Courneya, Rodgers, Daub et al., 2002; Blanchard et al., 2008; Blue et al., 2001; Conn, Tripp-Reimer et al., 2003; Courneya et al., 2000; Hoyt et al., 2009; Rhodes et al., 2004). These studies indicate that intention was predictive of exercise behavior across cultures. Therefore, intention should be addressed as a mediator in the processes of changing exercise behavior among a Thai population.

In sum, the results of this study partially confirm the applicability of the hypothesized model among a heterogeneous Thai sample. Outcome expectancies and perceived self-efficacy played a major role on intention to exercise among public Thais. Perceived self-efficacy is the best predictor of intention to exercise compared to outcome expectancies. Also, perceived self-efficacy directly and significantly contributed to exercise behavior. Intention to exercise mediated the effect of outcome expectancies and perceived self-efficacy on exercise behavior.

C. The Effects of Age and Gender on the Relationship of Outcome Expectancies, Perceived Self-Efficacy, and Intention with Exercise Behavior

The second purpose of the study was to examine the effects of age and gender (moderators) on the relationship between social-cognitive factors (independent variables) and exercise behavior (dependent variable) among Thais. The modified model, without perceived risk of heart disease, was a good fit for the data. Thus, the modified model without perceived risk was used to analyze for moderation effects.

1. Age as moderator

Differences across age groups were found between social-cognitive predictors and exercise behavior. The modified model for exercise showed a better fit in the middle-aged/older group than the younger group. The modified model for exercise behavior was significantly different between the younger and middle-aged/older groups. In the middle-aged/older sample, a larger amount of variance in intention and exercise behavior was accounted for by the model compared to the younger sample. In the middle-aged/older group, only perceived self-efficacy also directly predicted exercise behavior, but not in the younger group.

This finding is similar to the previous study of a general sample in South Korea that reported that the physical activity model showed a good fit in the middle-aged/older adults, whereas it was less applicable in younger adults (less than 36 years old; (Renner et al., 2007). Likewise, a previous study by Sniehotta and colleagues (2005) found that the exercise model fit the data well among coronary heart disease patients with an average age of 59 years. Supporting the present finding, the previous study by Schwarzer and Renner (2000) of age differential effects on dietary behavior among general adults revealed that perceived risk significantly predicted on intention in only older group but not in younger group (cutoff at 30 years old). However, in the present study, perceived risk was no longer in the modified model.

Moreover, additional analyses found that middle-aged/older adults perceived greater benefits of exercise and fewer negative consequences of exercise, higher perceived self-efficacy of ability to overcome barriers, and stronger intention to exercise than younger adults. The middle-aged/older adults also reported more frequent exercise than younger adults. These results might be possible because middle-aged/older adults may be concerned with health problems which lead to a higher intention to exercise and they are more likely engage in exercise in order to promote health behavior. These results are in congruence with a prior study by Renner and colleagues (2000) reporting that perceived risk of cardiovascular disease, self-efficacy for healthy diet, intention to adopt healthy diet, and adopting healthier nutrition associated with increasing age.

However, this result is different from one prior study (Lippke, Ziegelmann, & Schwarzer, 2004) reporting that the exercise model was not different between the younger and older orthopedic patients (< 45 years and > 45 years). The present finding is also in contrast to a prior study that indicated that age was a negative predictor on physical exercise among cardiac patients with an age range of 55 to 82 years old (Scholz et al., 2007). It may be that orthopedic or cardiac patients are fairly homogenous in terms of health beliefs and exercise behavior. With increasing age, a nonlinear relationship between health beliefs and exercise behavior might be also possible in the elderly group (65 or older).

However, no empirical studies in Thailand have focused on the effect of age on the relationship between social-cognitive variables and exercise behavior. Thus, this is the first study to capture the influence of age on the model of exercise in Thailand. In order to support this present study, future studies of this area should be replicated in a variety of samples in Thailand.

2. Gender as moderator

Gender differences in the relationships between social-cognitive predictors and exercise behavior were found in this study. The modified model for exercise showed a better fit in women than men. Between men and women, the modified model for exercise behavior was significantly different. The study reported that the exercise model accounted for a larger amount of variance in intention and exercise behavior in women than it did in men.

The present results are congruent with a prior study indicating that the model of dietary behavior among a South Korean sample was significantly different between men and women (Renner et al., 2008). In that study, the model of dietary behavior accounted for a larger amount of the total variance in intention and exercise in women than it did in men. However, the present study is in contrast to a previous study where gender did not moderate the relationship between social-cognitive factors and dietary behavior among a general sample in Germany (Schwarzer & Renner, 2000). Contrasting findings were reported by Jitramontree (2003): older women exercised less than men because of family responsibility such as house-work and child care. This present study is also in contrast with traditional Thai cultural beliefs that limit Thai women in performing exercise (Jitramontree, 2003). Namely, traditional Thai women usually wear skirts and they kept their legs or knees close together. Therefore, it is not acceptable if women engage in exercise that requires their legs to be an open position. Swimming and aerobic clothes are also inappropriate for Thai women because this type of clothing exposes their shapes. Hence, to understand exercise behavior among Thais, future studies need to be capture gender role and cultures related to exercise as well.

The present study also reported that all path coefficients of the exercise model in women were greater than they were in men. Interestingly, in women only, perceived self-efficacy directly predicted exercise behavior. Between women and men, there were the significant differences in the single paths; perceived self-efficacy on exercise behavior; and intention to exercise on exercise behavior. These findings indicate that for women perceived self-efficacy and exercise intention were more strongly associated with exercise behavior than for men. There were no differences between men and women in the mean scores of self-efficacy, intention or exercise. In contrast, another study showed that women reported higher perceived benefits of healthy diet and intention to healthy nutrition as well as healthier nutrition behaviors than men did (Renner et al., 2000).

As far as we know, in Thailand no studies have been conducted to examine the effect of gender on the relationship between social-cognitive variables on exercise behavior. As such, this is the first study to capture the moderating effect of gender on exercise. In order to confirm the findings of this present study, further studies of the moderating effect of gender on the relationship of social-cognitive factors and exercise behavior should be replicated in different populations in Thailand.

D. **Limitations**

This study has a number of limitations. First, the hypothesized model in this cross-sectional study was modified from the HAPA model. The variables of the *pre-intentional motivation phase* in the HAPA model were selected as the predictors of exercise behavior in this study. The variables of *post-intentional volition phase* in the HAPA model were not included. Therefore, a cross-sectional design prohibits making any causal inferences. Second, in path analysis it is assumed that no measurement error is present in the study. This limitation may affect the path coefficients. Third, the validity of self-report of exercise behavior has been questioned. However, there is evidence for the validity of self-reports of physical activity (Miller, Freedson, & Kline, 1994). However, self-report of exercise in this study used only one item asking frequency of exercise. Therefore, to understand the domains of exercise behavior, an exercise instrument measuring type of exercise, duration of exercise, and frequency of exercise should be included in future studies. Last, a convenience sample of Thai people from one geographical area limits the generalizability of the study findings across Thai populations living in other geographic areas. Further, despite attempts to recruit a diverse sample of public Thai people, the subjects participating in this study tended to be well educated and had a higher income than the general population.

E. **Implications of the Study**

Based on the major findings, exercise intervention programs for Thai population should incorporate outcome expectancies and perceived self-efficacy in order to impact intention to exercise. Thai people should be educated about the positive benefits of exercise and the negative perceptions of exercise should be addressed. Improving individuals' ability to overcome barriers to perform exercise should be addressed. In promoting exercise behavior, it would be beneficial to consider age and gender-specific strategies as well.

Further research based on the HAPA model should be conducted using more representative samples. Developing measures of perceived risk of heart disease specific to Thai populations that are culturally appropriate are needed. Future research of the entire HAPA model, including both *pre-intentional motivation phase* and *post intentional volition phase* in longitudinal studies are needed in order to explain adoption and maintenance of exercise behavior among Thai populations. Furthermore, intervention studies of exercise to confer causality of self-efficacy and outcome expectancies are also required in Thai populations.

F. **Conclusions**

The modified HAPA model is more applicable for middle-aged/older adults and women rather than younger adults and men. The beliefs about outcome expectancies, perceived self-efficacy, and intention are predictors of exercise behavior. Interventions should target intention to exercise through enhancing knowledge of benefits of exercise as well as increasing individuals' ability to overcome barriers of exercise. Interventions may be more effective if they target particular age and gender groups.

APPENDICES

Appendix A

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Exemption Granted

May 17, 2010

Ornwanya Poomsrikaew, MS,RN
Department of Biobehavioral Health Science
845 S Damen Ave, Dept. of Medical Surgical Nursing
M/C 802
Chicago, IL 60612
Phone: (312) 413-2659 / Fax: (312) 996-8945

RE: Research Protocol # 2010-0383
"Social-Cognitive Factors and Behavioral and Exercise Behavior Among Thais: An Application of the Health Action Process Approach Model"

Dear Ornwanya Poomsrikaew:

Your Claim of Exemption was reviewed on May 16, 2010 and it was determined that your research protocol meets the criteria for exemption as defined in the U. S. Department of Health and Human Services Regulations for the Protection of Human Subjects [(45 CFR 46.101(b)]. You may now begin your research.

Exemption Period: May 17, 2010 – May 16, 2013

Your research may be conducted with adult subjects only.

The specific exemption category under 45 CFR 46.101(b) is:
(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Appendix A (Continued)

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have
Appendix A (Continued)
responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

1. Amendments You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.

2. Record Keeping You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.

3. Final Report When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).

4. Information for Human Subjects UIC Policy requires investigators to provide information about the research protocol to subjects and to obtain their permission prior to their participating in the research. The information about the research protocol should be presented to subjects in writing or orally from a written script. When appropriate, the following information must be provided to all research subjects participating in exempt studies:
    a. The researchers affiliation; UIC, JBVMAC or other institutions,
    b. The purpose of the research,
    c. The extent of the subject's involvement and an explanation of the procedures to be followed,
    d. Whether the information being collected will be used for any purposes other than the proposed research,
    e. A description of the procedures to protect the privacy of subjects and the confidentiality of the research information and data,
    f. Description of any reasonable foreseeable risks,
    g. Description of anticipated benefit,
    h. A statement that participation is voluntary and subjects can refuse to participate or can stop at any time,
    i. A statement that the researcher is available to answer any questions that the subject may have and which includes the name and phone number of the investigator(s).
    j. A statement that the UIC IRB/OPRS or JBVMAC Patient Advocate Office is available if there are questions about subject's rights, which includes the appropriate phone numbers.

Please be sure to:
→Use your research protocol number (listed above) on any documents or correspondence with

Appendix A (Continued)

the IRB concerning your research protocol.

Appendix A (Continued)

We wish you the best as you conduct your research. If you have any questions or need further help, please contact me at (312) 355-2908 or the OPRS office at (312) 996-1711. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne, CIP
Assistant Director, IRB # 2
Office for the Protection of Research Subjects

Enclosure(s): None

cc: Mariann R. Piano, Department of Biobehavioral Health Science, M/C 802
Julie A. Zerwic, Department of Biobehavioral Health Science, M/C 802

Appendix B

Information Sheet

Social-Cognitive Factors and Exercise Behavior among Thais: An Application of the Health Action process Approach Model

You are being asked to fill out a survey about social-cognitive factors and exercise. We are asking you to take part in this study if you are 18 years old or older.

My name is Ornwanya Poomsrikaew. I am a nurse and a PhD student at the College of Nursing, University of Illinois at Chicago, U.S.A. I am conducting this survey for my dissertation. My faculty sponsor is Julie J. Zerwic, PhD, RN from the College of Nursing at the University of Illinois at Chicago. We would like to learn about the relationship between different various factors and exercise behavior in Thailand using a self-administrated questionnaire.

I have gotten the permission from Mr.Itthipol Treewatsuwan to invite you to be a part in my doctoral dissertation. Your participation is completely voluntary. Your decision whether or not to participate will not affect the services from staffs at the Division of Civil Registration and Identification Card at Udon Thani Municipality.

The first form will ask you basic questions about yourself like your age and education. You will then be asked to complete 5 questionnaires about your beliefs about exercise and exercise behavior. This should take about 10 minutes of your time.

There are no benefits to you for taking part in this study, but this study will help us learn more about what factors relate to exercise in Thailand. The only risk in filling out the survey is the possible loss of privacy. This means that the information you share with us may not be kept private. We have several ways that we will protect your information. There is a private room for you to complete the questionnaire. We are not asking your name and all the information you give will be kept in a locked case.

You do not need to sign your name on this form. If you agree to take part in this study, all you need to do is complete the questionnaires. This study is voluntary which means you can choose not to take part and that is ok. You will receive a small gift valued at $1.00 (American) such as a pencil, multi purpose cloth bag, or cloth purse for your participation. If you are interested in participate, please let me know. I will provide you with a survey questionnaire.

If you have any questions about this study, please contact Ornwanya Poomsrikaew, the principal investigator, at 089-2755-494 or email address: opooms2@uic.edu, or Dr. Julie J. Zerwic, my faculty sponsor at juljohns@uic.edu. You also may contact the Office for the Protection of Research Subjects (OPRS) by e-mail at uicirb@uic.edu.

Thank you for your time and interest.

Appendix C
Information sheet in Thai
โครงการวิจัย ปัจจัยทางจิตสังคม และการออกกำลังกาย

ผู้วิจัยชื่อ อรวรรยา ภูมิศรีแก้ว เป็นนักศึกษาปริญญาเอกที่คณะพยาบาลศาสตร์ มหาวิทยาลัย อิลลินอยส์ ณ นครชิคาโก ประเทศสหรัฐอเมริกา การทำวิจัยสำรวจครั้งนี้เป็นส่วนหนึ่งของการศึกษาปริญญาเอก อาจารย์ที่ปรึกษาชื่อ จูลี่ เซอร์วิค (Julie Zerwic, PhD, RN) การศึกษาครั้งนี้เป็นการสำรวจเกี่ยวกับปัจจัยทางจิตสังคมที่มีอิทธิพลต่อพฤติกรรมการออกกำลังกายของคนไทย ที่มีอายุตั้งแต่ 18 ปีขึ้นไป ทั้งผู้ที่ออกกำลังกาย หรือ ไม่เคยออกกำลังกาย

ผู้วิจัยได้รับอนุญาตจาก นายอิทธิพล ตรีวัฒน์สุวรรณ นายกเทศมนตรีนครอุดรธานี เพื่อขอเชิญชวนท่านเข้าร่วมตอบแบบสอบถาม ซึ่งการศึกษาครั้งนี้ ไม่ได้มีการบังคับ แต่เปิดโอกาสให้มีส่วนร่วมโดยสมัครใจ การตัดสินใจของท่านที่จะเข้าร่วม หรือไม่ จะไม่มีผลต่อการให้บริการ จากเจ้าหน้าที่ของฝ่ายทะเบียนราษฎร์แต่ประการใด

แบบสอบถามส่วนแรกเกี่ยวกับ ข้อมูลส่วนบุคคล ความคิดเห็นของท่านที่มีต่อการรับรู้ปัจจัยที่เกี่ยวกับการออกกำลังกาย และ พฤติกรรมการออกกำลังกาย ข้อคำถามทั้งหมดใช้เวลาทั้งสิ้นประมาณ 10 นาที

การศึกษาครั้งนี้ผู้วิจัยไม่ได้รับผลประโยชน์ทางการเงินแต่ประการใด การศึกษาครั้งนี้จะช่วยให้ผู้วิจัยจำแนกปัจจัยทางจิตสังคมที่มีผลต่อการออกกำลังกาย และผลการศึกษาจะถูกนำไปประกอบการพัฒนาโครงการออกกำลังกายของคนไทยต่อไป

ผู้ตอบแบบสอบถามไม่จำเป็นต้องเซ็นชื่อในแบบฟอร์มฉบับนี้ ถ้าผู้ตอบแบบสอบถามเห็นด้วยที่จะมีส่วนร่วมกับการศึกษาครั้งนี้ กรุณาตอบแบบสอบถามโดยครบถ้วน และข้อมูลจะถูกเก็บในกล่องที่มิดชิด เมื่อผลการวิจัยเผยแพร่จะไม่มีข้อมูลใดๆที่บงชี้ถึงตัวท่านแต่ประการใด หลังจากเสร็จสิ้นในการตอบแบบสอบถามท่านจะได้รับ กระเป๋าผ้า จำนวน 1 ใบ เป็นของที่ระลึก เพื่อเป็นการตอบแทน ที่ท่านได้สละเวลาอันมีค่าในการเข้าร่วมวิจัยครั้งนี้

หากท่านมีข้อสงสัย หรือคำถาม กรุณาติดต่อผู้วิจัย ที่เบอร์โทรศัพท์ 089-2755-494 หรืออีเมล์ opooms2@uic.edu หรือ คุณสามารถติดต่ออาจารย์ที่ปรึกษา จูลี่ เซอร์วิค (Julie Zerwic, PhD, RN) juljohns@uic.edu หรือติดต่อได้ที่ สถาบันพิทักษ์สิทธิ์ผู้เข้าร่วมวิจัย uicirb@uic.edu มหาวิทยาลัย อิลลินอยส์ ณ นครชิคาโก ประเทศ สหรัฐอเมริกา

ท่านที่สนใจจะเข้าร่วมวิจัย กรุณาแจ้งความประสงค์ได้ที่ ผู้วิจัย ณ ห้องวิจัย เพื่อตอบแบบสอบถาม

ขอขอบคุณที่สละเวลาอันมีค่าของท่านในการตอบแบบสอบถาม

Appendix D

SURVEY QUESTIONNIRE
Social-Cognitive Factors and Exercise Behavior among Thais

I would appreciate your response to the questionnaire. There is no right or wrong answers. Please tell me what you really think.

SECTION 1

These questions ask for information about you.

---

1. How old are you? __________years old

2. Sex

○ Male
○ Female

3. What is your marital status?

○ Never married
○ a member of an unmarried couple
○ Married
○ Separated
○Divorced
○ Widowed

4. What is the highest grade you have completed?

○ Never attended school
○ Elementary: 1 2 3 4 5 6
○ High school: 7 8 910 11 12
○ Vocational school
○ College: 1 2 3 4
○ Post-college: 5 6 7 +
○ Other detail…..

Appendix D (Continued)

5. What is your current work status?

○ Working
○ Unemployed
○ Retired
○ Student
○ Other detail….

6. How much is your monthly personal income?

○ No income
○ < $ 31
○ $ 32 - $ 156
○ $ 157 - 312
○ $ 313 - 781
○ $ 782 - 1562
○ > $ 1563

7. How physically active are you in your job?

○ Not at all
○ Minimally active
○ Somewhat active
○ Moderately active
○ Very active

Appendix D (Continued)

SECTION 2: The next set of questions asks you about risk perception of heart disease. In each item please mark only one that is TRUE for you.

Items	Strongly disagree	Disagree	Agree	Strongly agree
1. There is a possibility that I have heart disease	O	O	O	O
2. There is a good chance I will get heart disease during the next 10 years	O	O	O	O
3. A person who gets heart disease has no chance of being cured	O	O	O	O
4. I have a high chance of getting heart disease because of my past behaviors	O	O	O	O
5. I feel sure that I will get heart disease	O	O	O	O
6. Healthy lifestyle habits are unattainable	O	O	O	O
7. It is likely that I will get heart disease	O	O	O	O
8. I am at risk for getting heart disease	O	O	O	O
9. It is possible that I will get heart disease	O	O	O	O
10. I'm not doing anything now that is unhealthy to my heart.	O	O	O	O
11. I'm too young to have heart disease	O	O	O	O
12. People like me do not get heart disease.	O	O	O	O
13. I am very healthy so my body can fight off heart disease.	O	O	O	O
14. I am not worried that I might get heart disease.	O	O	O	O
15. People my age are too young to get heart disease.	O	O	O	O
16. People my age do not get heart disease.	O	O	O	O
17. My life habits do not put me at risk for heart disease.	O	O	O	O
18. No matter what I do, if I am going to get heart disease, I will get it.	O	O	O	O
19. People who don't get heart disease are just plain lucky.	O	O	O	O
20. The causes of heart disease are unknown.	O	O	O	O

Appendix D (Continued)

SECTION 3: These questions ask about perception of positive and negative outcomes of exercise. In each item please mark only one that is TRUE for you.

Items	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1. Exercise makes me feel better physically.	O	O	O	O	O
2. Exercise makes my mood better in general.	O	O	O	O	O
3. Exercise helps me feel less tired.	O	O	O	O	O
4. Exercise makes my muscles stronger.	O	O	O	O	O
5. Exercise is an activity I enjoy doing.	O	O	O	O	O
6. Exercise gives me a sense of personal accomplishment.	O	O	O	O	O
7. Exercise makes me more alert mentally.	O	O	O	O	O
8. Exercise improves my endurance in performing my daily activity.	O	O	O	O	O
9. Exercise helps to strengthen my bones.	O	O	O	O	O
10. Exercise is something I avoid because it causes me to be short of breath.	O	O	O	O	O
11. Exercise is something I avoid because it may cause me to have pain.	O	O	O	O	O
12. Exercise makes me fearful that I will fall or get hurt.	O	O	O	O	O
13. Exercise places too much stress on my heart.	O	O	O	O	O

Appendix D (Continued)

SECTION 4: These questions ask about your ability to overcome barriers in exercise. In each item please mark only one that is TRUE for you.

How certain are you that you could overcome the following barriers?
I can manage to carry out my exercise intentions….

Items	Very uncertain	Rather uncertain	Rather certain	Very certain
1…even when I have worries and problems	O	O	O	O
2…even if I feel depressed	O	O	O	O
3…even when I feel tense	O	O	O	O
4…even when I am tired	O	O	O	O
5…even when I am busy	O	O	O	O

Appendix D (Continued)

SECTION 5: These questions ask about your willingness to exercise. In each item please mark only one that is TRUE for you.

Items	Completely disagree	Disagree	Agree	Totally agree
1. I intend to exercise several times a week	O	O	O	O
2. I intend to work up a sweat regularly	O	O	O	O
3. I intend to exercise regularly	O	O	O	O
4. I intend to be physically active regularly for a minimum of 30 minutes at least 3 times a week	O	O	O	O
5. I intend to increase my leisure time activity	O	O	O	O

Appendix D (Continued)

SECTION 6: The last set of questions asks about your frequency of exercise. Please mark only one that is TRUE for you.

How often did you participate in physical exercise of 20 to 30 minutes duration per session during your leisure time within the past 4 months?

- Not at all
- Less than once a month
- About once a month
- About 2 or 3 times a month
- 1 to 2 times a week
- 3 or more times a week

THANK YOU SO MUCH

Appendix E
Questionnaire in Thai

แบบสอบถาม หมายเลข :_________

ผู้ตอบแบบสอบถาม หมายเลข :_________

โครงการวิจัย : ปัจจัยทางจิตสังคมและการออกกำลังกาย

(Research protocol # 2010-0383)

ผู้วิจัย:

อรวรรยา ภูมิศรีแก้ว

นักศึกษาปริญญาเอก สาขาพยาบาลศาสตร์

มหาวิทยาลัย อิลินอยส์ ณ นครชิคาโก ประเทศสหรัฐอเมริกา

UIC COLLEGE OF NURSING
UNIVERSITY OF ILLINOIS AT CHICAGO

Appendix E (Continued)

แบบสอบถาม

ปัจจัยทางจิตสังคมและการออกกำลังกาย

แบบสอบถามมีทั้งหมด 6 ส่วนขอความกรุณาตอบคำถามให้ครบทุกข้อ

ส่วนที่ 1 คำถามส่วนนี้ถามท่านเกี่ยวกับข้อมูลส่วนบุคคล โปรดตอบตามความเป็นจริง

1. อายุ_____________________ปี
2. เพศ

   O ชาย

   O หญิง
3. สถานภาพสมรส

   O โสด

   O แต่งงาน

   O แยกกันอยู่

   O หย่า

   O หม้าย
4. ระดับการศึกษาสูงสุด

   O ไม่ได้เข้าโรงเรียน

   O ประถมศึกษา

   O มัธยม ต้น หรือปลาย

   O อาชีวศึกษา/อนุปริญญา

   O ปริญญาตรี

   O สูงกว่าปริญญาตรี

Appendix E (Continued)

5. สถานภาพการทำงานปัจจุบัน

- ทำงาน
- ว่างงาน
- เกษียณอายุ
- นักเรียน / นักศึกษา
- อื่นๆ (ระบุ)______________________

6. ท่านมีรายได้เฉลี่ยต่อเดือนเท่าใด

- ไม่มีรายได้
- 1 - 999 บาท
- 1,000 - 4,999 บาท
- 5,000 – 9,999 บาท
- 10,000 – 24,999 บาท
- 25,000 – 49,999 บาท
- ตั้งแต่ 50,000 บาทขึ้นไป

7. ในขณะทำงาน ท่านมีการเคลื่อนไหวร่างกาย บ่อยแคไหน

- ไม่มีการเคลื่อนไหวเลย
- มีการเคลื่อนไหวน้อยมาก
- มีการเคลื่อนไหวบ้าง
- มีการเคลื่อนไหวปานกลาง
- มีการเคลื่อนไหวมาก

Appendix E (Continued)

ส่วนที่ 2: คำถามส่วนนี้ถามท่านเกี่ยวกับความคิดเห็นของท่านต่อการเจ็บป่วยด้วยโรคหัวใจ ในแต่ละข้อคำถาม โปรดทำเครื่องหมาย √ ลงในช่องคำตอบที่ตรงกับความคิดเห็นของท่าน

	ไม่เห็นด้วยอย่างมาก	ไม่เห็นด้วย	เห็นด้วย	เห็นด้วยอย่างมาก
1. ตอนนี้ ฉันอาจจะป่วยเป็นโรคหัวใจ	O	O	O	O
2. ฉันมีโอกาสจะป่วยเป็นโรคหัวใจในอีก 10 ปี ข้างหน้า	O	O	O	O
3. ผู้ที่เป็นโรคหัวใจไม่มีทางรักษา	O	O	O	O
4. ฉันมีโอกาสสูงที่จะเป็นโรคหัวใจเนื่องจากการดำเนินชีวิตในอดีตของฉัน	O	O	O	O
5. ในอนาคต ฉันมั่นใจว่าฉันจะป่วยเป็นโรคหัวใจ	O	O	O	O
6. สุขนิสัยที่ดีเป็นเรื่องที่ทำยาก	O	O	O	O
7. มีแนวโน้มว่า ฉันอาจจะป่วยเป็นโรคหัวใจ ในอนาคต	O	O	O	O
8. ฉันอยู่ในภาวะเสี่ยงต่อการเป็นโรคหัวใจ	O	O	O	O
9. ในอนาคต อาจจะเป็นไปได้ว่า ฉันจะป่วยเป็นโรคหัวใจ	O	O	O	O
10. ฉันไม่มีพฤติกรรม ที่เป็นอันตรายต่อสุขภาพหัวใจ	O	O	O	O
11. ฉันอายุน้อยเกินไปที่จะป่วยเป็นโรคหัวใจ	O	O	O	O

Appendix E (Continued)

ส่วนที่ 2: คำถามส่วนนี้ถามท่านเกี่ยวกับความคิดเห็นของท่านต่อการเจ็บป่วยด้วยโรคหัวใจ ในแต่ละข้อคำถาม โปรดทำเครื่องหมาย √ ลงในช่องคำตอบที่ตรงกับความคิดเห็นของท่าน

	ไม่เห็นด้วยอย่างมาก	ไม่เห็นด้วย	เห็นด้วย	เห็นด้วยอย่างมาก
12. ผู้ที่มีการดำเนินชีวิตแบบเดียวกันกับฉันจะไม่ป่วยเป็นโรคหัวใจ	○	○	○	○
13. ฉันเป็นผู้ที่มีสุขภาพดีมากดังนั้นร่างกายฉันสามารถต้านทานต่อการเป็นโรคหัวใจได้	○	○	○	○
14. ฉันไม่วิตกกังวลว่าฉันจะป่วยเป็นโรคหัวใจ	○	○	○	○
15. ผู้ที่มีอายุเท่ากับฉัน ยังอายุน้อยเกินไปที่จะป่วยเป็นโรคหัวใจ	○	○	○	○
16. โรคหัวใจจะไม่เกิดขึ้นกับผู้ที่มีอายุรุ่นเดียวกันกับฉัน	○	○	○	○
17. สุขนิสัยของฉันไม่ทำให้ฉันเสี่ยงต่อการเป็นโรคหัวใจ	○	○	○	○
18. ถ้าจะต้องป่วยเป็นโรคหัวใจ ไม่ว่าฉันจะปฏิบัติตัว อย่างไร ฉันก็ป่วยเป็นโรคหัวใจอยู่ดี	○	○	○	○
19. คนที่ไม่ป่วยเป็นโรคหัวใจ ถือว่าเป็นคนที่โชคดี	○	○	○	○
20. โรคหัวใจ เป็นโรคที่ไม่ทราบสาเหตุ	○	○	○	○

Appendix E (Continued)

ส่วนที่ 3: คำถามส่วนนี้ถามท่านเกี่ยวกับความคิดเห็นของท่านต่อผลลัพธ์ของการออกกำลังกาย ในแต่ละข้อคำถาม โปรดทำเครื่องหมาย √ ลงในช่องคำตอบที่ตรงกับความคิดเห็นของท่าน

	ไม่เห็นด้วยอย่างมาก	ไม่เห็นด้วย	ไม่มีความคิดเห็น	เห็นด้วย	เห็นด้วยอย่างมาก
1. การออกกำลังกายทำให้ร่างกายของฉันแข็งแรงขึ้น	○	○	○	○	○
2. โดยทั่วไปการออกกำลังกายทำให้ฉันอารมณ์ดีขึ้น	○	○	○	○	○
3. การออกกำลังกายทำให้ฉันไม่เหนื่อยง่ายในการทำกิจกรรมต่างๆ	○	○	○	○	○
4. การออกกำลังกายทำให้กล้ามเนื้อของฉันแข็งแรงขึ้น	○	○	○	○	○
5. การออกกำลังกายเป็นกิจกรรมที่ฉันชื่นชอบ	○	○	○	○	○
6. การออกกำลังกายได้สำเร็จเป็นสิ่งหนึ่งที่ฉันรู้สึกภาคภูมิใจในตัวเอง	○	○	○	○	○
7. การออกกำลังกายทำให้ฉันรู้สึกกระปรี้กระเปร่า	○	○	○	○	○

Appendix E (Continued)

ส่วนที่ 3: คำถามส่วนนี้ถามท่านเกี่ยวกับความคิดเห็นของท่านต่อผลลัพธ์ของการออกกำลังกาย ในแต่ละข้อคำถาม โปรดทำเครื่องหมาย √ ลงในช่องคำตอบที่ตรงกับความคิดเห็นของท่าน

	ไม่เห็นด้วยอย่างมาก	ไม่เห็นด้วย	ไม่มีความคิดเห็น	เห็นด้วย	เห็นด้วยอย่างมาก
8. การออกกำลังกายช่วยให้ฉันมีความทน ต่อการทำกิจวัตรประจำวันเพิ่มขึ้น	○	○	○	○	○
9. การออกกำลังกายช่วยให้กระดูกของฉันแข็งแรง	○	○	○	○	○
10. การออกกำลังกายเป็นสิ่งที่ฉันหลีกเลี่ยงเพราะการออกกำลังกายเป็นสาเหตุทำให้มีอาการหายใจหอบถี่	○	○	○	○	○
11. การออกกำลังกายเป็นสิ่งที่ฉันหลีกเลี่ยงเพราะการออกกำลังกายเป็นสาเหตุทำให้มีอาการเจ็บปวด	○	○	○	○	○
12. การออกกำลังกาย อาจเป็นสาเหตุทำให้ฉันหกล้ม หรือได้รับบาดเจ็บ	○	○	○	○	○
13. การออกกำลังกายอาจเป็นสาเหตุทำให้หัวใจเต้นแรงมากเกินไป	○	○	○	○	○

Appendix E (Continued)

ส่วนที่ 4: คำถามส่วนนี้ถามท่านเกี่ยวกับความสามารถของท่านต่อการเอาชนะอุปสรรคในการออกกำลังกาย ในแต่ละข้อคำถาม โปรดทำเครื่องหมาย √ ลงในช่องคำตอบที่ตรงกับความคิดเห็นของท่าน

	ไม่แน่นอนที่สุด	ไม่แน่นอน	แน่นอน	แน่นอนที่สุด
1. ถึงแม้ว่า ฉันมีความวิตกกังวล หรือมีปัญหาใดๆ ฉันก็สามารถไปออกกำลังกายตามที่ตั้งใจไว้ได้	O	O	O	O
2. ถึงแม้ว่า ฉันรู้สึกซึมเศร้า หรือหดหู่ ฉันก็สามารถไปออกกำลังกายตามที่ตั้งใจไว้ได้	O	O	O	O
3. ถึงแม้ว่า ฉันรู้สึกเคร่งเครียด ฉันก็สามารถไปออกกำลังกาย ตามที่ตั้งใจไว้ได้	O	O	O	O
4. ถึงแม้ว่า ฉันเหน็ดเหนื่อย ฉันก็สามารถไปออกกำลังกายตามที่ตั้งใจไว้ได้	O	O	O	O
5. ถึงแม้ว่า ฉันมีงานยุ่ง ฉันก็สามารถไปออกกำลังกายตามที่ตั้งใจไว้ได้	O	O	O	O

Appendix E (Continued)

ส่วนที่ 5: คำถามส่วนนี้ถามท่านเกี่ยวกับความตั้งใจของท่านต่อการออกกำลังกาย ในแต่ละข้อคำถาม โปรดทำเครื่องหมาย √ ลงในช่องคำตอบที่ตรงกับความคิดเห็นของท่าน

	ไม่เห็นด้วยอย่างมาก	ไม่เห็นด้วย	เห็นด้วย	เห็นด้วยอย่างมาก
1. ฉันมีความตั้งใจ ที่จะไปออกกำลังกายหลายครั้งต่อสัปดาห์	O	O	O	O
2. ฉันมีความตั้งใจ ที่จะออกกำลังกายจนเหงื่อออกเป็นประจำ	O	O	O	O
3. ฉันมีความตั้งใจ ที่จะไปออกกำลังกายอย่างสม่ำเสมอ	O	O	O	O
4. ฉันมีความตั้งใจ ที่จะออกกำลังกายเป็นประจำอย่างน้อย 30 นาที 3 ครั้งต่อสัปดาห์	O	O	O	O
5. ในช่วงเวลาว่าง ฉันมีความตั้งใจ ที่จะไปออกกำลังกายเพิ่มขึ้น	O	O	O	O

Appendix E (Continued)

ส่วนที่ 6: คำถามส่วนนี้ถามท่านเกี่ยวกับพฤติกรรมในการออกกำลังกาย โปรดทำเครื่องหมาย √ ลงในช่องคำตอบที่ใกล้เคียงความเป็นจริงสำหรับท่านมากที่สุด เพียง 1 ข้อ

ท่านออกกำลังกาย อย่างน้อย 20 – 30 นาทีต่อครั้ง ในช่วง 4 เดือนที่ผ่านมา บ่อยแค่ไหน

☐ ไม่เคยเลย

☐ น้อยกว่า 1 ครั้งต่อเดือน

☐ ประมาณ 1 ครั้งต่อเดือน

☐ ประมาณ 2 - 3 ครั้งต่อเดือน

☐ 1 - 2 ครั้งต่อสัปดาห์

☐ 3 ครั้งขึ้นไปต่อสัปดาห์

<u>ขอขอบคุณทุกท่านที่สละเวลาอันมีค่าในการตอบแบบสอบถามครั้งนี้</u>

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Education

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1999	Master of Science in Health Administration (M.S.), Mahidol University Public Health School Bangkok, Thailand
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Professional Experience

2008-2010	Teaching assistant—NUSC 525 Intermediate Statistics, College of Nursing, University of Illinois at Chicago, Chicago, U.S.A.
2002-2006	Nursing instructor—Boromarajonani College of Nursing Udon Thani, Thailand
1993-2001	Register nurse—Kumpawapi Hospital, Udon Thani, Thailand
1989-1993	Register nurse—Nomsom Hospital, Udon Thani, Thailand

Poster Presentations

Poomsrikaew, O., Berger, B. E. & Zerwic, J. J. (April, 2011) Age differences in cognitive health beliefs and exercise behavior among Thai people. Student Research Forum, UIC Forum, University of Illinois at Chicago, Chicago, Illinois.

Poomsrikaew, O., Berger, B. E. & Zerwic, J. J. (March, 2011) Age differences in cognitive health beliefs and exercise behavior among Thai people. 35th Annual Midwest Nursing Research Society, Columbus, Ohio.

Poomsrikaew, O., Ryan, C. J. & Zerwic, J, J. (March, 2009) Knowledge of heart attack symptoms and risk factors among native Thais. 33rd Annual Midwest Nursing Research Society, Minneapolis, Minnesota.

Oral Presentations

Poomsrikaew, O., Berger, E. B. & Zerwic, J. J. (March, 2011) Age and gender make a difference in cognitive health beliefs and exercise behavior among Thai people. 35th Annual Midwest Nursing Research Society, Columbus, Ohio.

Poomsrikaew, O., Ryan, C. J.& Zerwic, J, J. (November, 2008) Knowledge of heart attack symptoms and risk factors among native Thais. American Association of Critical Care Nurses Chapter Meeting. Chicago, Illinois.

Publications

Poomsrikaew, O., Ryan, C. J., & Zerwic, J. J. (2010). Knowledge of heart attack symptoms and risk factors among native Thais: A street-intercept survey method. *International Journal of Nursing Practice, 16*(5), 492-498.

Poomsrikaew, O., Ryan, C. J., & Zerwic, J. J. (2009). Knowledge of heart attack symptoms and risk factors among native Thais [Abstract]. *Western Journal of Nursing Research, 31*(8) 1088-1089.

Honors and Awards

2011	First Place, UIC Graduate Student Research Forum
2010	UIC College of Nursing Graduate Student Award
2010	Thailand Nursing Council Award
2010	Seth & Denise Rosen Graduate Student Research Award
2009	UIC College of Nursing Graduate student Award
2009	Honorable Mention, the Graduate Student Poster Competition, 33rd Annual Midwest Nursing Research Society
2009	Virginia M. Ohlson Scholar, University of Illinois at Chicago, Chicago, Illinois, USA
2006-2011	The Royal Thai Scholarship, Thailand (Doctoral study)

1985-1989	Public Health Ministry Scholarship, Thailand (Bachelor study)

Professional Memberships

2008-present	Honor Society of Nursing, Sigma Theta Tau Alpha lambda
2008-present	Midwest Nursing Research Society
2008-present	American Heart Association
1989-present	Nursing Council of Thailand
1989-present	Nurses Association of Thailand