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Age and Gender Differences in Social-Cognitive Factors and Exercise Behavior Among Thais

Ornwanya Poomsrikaew[1], **Barbara E. Berger**[1], **Mi Ja Kim**[1], **and Julie J. Zerwic**[1]

Abstract

The purpose of this study was to examine the relationship of perceived risk, outcome expectancies, and perceived self-efficacy to intention and in turn exercise behavior. A convenience sample of people 18 years or older ($N = 645$) was recruited from public locations in Thailand. A descriptive cross-sectional design was used with self-administered questionnaires. Path models were estimated using Amos 18. Outcome expectancies and perceived self-efficacy indirectly influenced exercise behavior via intention. Unexpectedly, perceived risk of heart disease did not contribute to the model. Differences were found across age and gender groups. The final models showed a better fit in the middle-aged group, $\chi^2(1) = 0.374$, $p = .541$, and in women, $\chi^2(1) = 0.197$, $p = .657$, than in younger individuals and men. Interventions that enhance intention to exercise through outcome expectancies and perceived self-efficacy may be effective. Interventions may be more effective if they target particular age and gender groups.

[1]University of Illinois at Chicago

Corresponding Author:
Ornwanya Poomsrikaew, University of Illinois at Chicago, College of Nursing, 845 S. Damen Ave. (MC 802), Chicago, IL 60612-7350
Email: opooms2@uic.edu

Keywords

age groups, gender role, social-cognitive factors, exercise behavior, Thai population

In Thailand, cardiovascular disease (CVD) is the leading cause of death (Bureau of Policy and Strategy, 2009). Its incidence is increasing, as is the prevalence of CVD risk factors (Ministry of Public Health, 2008). One health behavior that could benefit Thai individuals is increasing exercise to reduce modifiable risk factors of CVD. Exercise has also been used to prevent cardiac disease for healthy people and to control chronic conditions for cardiac patients (Arao et al., 2007). However, the rate of moderate or high exercise in the Thai population is low: 37.5% (Ministry of Public Health, 2008). To understand how to increase the adoption and maintenance of exercise behavior, the determinants of exercise need to be investigated among Thais.

According to social cognitive theory, health behavior is governed by expectations and incentives. The likelihood that individuals will adopt a health behavior depends on three expectancies: (a) that the person is at risk (perceived risk), (b) that behavioral change will reduce the threat (outcome expectancies), and (c) that one is sufficiently capable of adopting a positive behavior or refraining from a risky habit (self-efficacy; Bandura, 1986).

The Health Action Process Approach (HAPA) is one model derived from the social cognitive theory that is used to explain how people adopt and maintain desired health behaviors (Schwarzer, 1992). The HAPA model is divided into the preintentional motivation phase and the postintentional volition phase. In the first phase, intention is established by perceived risk, outcome expectancies, and perceived self-efficacy. The hypothesized causal order is from perceived risk to outcome expectancies to perceived self-efficacy (Schwarzer, 1992). Individuals who see themselves as vulnerable to disease are likely to engage in a healthy lifestyle (Renner, Knoll, & Schwarzer, 2000). Outcome expectancies help a person balance the pros and cons of a certain behavior and are seen as precursors of perceived self-efficacy (Schwarzer, 1992, 2008). Perceived self-efficacy describes individuals' beliefs in their ability to perform an action. Perceived self-efficacy, outcome expectancies, and perceived risk significantly contribute to intention (Figure 1; Renner & Schwarzer, 2003; Schwarzer, 1992).

The second phase (postintentional volition) describes how hard people try to take action and how long they persist. This phase involves perceived self-efficacy and planning (Figure 1). Once established, intention has to transform into detailed instructions on how to perform the desired behavior. To initiate

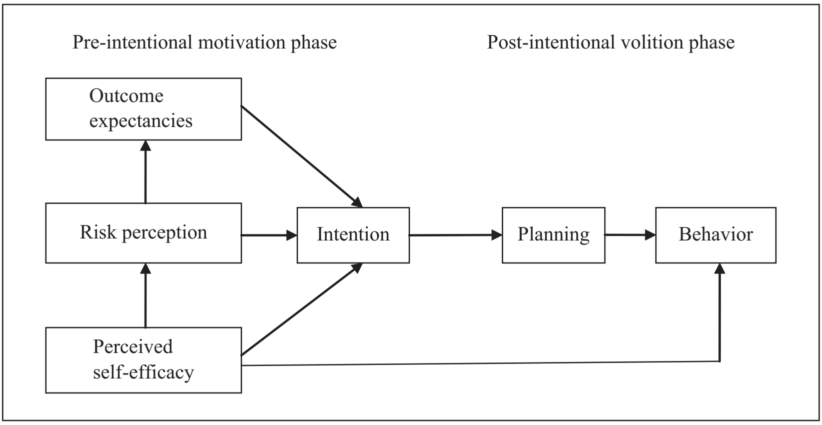

Figure 1. The health action process approach model
Source: Schwarzer, 1992.

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 in performing and persisting in behaviors.

Studies based on the HAPA model have provided evidence to support that perceived risk of CVD, outcome expectancies, and perceived self-efficacy jointly accounted for 52% to 80% of the variance in intention to exercise (Schwarzer, Ziegelmann, Luszczynska, Scholz, & Lippke, 2008; Sniehotta, Scholz, & Schwarzer, 2005). Studies have also supported that predictors of intention to exercise included behavioral beliefs of exercise or outcome expectancies (Conn, Tripp-Reimer, & Maas, 2003) and perceived behavioral control or perceived self-efficacy (Blanchard et al., 2008; Conn, Tripp-Reimer, et al., 2003; Jones, Courneya, Fairey, & Mackey, 2005). A number of studies based on the HAPA model reported that exercise behavior was reasonably predicted by intention (Sniehotta, Scholz, et al., 2005; Ziegelmann, Lippke, & Schwarzer, 2006). In addition, studies have supported that intention could significantly contribute to exercise behavior (Blanchard et al., 2008; Hoyt, Rhodes, Hausenblas, & Giacobbi, 2009; Rhodes, Courneya, & Jones, 2004). Several studies found that perceived self-efficacy was also directly predictive of exercise behavior in the HAPA model (Renner, Spivak, Kwon, & Schwarzer, 2007; Scholz, Sniehotta, & Schwarzer, 2005; Schwarzer et al., 2008; Sniehotta, Scholz, et al., 2005). Similarly, previous studies reported that perceived self-efficacy was a significant predictor of exercise behavior among women (Choi, Wilbur, Miller, Szalacha, & McAuley, 2008; Wilbur, Vassalo, Chandler, McDevitt, & Miller, 2005) and older adults (Conn, Burks, Pomeroy, Ulbrich, & Cochran, 2003; Resnick & Nigg, 2003). In sum, these 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. However, these studies have primarily been conducted in Western countries. Thus, determining these relationships in Thais may help identify areas that could be intervened on to affect exercise behavior in this population.

Some Thai studies have reported that exercise behavior was influenced by perceived self-efficacy among undergraduate students (Srichaisawat, 2006), older adults (Anunsuksawat, 2006; Jitramontree, 2003), coronary artery disease patients (Namphonkrung, Jitpanya, & Lueboonthavatchai, 2005; Sornpirom, 2009), and hypertensive patients (Tantayothin, 2004). Exercise was also predicted by perceived barriers among undergraduate students (Srichaisawat, 2006), older adults (Anunsuksawat, 2006; Asawachaisuwikrom, 2005; Jitramontree, 2003), and hypertensive patients (Tantayothin, 2004). Moreover, exercise was influenced by perceived benefits among older adults (Asawachaisuwikrom, 2005) and hypertensive patients (Tantayothin, 2004). Only one study in Thailand examined the effect of intention as a mediator on exercise behavior among older adults: Exercise was indirectly influenced by perceived self-efficacy, perceived benefits, and perceived barriers via intention to exercise (Jitramontree, 2003).

Previous studies have supported that age affected the 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). In older adults, perceived risk of CVD and outcome expectancies more highly influenced intention to exercise than in younger adults (Renner et al., 2007). Older adults perceived themselves as more vulnerable to CVD 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. This suggests that advancing age may increase perceived risks, leading to a higher intention of health-promoting behaviors, such as physical exercise and a healthy diet.

Gender differences also play an important role in the relationship between social-cognitive factors and health behaviors. 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 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). In addition, Renner and colleagues (2000) reported that women perceived a lower risk of CVD for themselves than men did. In turn, women had greater positive outcome expectancies of healthy diet and intention to adopt low-fat diet than did men. Women also displayed healthier dietary behavior than men (Renner et al., 2000; Renner et al., 2008).

Purpose

The purpose of the study was to examine the relationship of perceived risk, outcome expectancies, and perceived self-efficacy with intention and in turn exercise behavior. Secondarily, the effects of age and gender on the relationship between social-cognitive factors and exercise behavior were examined.

Method

Design

A cross-sectional design was used.

Sample

A convenience sample was recruited from public locations in Thailand: Udon Thani municipality government building and a public park. Individuals who came to Udon Thani municipality government building to register a birth, death, or domicile were invited to participate in the study. At the public park, individuals were approached and invited to participate. These settings were selected to enroll participants who resided within a certain geographic area but were heterogeneous related to education, income, and age. It was expected that the population would reflect the gender mix of the area. Individuals were eligible if they were (a) 18 years of age or older, (b) able to read and understand Thai, and (c) alert and oriented to person, place, and time.

The investigator approached eligible individuals who were in the designated area during the time of data collection and invited them to participate in the study. Institutional Review Board approval was obtained, and all individuals consented to participate in the study.

A total of 550 participants were estimated to be needed based on power of .80, a small effect size index (f2) of .02, an alpha of .05, and three independent variables (Cohen, 1992) by G*Power 3.0.10 (Faul, Erdfelder, Buchner, & Lang, 2009). An additional 20% was included for incomplete questionnaires, based on a recent survey 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 participants.

Of the 660 recruited, 15 participants with 5% or greater missing values were deleted from the data set. For 33 participants with less than 5% missing values, their missing values were estimated by expectation maximization (Tabachnick & Fidell, 2001). Thus, a total sample of 645 participants was used in path analysis. Of these, 505 (78.3%) were recruited from the municipality building and 140 (21.7%) from the public park. See Table 1 for demographic characteristics of the sample. The average age was 37 years (SD = 10.85), ranging from 18 to 68 years. The sample included 313 men (48.5%) and 331 women (51.3%; 1 respondent did not indicate gender). A total of 28% of the sample had completed high school, and 59% had either completed a university degree or were studying in college. Compared with the Thai population, the sample in this study on average had higher levels of education (Ministry of Public Health, 2008).

Participants recruited from the public park (n = 140) were older than those from the municipality building, n = 505; M = 40.85 versus M = 35.68, $t(df = 641) = -5.07$, $p < .01$, and had lower monthly family income, $\chi^2(df = 6) = 17.33$, $p < .01$. There were no differences in gender, marital status, education, and working status. Individuals from the public park perceived greater self-efficacy to overcome barriers to exercise, M = 14.69 versus M = 13.11, $t(df = 643) = -5.56$, $p < .01$, and stronger intention to exercise, M = 16.33 versus M = 15.19, $t(df = 643) = -4.91$, $p < .01$, and reported more frequent exercise than those from the municipality building, M = 35.01 versus M = 22.29, $t(df = 643) = -7.39$, $p < .01$. However, individuals from the municipality building perceived themselves at higher risk of heart disease than those from the public park, M = 48.47 versus M = 45.99, $t(df = 643) = 4.33$, $p < .01$.

Measures

After consenting, participants were asked to self-administer a questionnaire consisting of the following measures. All scales were translated from English into Thai language by bilingual individuals through back-translation.

Table 1. Participants' Demographics (N = 645)

Characteristics	n	%
Age (years)		
18-35 (M = 27.43, SD = 4.81)	307	47.6
36 or older (M = 45.35, SD = 7.13)	336	52.1
Total sample M = 36.79, SD = 10.85, range (18-68)		
Gender		
Men	313	48.5
Women	331	51.6
Marital status		
Single (never married)	227	35.2
Married	356	55.2
Separated	19	2.9
Divorced	29	4.5
Widowed	13	2.0
Education		
None	5	.8
Elementary school	76	11.8
High school	180	27.9
Vocational school	140	21.7
College	210	32.6
Post college	32	5.0
Work status		
Working	557	86.4
Unemployed	38	5.9
Retired	15	2.3
Student	33	5.1
Individual income (per month)		
None	45	7.0
≤US$31	6	0.9
US$32-US$156	91	14.1
US$157-US$312	279	43.3
US$313-US$781	150	23.3
US$782-US$1,562	58	9.0
≥US$1,563	13	2.0

Perceived risk. The Perception of Risk of Heart Disease Scale (PRHDS) developed by Ammouri and Neuberger (2008) was used to assess perceived risk of heart disease. 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 Risk reflects vulnerability judged to be unobservable, unknown, new, and delayed in appearance of harm. An example of an item is "There is a possibility that I have heart disease." Responses are rated on a 4-point Likert-type 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. In prior studies (Ammouri & Neuberger, 2008), Cronbach's alpha coefficients of the Dread Risk, Risk, and Unknown Risk subscales and total score were .80, .72, .68, and .80, respectively. In the current study, the internal consistency was .90, .61, and.52 for Dread Risk, Risk, and Unknown Risk subscales and .74 for the total. In prior research (Ammouri & Neuberger, 2008), 2-week test–retest reliability coefficients of the Dread Risk, Risk, and Unknown Risk subscales were .76, .70, and .61, respectively. Concurrent validity was supported by the positive correlations between these subscales and the Health Promotion Lifestyle Profile II subscales ($r = .20$ to $.39$, $p < .01$).

Outcome expectancies. The Outcome Expectations for Exercise Scale–2 (OEE-2) was developed by Resnick (2005) and is composed of two subscales: Positive Exercise Outcomes (POEE) and Negative Exercise Outcomes (NOEE). The POEE subscale consists of nine items. Participants are asked, for example, "Exercise makes me feel better physically." The NOEE subscale includes four items, for instance: "Exercise causes me to feel short of breath." Responses of items are given from 1 (*strongly disagree*) to 5 (*strongly agree*). After reverse scoring of the four negative items, scores are summed, with higher scores indicating more positive perceived outcomes of exercise. The reliability and validity of the OEE-2 was investigated in 161 residents living in a continuing-care retirement community. Evidence of convergent validity was found by the correlation of the POEE subscale, the NOEE subscale, and the total OEE-2 with the exercise subscale of the Yale Physical Activity Survey (r = .32, .34, and .38, respectively; $p < .05$). The internal consistencies of the POEE and NOEE subscales were good, with alpha coefficients of .93 and .80, respectively. In the current study, the internal consistency reliability coefficient was .90 for POEE, .84 for NOEE, and .84 for the total OEE-2.

Perceived self-efficacy. The Physical Exercise Self-efficacy Scale was developed by Schwarzer and Renner (2008) to measure perceived self-efficacy for physical exercise. The general stem for all items is "How certain are you that you could overcome the following barriers?" The measure consists of five indicators; for example, "I can manage to carry out my exercise intention even when I have worries and problems." Responses are given using a 4-point scale ranging from 1 (*very uncertain*) to 4 (*very certain*). Scores are summed, with higher scores indicating a higher perceived self-efficacy of exercise. Internal consistency reliability was reported to be .88 (Schwarzer & Renner, 2008). The Physical Exercise Self-efficacy Scale was moderately correlated with exercise intention ($r = .33, p < .01$) and moderately correlated with exercise behavior scales ($r = .39, p < .01$) 6 months later (Schwarzer & Renner, 2008). In the current study, the alpha coefficient was .89.

Intention. The exercise intention scale was adapted from the six-item subscale established by Sniehotta, Schuz, et al. (2005). We removed the item "I intend to adhere to the exercise regime prescribed to me during the rehabilitation" because this is not relevant in the general population. This resulted in a scale composed of five items asking participants to respond to statements such as, "I intend to exercise several times a week." Responses are given using a 4-point scale: 1 (*completely disagree*), 2 (*disagree*), 3 (*agree*), and 4 (*totally agree*). Scores are summed, with higher scores representing a greater positive intention to exercise. Internal consistency reliability was .82 in prior research (Sniehotta, Schwarzer, Scholz, & Schuz, 2005). The 2-month test–retest reliability coefficient was .84. The predictive validity of the measure showed that the exercise intention scale was slightly correlated to an exercise behavior scale ($r = .25, p < .01$) 4 months later. The alpha coefficient in the current study was .87.

Exercise behavior. The Leisure Time Exercise Behavior by Self-Report is a one-item questionnaire (Godin, Jobin, & Bouillon, 1986) used to assess exercise behavior to provide a simple and easy-to-use instrument for psychosocial studies. The question in the current study was "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 were as follows: (a) not at all, (b) less than once a month, (c) about once a month, (d) about 2 or 3 times a month, (e) 1 to 2 times a week, and (f) 3 or more times a week. The scales allocated a score of 0 for "not at all," 2 for "less than once a month," 4 for "about once a month," 10 for "about 2 or 3 times a month," 24 for "1 to 2 times a week," and 48 for "3 or more times a week." The psychometric properties of the Leisure Time Exercise Behavior by Self-Report were examined by Godin and colleagues (1986). Test–retest reliability over 2 weeks was 0.64. Concurrent validity was examined in 61 volunteers. Leisure Time Exercise Behavior by Self-Report was significantly associated with maximum oxygen intake ($r =.38, p < .001$) and muscular endurance ($r = .38, p < .001$).

Analysis

Path analysis using Analysis of Moment Structures 18 (Arbuckle, 2009) was conducted to examine the effect of variables. With 645 participants, univariate and multivariate outliers with ungrouped data were detected. We found 27 cases that were univariate outliers because of their extremely low *z* scores on perceived risk of heart disease, outcome expectancies, or intention; these cases were deleted. Once these 27 cases were deleted, the skewness and kurtosis of these three variables were close to zero. This indicates that the distributions were normal. The baseline model was run with deleted outlier data (618 participants) and with outlier data (645 participants). There was no significant difference in the model between the two data sets. Therefore, we retained the outliers in the analysis. As differences were found between public park and municipality participants in several social cognitive variables, the baseline model was run with and without public park participants, and no difference was found. Therefore, the samples from the two settings were combined in subsequent analyses.

The data set in this study had a multivariate nonnormal distribution; therefore, the bootstrap technique was used to assess the stability of parameter estimates and indices of fit (Byrne, 2010). Theoretically, the investigator hypothesized that intention mediated perceived risk, outcome expectancies, and perceived self-efficacy for exercise. Perceived self-efficacy would also have a direct effect on exercise behavior. The hypothesized model was specified with exercise behavior as the endogenous variable, intention as the mediator, and perceived risk, outcome expectancies, and perceived self-efficacy as exogenous variables. The model fit was assessed by examining the χ^2 statistic with a p value larger than .05 indicating an acceptable fit. However, because the χ^2 statistic is sample-size dependent, the comparative fit index (CFI), goodness-of-fit index (GFI), and root mean square error of approximation (RMSEA) were also used to evaluate fit (Bollen & Long, 1993; 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 to 5 times the degrees of freedom (Bollen & Long, 1993).

To examine age and gender as moderators, first the effects of outcome expectancies, perceived self-efficacy, and intention (mediator) on exercise behavior were estimated with four subsamples separately: younger adults (18-35 years) and middle-aged/older adults (36 years or older) and men only versus women only. Participants aged 18 to 35 were classified as younger

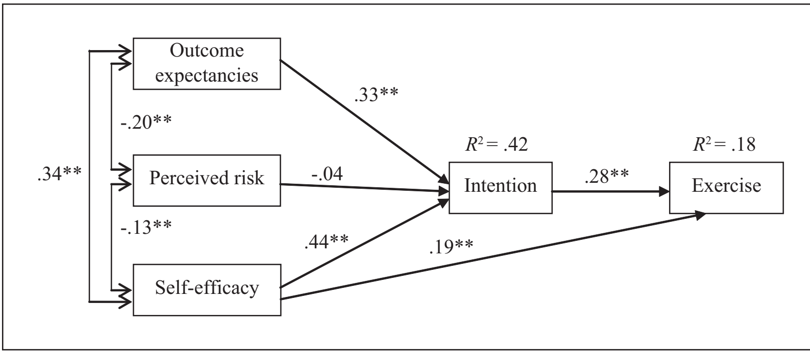

Figure 2. The baseline model for exercise behavior among Thais
**$p < .01$.

adults, and those 36 or older were classified as middle-aged/older adults (Renner et al., 2007). 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; Tabachnick & Fidell, 2001). Before running multiple group analyses, the single-group models have to fit well with the data (Tabachnick & Fidell, 2001). With a nested model, the χ^2 difference value ($\Delta\chi^2$), which is estimated by the subtraction of the χ^2 value of the constrained model from the unconstrained model, is used as the index for comparing models across two groups. If the $\Delta\chi^2$ value is statistically significant, it indicates that the two models are not equivalent (Byrne, 2010; Tabachnick & Fidell, 2001).

Results

The baseline version of the hypothesized model (Figure 2; 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 ($N = 645$). The baseline model had GFI and CFI indices, which were higher than 0.95 (GFI = 0.985 and CFI = 0.962). However, in the baseline model, the χ^2 / df ratio was larger than 5 times the degrees of freedom and RMSEA was higher than 0.05 (χ^2 / df = 12.385; RMSEA = 0.133). Therefore, the baseline model was not a good fit with the data. The path of perceived risk of heart disease on intention was not significant in the baseline model ($\beta = -.04$, $p = .214$). Thus, perceived risk of heart disease was removed from

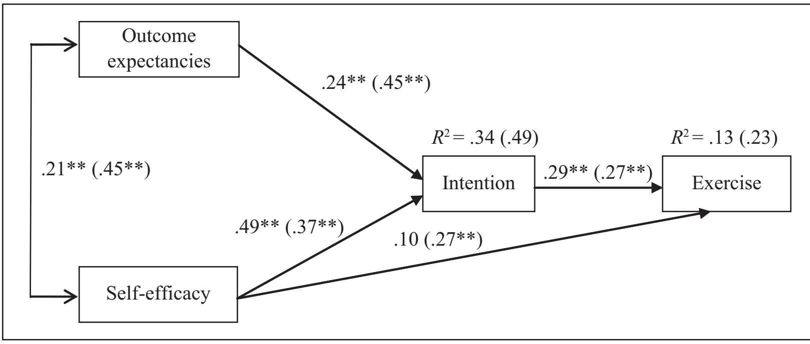

Figure 3. The comparison of the model for exercise behavior between younger and middle-aged/older adults (coefficients for middle-aged adults in parentheses)
$^{**}p < .01$.

future models. The modified model was constructed, and the model fit and parameters were reestimated. 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: $\chi^2(1) = .891$, $p = .345$; $\chi^2 / df = 0.891$; GFI = 0.999; CFI = 1.000; RMSEA = 0.000. A chi-square difference test revealed a significant improvement in the fit of the modified model: $\Delta\chi^2(1) = 24.682$, $p < .01$. Hence, with perceived risk of heart disease removed, the modified model was more parsimonious and a better fit than the baseline model. In the modified model, exercise was directly and significantly influenced by intention to exercise ($\beta = .28$, $p < .01$) and perceived self-efficacy ($\beta = .19$, $p < .01$), and explained 18% of variance in exercise. Intention to exercise was influenced by perceived self-efficacy ($\beta = .44$, $p < .01$) and outcome expectancies ($\beta = .34$, $p < .01$), and 42% of variance in intention to exercise was accounted for by self-efficacy and outcome expectancies.

The modified model was used to examine different age or gender groups for the relationship between social-cognitive factors and exercise behavior. The modified model was tested separately for younger and middle-aged/older groups. Overall, the model for younger adults (see Figure 3) was a good fit for the data: $\chi^2(1) = 1.345$, $p = .246$; $\chi^2 / df = 1.345$; GFI = 0.998; CFI = 0.998; RMSEA = 0.034. The model for middle-aged/older adults (also in Figure 3) also had a good fit for the data: $\chi^2(1) = 0.374$, $p = .541$; $\chi^2 / df = 0.374$; GFI = 0.999; CFI = 1.000; RMSEA = 0.000. The model of exercise behavior for the middle-aged adults showed a larger amount of variance in intention (49%) and in exercise (23%) when compared with variance in intention (34%)

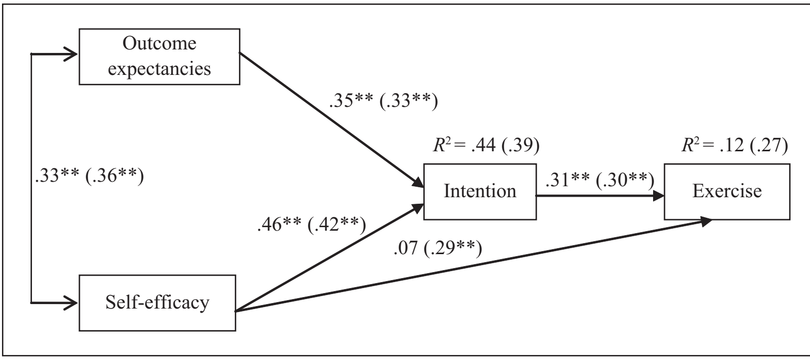

Figure 4. The comparison of the model for exercise behavior between men and women (coefficients for women in parentheses)
$^{**}p < .01$.

and in exercise (13%) in the younger age group. The model for exercise behavior was significantly different, $\Delta\chi^2(4) = 18.894$, $p < .01$, between the younger and middle-aged/older groups. Significant differences of the single path between the younger and middle-aged/older adults were found in outcome expectancies on intention, $\Delta\chi^2(1) = 21.42$, $p < .01$.

The exercise model was estimated separately for men and women. The model for men (Figure 4) was a good fit for the data: $\chi^2(1) = 0.764$, $p = .382$; $\chi^2 / df = 0.764$; GFI = 0.999; CFI = 1.000; RMSEA = 0.000. The model for women (Figure 4) also had a good fit with the data: $\chi^2(1) = 0.197$, $p = .657$; $\chi^2 / df = 0.197$; GFI = 1.000; CFI = 1.000; RMSEA = 0.000. The model of exercise behavior for women demonstrated a larger amount of variance in exercise (27%) when compared with variance in exercise (12%) in men. Between men and women, the modified model for exercise behavior was significantly different, $\Delta\chi^2(4) = 14.056$, $p < .01$. The single paths of perceived self-efficacy on exercise behavior, $\Delta\chi^2(1) = 6.357$, $p < .05$, perceived self-efficacy on intention, $\Delta\chi^2(1) = 4.363$, $p < .05$, and intention on exercise behavior, $\Delta\chi^2(1) = 4.942$, $p < .05$, were significantly different between men and women.

Discussion

CVD and its risk factors are significantly increasing in the Thai population. It is important to develop behaviors that will reduce risk factors and promote the health of the Thai population. In this study, determinants of exercise behavior were examined to identify factors that may be amenable for intervention. We need to know how to increase exercise in this population because exercise is shown to lower CVD and its risk factors, but exercise is reportedly low in this population. Unexpectedly, based on our model, we found that exercise was not influenced by perceived risk of heart disease. Intention to exercise did affect exercise. Intention was influenced by outcome expectancies and perceived self-efficacy. Interestingly, perceived self-efficacy was not only related to intention (and thus indirectly influenced exercise) but also perceived self-efficacy on its own directly influenced exercise.

In this study, exercise behavior was influenced by intention to exercise (as a mediator in the hypothesized model). This result is consistent with one prior study in Thailand (Jitramontree, 2003), one in South Korea (Renner et al., 2007), and many previous Western studies (Blanchard et al., 2008; Hoyt et al., 2009; Rhodes et al., 2004; Sniehotta, Scholz, et al., 2005; Ziegelmann et al., 2006). These studies indicated that intention was an influence on exercise behavior across cultures. Therefore, intention should be addressed as a mediator in the processes of changing exercise behavior among a Thai population.

This study found that perceived self-efficacy was a significant direct predictor of exercise behavior, which was consistent with other Thai studies with 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 effect of perceived self-efficacy on exercise behavior in the present study was somewhat lower than in previous Thai studies. The difference may be explained by those studies not including intention to exercise. Hence, including intention to exercise (as in this present study) may diminish the direct effect of perceived self-efficacy on exercise behavior.

This result is also similar to 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., 2005) and older adults (Conn, 1998; Conn, Burks, et al., 2003; Resnick & Nigg, 2003). However, contrasting findings were reported by Maglione and Hayman (2009), who found that perceived self-efficacy did not contribute to exercise behavior among U.S. college students. This suggests that, in younger groups, exercise behavior may not be influenced by perceived self-efficacy.

This study's findings indicated that intention to exercise was significantly influenced by outcome expectancies and perceived self-efficacy, as it was in studies in Western countries (Conn, Tripp-Reimer, et al., 2003; Sniehotta, Scholz, et al., 2005), in South Korea (Renner et al., 2007), and in Thailand

(Jitramontree, 2003). Unexpectedly in this study, perceived risk of heart disease was not a significant predictor of intention to exercise, even though perceived risk is an important variable within the HAPA model. However, a few previous studies have also found no relationship between perceived risk and exercise (Schwarzer et al., 2007; Schwarzer et al., 2008). This may be due to measurement error, or it may be that perceived risk is less relevant in determining exercise intention or exercise behavior (Schwarzer et al., 2007). The PRHDS used to measure perceived risk of heart disease was developed for Jordanian people in English. The measure might not be applicable in Thai culture. In this present study, the internal consistency reliability of two subscales of the PRHDS was low: Risk subscale ($\alpha = .55$) and Unknown Risk subscale ($\alpha = .50$). These data indicate that the tool may not be a reliable measure of perceived risk of heart disease. In this study in Thai people, perceived risk of heart disease may be a challenging construct to capture because Thais may be reluctant to admit they are at risk because of a cultural belief that this would "tempt fate." As this is the first study to address the effect of perceived risk of heart disease on exercise intention in Thailand, it is premature to conclude that perceived risk of heart disease plays no role in contributing to exercise intention among Thais.

The second purpose of the study was to examine the effects of age and gender on the relationship between social-cognitive factors and exercise behavior among Thais. 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 in the younger group. This finding is similar to a previous study of a general sample in South Korea that reported that the physical activity model showed a good fit in middle-aged/older adults, whereas it was less applicable in younger adults (Renner et al., 2007). Likewise, a previous study by Sniehotta, Scholz, et al., 2005 found that the exercise model fit the data well among coronary heart disease patients with an average age of 59 years. This result is different from one prior study (Lippke, Ziegelmann, & Schwarzer, 2004) in which the exercise model was not different between younger and older orthopedic patients. The present study and a prior study (Renner et al., 2007) reported that, in middle-aged/older adults, perceived positive outcomes of exercise had a greater influence on intention to exercise than in younger adults. This is the first study to capture the effect of age on the relationship between social-cognitive variables and exercise behavior in Thailand.

In the current study, gender differences were found in the relationships between social-cognitive predictors and exercise behavior. The modified model for exercise showed a better fit in women than 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). However, the present study findings are in contrast to a previous study by Schwarzer and Renner (2000) in which gender did not moderate the relationship between social-cognitive factors and dietary behavior among a general sample in Germany. The present study also indicated that, for women, perceived self-efficacy and intention to exercise were more strongly associated with exercise than for men.

This study has a number of limitations. The hypothesized model in this cross-sectional study was modified from the HAPA model. A cross-sectional design precluded making any causal inferences. The validity of self-report of exercise behavior has been questioned. In addition, 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. A convenience sample of Thai people from one geographical area limited the generalizability of the study findings across Thai populations living in other geographic areas. Furthermore, despite attempts to recruit a diverse sample of public Thai people, the participants in this study tended to have higher levels of education compared with the general population (which may reflect an urban vs. rural population).

In conclusion, the modified HAPA model was more applicable for middle-aged/older adults and women than for younger adults and men. Outcome expectancies, perceived self-efficacy, and intention were significant predictors of exercise behavior. Exercise intervention programs should incorporate outcome expectancies and perceived self-efficacy to impact intention to exercise. Positive benefits of exercise, negative perceptions of exercise, and improving individuals' abilities 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. Measures of perceived risk of heart disease that are culturally appropriate and specific to Thai populations are needed. Furthermore, future research on the entire HAPA model in longitudinal studies is needed to explain adoption and maintenance of exercise behavior among Thai populations.

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