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**A CAUSAL MODEL OF EXERCISE BEHAVIOR OF THE
ELDERLY IN BANGKOK METROPOLIS**

PRAPAPORN CHINUNTUYA

อธิการบดี

จาก

บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล

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**A CAUSAL MODEL OF EXERCISE BEHAVIOR OF
THE ELDERLY IN BANGKOK METROPOLIS**

Praporn Chinuntuya
.....

Ms. Praporn Chinuntuya
Candidate

Chounchom Charoenyooth
.....

Assoc.Prof. Chounchom Charoenyooth,
Ph.D.
Major-Advisor

Nonglak Wiratchai
.....

Prof. Nonglak Wiratchai, Ph.D.
Co-advisor

Prakin Suchaxaya
.....

Assis.Prof. Prakin Suchaxaya, Ph.D.
Co-advisor

Linchong Pothiban
.....

Assis.Prof. Linchong Pothiban, D.S.N.
Co-advisor

Anchalee Pongpun
.....

Asst.Prof. Anchalee Pongpun
M.A. (Applied Linguistics)
Acting Dean
Faculty of Graduate Studies

Kobkul Phanchuenworakul
.....

Assoc.Prof. Kobkul Phanchuenworakul,
Ph.D.
Chairman
Doctor of Nursing Science
Faculty of Nursing

Thesis
entitled

**A CAUSAL MODEL OF EXERCISE BEHAVIOR OF
THE ELDERLY IN BANGKOK METROPOLIS**

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on

July, 9, 2001

Prapaporn Chinuntuya

Ms. Prapaporn Chinuntuya
Candidate

Chounchom Charoenyooth

Assoc.Prof. Chounchom Charoenyooth,
Ph.D.
Chairman

Nonglak Wiratchai

Prof. Nonglak Wiratchai, Ph.D.
Member

Prakin Suchaxaya

Assis.Prof. Prakin Suchaxaya, Ph.D.
Member

Somchai Leetongin

Dr. Somchai Leetongin, M.D.
Member

Linchong Pothiban

Assis.Prof. Linchong Pothiban, D.S.N.
Member

Anchalee Pongpun

Asst.Prof. Anchalee Pongpun
M.A. (Applied Linguistics)
Acting Dean
Faculty of Graduate Studies
Mahidol University

Kobkul Phanchuenworakul

Assoc.Prof. Kobkul Phanchuenworakul,
Ph.D.
Dean
Faculty of Nursing
Mahidol University

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Prapaporn Chinuntuya

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**PRAPAPORN CHINUNTUYA : A CAUSAL MODEL OF
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THESIS ADVISORS: CHOUNCHOM CHAROENYOOTH, Ph.D., NONGLAK
WIRATCHAI, Ph.D., PRAKIN SUCHAXAYA, Ph.D., LINCHONG
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An important consideration in health promotion of the elderly is the initiation and maintenance of regular leisure-time and lifestyle exercise. Despite the documented potential benefits of exercise, the vast majority of the elderly remain physically inactive. Hence, the identification of factors influencing exercise behavior for the elderly is an important approach in developing nursing interventions.

The purpose of this study was to develop a causal model to explain exercise behavior of the elderly including leisure-time and lifestyle exercise. The hypotheses of both models were based on Pender's Health Promotion Model. The participants were three-hundred elderly people living in selected communities care for by health centers in the Bangkok metropolis. Multi-stage random sampling was used to identify the participants. A set of questionnaires were used, composed of Personal Data Form, Social Support for Exercise Questionnaire, Perceived Barriers to Exercise Questionnaire, Perceived Self-Efficacy for Exercise Questionnaire, Commitment to a Plan of Exercise Questionnaire, and Exercise Behavior (YPAS). Data were analyzed using SPSS and LISREL.

The results showed more variance in the leisure-time exercise model than in the lifestyle exercise model. In both models, commitment to a plan of exercise was the best predictor of exercise behavior and acted as an effective mediator variable. In both models social support for exercise had a direct positive effect on exercise behavior as well as an indirect effect through a commitment to a plan of exercise. In the leisure-time exercise model, perceived barriers to exercise had significantly negative direct effect on exercise behavior and a significantly negative indirect effect through a commitment to a plan of exercise. Perceived self-efficacy for exercise had a significantly direct effect on exercise behavior in the leisure-time exercise model while it influenced exercise behavior indirectly through a commitment to a plan of exercise in lifestyle exercise model.

The findings indicated that Pender's HPM can be used for predicting exercise behavior among Thai elderly. The findings lead to testing of nursing interventions for promoting exercise behavior of the elderly.

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ประภาพร จินันทุยา : แบบจำลองเชิงสาเหตุของพฤติกรรมออกกำลังกายของผู้สูงอายุในกรุงเทพมหานคร (A CAUSAL MODEL OF EXERCISE BEHAVIOR OF THE ELDERLY IN BANGKOK METROPOLIS) คณะกรรมการควบคุมวิทยานิพนธ์: ชื่นชม เจริญยุทธ, Ph. D., ประคิม สุจฉายา, Ph.D., ลินจง ไปริบาล, D.S.N., นงลักษณ์ วิรัชชัย, Ph.D. 221 หน้า. ISBN 974-04-0430-8

การออกกำลังกายที่เป็นแบบแผนและการออกกำลังกายที่ไม่เป็นแบบแผนเป็นสิ่งสำคัญที่ควรนำมาพิจารณาในการส่งเสริมสุขภาพผู้สูงอายุ ถึงแม้จะมีหลักฐานที่แสดงถึงประโยชน์ของการออกกำลังกาย แต่มีผู้สูงอายุจำนวนมากที่ยังคงมีพฤติกรรมไม่ออกกำลังกาย ดังนั้นการค้นหามีปัจจัยที่มีอิทธิพลต่อพฤติกรรมการออกกำลังกายของผู้สูงอายุจึงเป็นองค์ความรู้ที่สำคัญในการช่วยพัฒนาการปฏิบัติการพยาบาล

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อทดสอบความสัมพันธ์เชิงสาเหตุระหว่างปัจจัยการสนับสนุนทางสังคม การรับรู้อุปสรรค การรับรู้สมรรถนะของตนเอง กับพฤติกรรมการออกกำลังกาย กรอบแนวคิดการออกกำลังกายทั้งที่เป็นแบบแผนและไม่เป็นแบบแผนพัฒนามาจากโมเดลการส่งเสริมสุขภาพของเพนเดอร์ (1996) กลุ่มตัวอย่างคือผู้สูงอายุที่อาศัยอยู่ในชุมชนที่เป็นเขตรับผิดชอบของศูนย์บริการสาธารณสุข กรุงเทพมหานคร จำนวน 300 คน ใช้วิธีการสุ่มตัวอย่างแบบหลายขั้นตอน เครื่องมือในการวิจัยได้แก่ แบบบันทึกข้อมูลส่วนบุคคล แบบวัดการสนับสนุนทางสังคมด้านการออกกำลังกาย แบบวัดการรับรู้อุปสรรคด้านการออกกำลังกาย แบบวัดการรับรู้สมรรถนะของตนเองด้านการออกกำลังกาย แบบวัดเจตจำนงต่อแผนการออกกำลังกายและแบบวัดพฤติกรรมการออกกำลังกายวิเคราะห์ข้อมูลโดยใช้โปรแกรม SPSS/PC และ LISREL

ผลการศึกษาพบว่ากรอบแนวคิดพฤติกรรมการออกกำลังกายที่เป็นแบบแผนสามารถอธิบายความแปรปรวนของพฤติกรรมการออกกำลังกายได้มากกว่ากรอบแนวคิดพฤติกรรมการออกกำลังกายที่ไม่เป็นแบบแผน ปัจจัยด้านเจตจำนงต่อแผนการออกกำลังกายเป็นตัวทำนายพฤติกรรมการออกกำลังกายที่ดีที่สุด การสนับสนุนทางสังคมด้านการออกกำลังกายมีอิทธิพลโดยตรงทางบวกกับพฤติกรรมการออกกำลังกายและมีอิทธิพลโดยอ้อมผ่านเจตจำนงต่อแผนการออกกำลังกายในทั้งสองกรอบแนวคิด สำหรับกรอบแนวคิดการออกกำลังกายที่เป็นแบบแผน การรับรู้อุปสรรคในการออกกำลังกายมีอิทธิพลโดยตรงทางลบกับพฤติกรรมการออกกำลังกายและมีอิทธิพลทางอ้อมผ่านเจตจำนงต่อแผนการออกกำลังกาย การรับรู้สมรรถนะของตนเองมีอิทธิพลโดยตรงทางบวกกับพฤติกรรมการออกกำลังกาย ในขณะที่กรอบแนวคิดการออกกำลังกายที่เป็นไม่เป็นแบบแผน การรับรู้สมรรถนะแห่งตนมีอิทธิพลทางอ้อมโดยผ่านเจตจำนงต่อแผนการออกกำลังกาย

ผลการศึกษาบ่งชี้ว่าโมเดลการส่งเสริมสุขภาพของเพนเดอร์สามารถทำนายพฤติกรรมการออกกำลังกายของผู้สูงอายุไทยได้ดีและควรมีการทดสอบการปฏิบัติการพยาบาลที่ส่งเสริมหรือปรับพฤติกรรมการออกกำลังกายของผู้สูงอายุต่อไป

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CHAPTER I

INTRODUCTION

Background and Significance of the Study

The achievements of medical science in prolonging the human life leads to a longer life span of the people resulting in a social phenomenon called aging population. World population growth especially in specific population comes as a consequence of declining mortality and enhanced longevity. In 1993, 200 million of the world's total of 356 millions persons over 65 were in developing countries. By 2025, there will be more than 800 million older people in the world (WHO, 1998: 101).

In Thailand, an increase in the aging phenomenon is similar to that other in developing countries. In 1970, the proportion of the population aged over 65 was 4.9 percent and it increased rapidly to 6.1 percent in 1990 (Ministry of Public Health, 1993: 16). The number of persons aged 65 and above is expected to increase from 7.4 percent in 2000 to 9.4 percent in 2010 (Alfa Research Company, 1993: 101). In Bangkok, the population aged over 60 years increased from 6.4 percent in 1993 to 7.0 percent in 1997 (National Statistical Office, 1998: 28). The phenomenon is due to a combination of factors, especially the dramatic decline in infant and child mortality, reduction of maternal deaths, technological advancement, and medical modernization.

This demographic transition becomes critical and results in an increasing number of old aged population. This phenomenon signifies the increasing amount of medical expenditure and social costs to be allocated to this specific group which is the primary responsibility of the government to provide all needed cares for its constituents. Policies and plans were set up to tackle these problems (WHO 1998; Wise 1994: 1). The 8th National Public Health Development Plan was intended to promote families and communities care for Thai people especially among the elderly and the poor (Committee for National Public Health Development, 1996: 183). Concerted effort to promote health care among the elderly is seen as an utmost benefit to reduce these costs as well as to maintain their quality of life.

Through this healthiness, the elderly can increase the quality of life by limiting the impact of disease and illness, remain independent and are able to engage in meaningful pursuits (Heidrich, 1998: 173-174). Over 80 percent of the elderly experience at least one chronic disease condition (Dean & Holstein, In Badura & Kickbusch, Eds., 1991: 341). Studies assessing the health of the elderly in Bangkok indicated that over 70 percent of them had one or more chronic illnesses (Incharoensakdi, 1997; Toenwong, 1996). Hypertension, cardiovascular problems, low back pain, arthritis, diabetes mellitus were most commonly identified health problems among them. Health promotion becomes increasingly important to the elderly because of the need to protect remaining psychological and biological reserves. Various health promotion programs were specially designed to facilitate the health care promotion for the elderly. These programs usually covered areas such as

exercise, healthy nutrition, prevention of frailty and injury, and chronic disease management (WHO, 1998: 105).

Among these various activities, exercising appears to be an important component of health in both young and elderly (Dishman, et al., 1985; 158; Shephard, 1997: 18-29). Pender (1998:164) has stated that exercise is a behavior that must occur with regularity throughout the lifespan to have optimum health benefit. Exercise provides a myriad of specific physiologic and psychosocial benefit to the elderly. It can prevent several illnesses and symptoms that are precedent of the chronic diseases such as ischemic heart disease, peripheral vascular disease, hypertension, chronic obstructive lung disease, obesity, diabetes mellitus, osteoporosis, and cancer. Besides, exercise also helps strengthen muscle; enhance immune and bowel function; and counter the anxiety, sleeplessness, and mild depression. As far as the socialization is concerned, exercise allows the elderly an interaction with others, and this decreases feeling of social isolation or loss of social connection (Chodzko-Zajko, Ed., 1997: 5; Pescatello & DiPietro, 1993: 354-360; Robergs & Roberts, 1997: 585-593; Shahady, 1996: 14-16; Shephard, 1997: 28-29). Therefore, exercise could promote functional ability resulting in the high level of self-concept and self-worthiness of the elderly and keep them in social activities and in a good condition which will enable them to share their valuable experiences for the benefit of the society.

Pender (1996: 201) has identified two types of exercise: lifestyle exercise and leisure-time exercise. Lifestyle exercise is defined as physical activity with moderate intensity that can be planned and integrated of numerous short bouts of daily physical activities throughout the day for an accumulation of energy expenditure. It consists

of walking, stair climbing, gardening, yard work, playing with children, and household work. On the contrary, the leisure-time exercise is a structured, repetitive, and planned physical activity which focuses on intensity, duration, frequency, location, and scheduling. It is composed of sports and formal conditioning exercises such as jogging, aerobic, swimming, or myriad of other recreational activities.

The lifestyle exercise is a new alternative model that demonstrates an extension of a broader physical activity-health paradigm, which was neglected in the traditional exercise-fitness model (King, 1994: 1406; Pate, et al., 1995: 405). Lifestyle exercise helps reinforce participation and minimize impediments including a convenient, consistent time and place. It is flexible enough to accommodate into a person's existing activity preferences and daily fluctuations in motivation. and yet is planned to achieve tangible, long-term objective within a reasonable time. Available evidence indicates that lifestyle exercise has higher prevalence and adherence rates than the traditional exercise-fitness model (Dishman, et al., 1985: 168; King, 1994: 1406; Laitakari, et al., 1996: 473).

The overall physical activity is considered as important as episodic exercise in producing important health and well-being outcomes among the elderly (DiPietro, 1996: 956). Recent attention on the appropriate pattern of exercise among the elderly has moved from episodic exercise or leisure-time exercise to overall physical activity or lifestyle exercise for many reasons (Conn, 1998a: 370). However, Allison & Keller (1997: 63-67), and Pate et al. (1995: 406) have suggested that combination of these two models would be the most appropriate measure among the elderly. Therefore, the trend of research on exercise should take into consideration an integration of the

lifestyle and leisure-time exercise concepts in their conceptual framework so as to design the program accordingly.

Despite the documented potential benefits of exercise, the vast majority of the elderly remain physically inactive in Western countries (Conn, 1998a: 371). Similar findings were also found among the Thai elderly, particular in urban areas. It was found that level of exercise was relatively low (Chayovan & Knodel; 1995; Chuprapawan, Ed., 1994; Incharoensakdi, 1997; Inpang, 1999; Tounwong, 1996). Studies conducted by Dan et al. (1990: 538) and Dishman (1994: s79) revealed that exercise and physical activities decrease with advancing age. Hence, identification of indicators related to the promotion of exercise behaviors for the elderly is an important approach in predicting the elderly's exercise behavior.

A number of previous studies revealed that there were many factors that affect the exercise behavior of the elderly in Western countries including knowledge about exercise and its benefit and commitment to exercise (Howze, et al., 1989); exercise efficacy (McAuley, 1993); barriers and social support (Wilcock, et al., 2000); self-efficacy expectation, perceived barriers, age, outcome expectancy, and lifelong exercise (Conn, 1998b); and benefits and barriers (Pender, 1996: 59-60). In Thailand, a proportion of studies concerning exercise among the elderly had been conducted and there were some factors that have shown to an effect on exercise behavior of the elderly including perceived health status and perceived self-efficacy (Nunta, 1998); sex and perceived benefit of the exercise (Vannarit, 1999); and physical, psychological and economic barriers (Inpang, 1999). These indicators encompass personal and environmental factors of the elderly.

Pender's (1996) Health Promotion Model (HPM) is a model of health-related behavior developed within a nursing perspective. It explains the multidimensional nature of persons interacting with their environment as they pursue health. The HPM had been widely used in various studies that aimed to predict health promoting lifestyle, particularly exercise behavior in different samples such as community-dwelling elderly, cardiac patients, cancer patients, adolescents, in different work sites (Pender, 1996: 59-60), as well as the elderly in Thailand (Inpang, 1999; Nunta, 1998; Punyothi, 1996; Vannarit, 1999). The results of these studies indicate that the HPM could be appropriately used to explain and predict exercise behavior among the elderly. However, the findings need to be strengthened since uses of the revised HPM as a research framework to study exercise behavior of elderly have just recently begun. Thus, the HPM needs further testing to determine the predictive power of the model towards the exercise behavior of the elderly in particular.

Pender (1996: 198) has stated that adoption and maintenance of the benefits of leisure-time and lifestyle activities require commitment to ongoing designed processes in the program throughout one's life. To maximize the engagement in and maintenance of the exercise behavior among all groups of people is to encourage them to carry on such behaviors continuously. To achieve this goal, health professionals must understand the complex motivation, which leads to behavior that in turn underlies individual effort to adopt or maintain physically active lifestyle throughout his/her life. Different motivational variables may be salient at different physical activities or for different individuals at the same development point. Thus, an

analytical approach must be taken when applying the model of health behavior to specific group such as in the elderly.

Due to the scarcity of the studies that can shade and provide a better and sound explanation of exercise behavior of the elderly in the Thai context, a study that examine the models proposed from a nursing perspective as an explanation of health behaviors is necessary. Furthermore, since the fundamental understanding of exercise behavior process seems not to be adequate, the study of a causal model of exercise behavior is also very necessary. The findings can help nurse understand direct and indirect effects of predictor factors to exercise behavior.

Therefore, the study of a causal model to illustrate the structure of the elderly exercise behavior based on Pender's HPM (1996) is needed. Social support for exercise, perceived barriers to exercise, perceived self-efficacy for exercise, and commitment to a plan of exercise are the specified factors included in the model because these factors have been proved for their correlations with exercise behavior in various groups including the elderly. In this study, the model of exercise behaviors includes the model of leisure-time exercise and lifestyle exercise. The first model, the leisure-time exercise model, consists of three predictor variables that are expected to have direct effects on exercise behavior: social support for exercise, perceived barriers to exercise, and perceived self-efficacy for exercise, while commitment to a plan of exercise is a variable considered as mediated factor. The second model consists of the same variables as in the first model but it is for lifestyle exercise. It is expected that the findings of the study would be of help in determining the utility of the models in

explaining and predicting exercise behavior among the elderly and in successfully intervening to increase levels of exercise behavior.

Research Questions

Do social support for exercise, perceived barriers to exercise, and perceived self-efficacy for exercise have direct effects and indirect effects via commitment to a plan of exercise, on the elderly's exercise behavior?

Based on Pender's suggestion (1996), the research question will be answered separately for leisure-time exercise and lifestyle exercise behavior.

Purpose of the Study

This study aimed to develop the causal model to explain the exercise behavior of the elderly including leisure-time exercise and lifestyle exercise and to examine the causal relationships between variables including social support for exercise, perceived barriers to exercise, perceived self-efficacy for exercise, commitment to a plan of exercise, and exercise behavior.

Theoretical Framework

The Health Promotion Model (HPM) of Pender (1996) is used as a framework for this study. Based on the humanism perspective used in the HPM to explain how individuals behave to maintain their healthiness and gradually achieve well-being, this view is served as a basis for understanding the elderly's health motivation as well. Just like other individuals, the elderly in this study are viewed as individuals who move continuously toward increasing the level of well-being with self-actualization as a goal of health promotion. The elderly are still capable of actively their own behavior and creating conditions of living through which they can express their unique human health potential. They still maintain and assess their self-awareness and competencies in order to facilitate their interaction with their environment. Moreover, as the environment is dynamic, the elderly are expected to have the ability to modify the environment and be modified in accordance with the environment over time. Regarding this need of accommodating with the changing environment, the elderly have to involve in health promoting behavior throughout their life span in order to maintain health.

The model accommodates a number of constructs from the expectancy-value theory and social cognitive theory, within a nursing perspective of holistic human functioning (Pender, 1996: 53). According to social cognitive theory (Bandura, 1997), personal, environment, and behavior factors operate as reciprocal interacting determinants of each other. The springboard of exercise behavior cannot be isolated: exercise behavior motivation must be examined as a dynamic reciprocal interacting causal system. Within the causal system, the social cognitive theory places a priority

on examining cognitive process. Thought provides a proactive means for the elderly to control other exercise behavior determinants (person, behavior, and environment). The elderly with developed cognitive skill have the ability for their causation or self-regulation and may engage in exercise behavior in any situation.

The expectancy-value theory is a version of the utilitarian approach to behavior, which holds that the human acts are rational and motivated by a desire to seek the greatest possible utility (Geen, 1995: 28). Exercise outcome expectations are categorized to include detrimental or beneficial physical effects, positive and negative social consequences, and internalized self-incentives (Bandura, 1997: 409). The elderly may be motivated to participate in exercise behavior to improve their health status, to receive social approval, and to experience self-satisfaction, respectively. Furthermore, the elderly will invest their efforts and resources in engaging in exercise that has a positive value to them.

The revised Health Promotion Model (HPM) of Pender (1996) can explain the multidimensional nature of persons interacting with their environment as they pursue health. The HPM as presented in Figure 1 was used as the framework for this study, aiming at predicting exercise behavior including leisure-time exercise and lifestyle exercise. Several factors were proposed to determine the motivation of exercise behavior among the elderly. These include personal factors, behavior-specific cognitions and affect, and behavior outcome. The variables in the revised HPM and their interrelationships are described as follows:

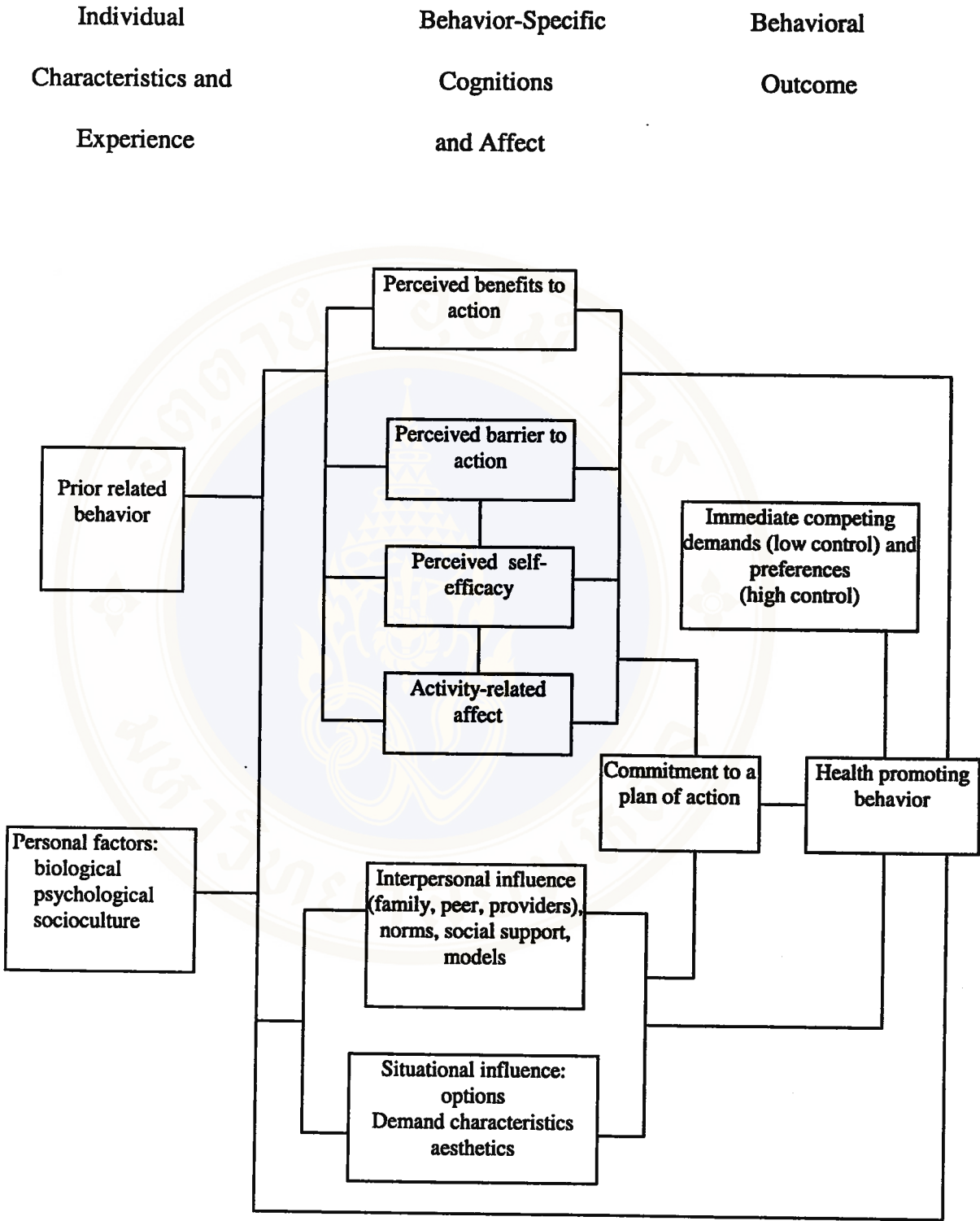


Figure 1: Revised Health Promotion Model (1996)

1. The Individual Characteristics and Experiences

This category of variables provides an insight into the uniqueness of the person's personal characteristics and experiences that affect subsequent actions. The importance of their effect will depend on the target behavior being considered. Two variables are considered at this point: the prior related behavior and the personal factors. The former factor, prior related behavior, refers to a behavior that has been performed repeatedly in the past and has become habitual. The latter factor, personal factors, is comprised of biologic, psychological and sociocultural factors. Recognition of prior related behavior and personal factors for exercise behavior of the elderly is obvious. However, the data gleaned from various studies indicate that these factors poorly motivate the elderly to engage in exercise behavior. Thus, both factors were excluded from the group of variables to be tested in this study.

2. The Behavior-Specific Cognitions and Affect

This category of variables is a major motivational significance and constitutes a critical "core" for nursing intervention to motivate individuals to engage in health-promoting behavior. Five factors are incorporated in this second component of the model: the perceived benefits of action; the perceived barriers to action, the perceived self-efficacy, the activity-related affect, the interpersonal influences, and the situational influences.

The Perceived Benefits of Action

Based on the concept of expectancy-value theory, the perceived benefits of action posits that one's plan to engage in a particular behavior often hinges on both intrinsic and extrinsic anticipated benefits or outcomes that will occur. Individuals tend to invest time and resources in activities with a high likelihood of increasing their experience of positive outcomes. The expected magnitude of the benefits and the temporal relation of benefits to action affect the potency of anticipated benefits as a determinant of health behavior. In the HPM, anticipated benefits are proposed as directly motivating behavior as well as indirectly motivating behavior through determining the extent of commitment to a plan of action to engage in that behavior. This variable is useful since it can shade some light on the exercise behavior but is seldom significantly proved when tested for its predictability (Pender, 1998). Moreover, this factor is inconsistently correlated with exercise behavior among the elderly (Punyothi, 1996; Vannarit, 2000). Due to its inconsistency and insufficient to explain exercise behavior in prior studies among the elderly, this factor was omitted from the proposed research model.

Perceived Barriers to Action

Perceived barriers to action determine the factors that constrain, block, hurdle or affect individuals' intention to engage in a particular behavior and the actual execution of the behavior or the health-promoting behavior in particular. The barriers can be internal or external. Perceived barriers to exercise refer to the elderly's evaluation of internal and external barriers, which constrain exercise behavior.

Internal barriers include laziness, misconception of exercise, lack of time and knowledge, and physical exertion. External barriers are transportation, lack of facility and friends, and economic status (Jones & Nies, 1996: 153; Nies, et al., 1998: 268-270; O'Neill & Reid, 1991: 392). Both barriers are the reasons why the elderly anticipate the difficulty in engaging in exercise or physical activity. Therefore, perceived barriers to exercise have a negatively directly influence on exercise behavior. Conn (1998b) has shown that perceived barriers to exercise have an indirect negative effect on exercise behavior among the old age. In sum, perceived barriers to exercise are expected to have both negative direct effect and indirect effect via commitment to a plan of exercise, on exercise behavior.

Many researchers have explored the influence of barriers to exercise on exercise behavior. The barriers to exercise was found to correlate most frequently with exercise behavior among adolescent (Garcia, et al., 1995; Sallis, et al., 1992) and could explain exercise behavior among elderly as well (Conn, 1998b; Pender, 1996). Thus, the barrier to action was a part of the present research model.

Perceived Self-efficacy

Perceived self-efficacy is defined as the judgment of one's capability to organize and execute the course of action under a variety of circumstances (Bandura, 1997: 3). The greater the perceived self-efficacy, the more vigorous and persistent individuals will be to engage in a behavior. In the HPM, perceived self-efficacy influences perceived barriers to action at which higher efficacy results in lowered perception of barriers to the performance of the target behavior. In sum, self-efficacy

motivates health-promoting behavior directly by efficacy expectations and indirectly by affecting perceived barriers and commitment or persistence in pursuing a plan of action.

Perceived self-efficacy for exercise is defined as the elderly's judgment of the ability to perform exercise under various circumstances. Dwyer et al (1998: 1175) have indicated that one's confidence to participate in physical activity when confronted with specific perceived barriers depend upon one's level of interest. Findings from various studies have substantiated that perceived self-efficacy is an important influence on physical activity participation and exercise behavior (Clark, 1995: 355; Dishman, et al., 1985; McAuley, 1993: 109). Exercise in this context is seen as a process that includes the adoption stage, maintaining stage, and adherence stage. Conn (1998b) has indicated that perceived self-efficacy has an indirect effect on exercise behavior among the elderly. Hence, perceived self-efficacy is expected to have both direct and indirect effects, through commitment to a plan of exercise, on exercise behavior among the elderly.

Self-efficacy is a cognition that has been proved for its correlation with exercise behavior in various groups (Macus, et al., 1992; Poag & McAuley, 1992) as well as in the elderly was (Conn, 1998b; Nunta, 1998). Therefore, this factor is included in the present research model.

Activity-Related Affect

Activity-related affect is considered as individuals' positive and negative feelings that occur prior to, during, and after doing behavior. Behaviors related to

positive feelings are likely to be repeated but those related to negative feelings are likely to be avoided. It should be noted that the activity-related affect depicted in this model is different from the evaluative dimension of attitude as proposed by Fishbein and Ajzen (1980). That of Fishbein and Ajzen reflects affective evaluation of the specific outcomes of a behavior rather than the response to the stimulus properties of the behavior itself. Activity-related affect is perceived to influence health behavior directly as well as indirectly through self-efficacy and commitment to a plan of action.

A new concept in the revised HPM (1996), the concept of activity-related affect needs further clarification as well as measurement through more sensitive psychometric tools (Garcia & King, 1991). Thus, it is not qualified to be a part of the model for this study.

Interpersonal Influences

Interpersonal influences are defined as the cognitions concerning the beliefs or attitudes of others. These cognitions may or may not correspond with reality. Primary sources of interpersonal influences on health-promoting behavior are families, peers, and health care providers. Interpersonal influences also include norm (significance of significant others), social support (instrumental and emotional encouragement), and modeling (vicarious learning through observing others engaged in a particular behavior).

Social support for exercise is defined as a person's evaluation about frequency or subjective feelings of emotional, tangible, and informational support from family and friends (Pender, 1996: 257; Schaefer, et al., 1981: 384-385). Social support for

exercise refers to the elderly's evaluation about frequency of receiving informational, emotional, and instrumental assistance from family members and friends (Sallis, et al., 1987: 827). These activities can help the elderly move toward the goal of exercise. Intharapanich (1993) and Sallis et al. (1987: 825) have indicated that social support appears to be an important determinant of success in motivation to accepting, changing, and maintaining continuous exercise behavior. Therefore, social support has a direct positive effect on exercise behavior as well as has an indirect effect on exercise behavior through commitment to a plan of exercise. In this study, this variable is selected because of its substantive correlation determined in prior studies.

Situation Influences

Situation influences are defined as personal perceptions of options available, demand characteristics, and aesthetic features of the circumstance in which a given behavior is proposed to take place. In the revised HPM, situational influences have been reconceptualized as having direct and indirect effects on health-promoting behavior. In this context, situations may directly affect behaviors by presenting an environment "loaded" with cues that trigger action.

Environment influences include options (facilities, equipment), and aesthetics (safe, pleasant, and demand characteristics), environmental influences dictate for specific behavior of the surroundings in daily lives of the elderly. Though this variable is a powerful variable as are the variables in the cognitive and affective domain in motivating and enabling exercise behavior, limited number of research studies has been focused on the effect of the physical environment at home and in

community on exercise behavior (Pender, 1998: 151). A number of studies used this ecological approach to examine micro and macro environment of the elderly in order to identify the features that can predict exercise behavior. Thus, this variable was not selected in this study because of its inadequacy to explain exercise behavior in the elderly.

3. The Behavioral Outcome

This last component of the model, behavioral outcome, is comprised of three variables as follows:

Commitment to a Plan of Action

This factors associated with the concept of “intentionality” that refers to a major determinant of volitional behaviors. The commitment to a plan of action implies the underlying cognitive processes: (1) commitment to carry out a specific action at a given time and place and with specified persons or alone, irrespective of competing preference, (2) identification of definition strategies for eliciting, carrying out, and reinforcing the behavior. The requirement of identification of specific strategies to be used at different points in the behavioral sequence goes beyond intentionality to further the likelihood that the plan of action developed by nurses and patient will be successfully developed. Commitment to a plan of action is supposed to have direct influence on health promoting behavior. However, it should be noted that commitment alone without associated strategies often results in “good intentions” but failure to perform a valued health behavior.

Commitment to a plan of exercise as outcome behavior is defined as the elderly's microbehaviors that support consistency in exercise behavior. The microbehaviors comprise of cognition and overt behaviors, which are a planned to exercise by the elderly. If these multiple microbehaviors occur, consistency in exercise behavior over time should be gained (Pender, 1999). Howze et al. (1989) have discovered that commitment to a plan of exercise has a positive relation to the exercise behavior of a sedentary elderly. Moreover, Fuchs (1996) has found that intention is a high level of cognitive guidance, which determines regularly exercise behavior. Therefore, commitment to a plan of exercise is expected to have a direct positive effect on exercise behavior among the elderly and thus was included in this study.

Immediate Competing Demands and Preferences

Immediate competing demands and preferences refer to alternative behaviors that intrude into consciousness as possible course of action immediately before the intended occurrence of a planned health-promoting behavior. Competing demands are viewed as those alternative behaviors over which individuals have a relatively low level of control because of environment contingencies while those of competing preferences are viewed as alternative behaviors with powerful reinforcing properties over which individual exert a relatively high level of control. Both competing demands and preferences can derail a plan of action to which one has committed. Competing demands can be differentiated from barriers in that the individual must carry out an unanticipated behavior based on external demand or untoward results are

likely to occur. Competing preferences can be differentiated from barriers such as lack of time, because competing preferences are last-minute urges based on one's preference hierarchy that derails a plan for positive health action. In the HPM, immediate competing demands and preferences directly affect the probability of occurrence of health behavior as well as moderate the effects of commitment. Being a new concept introduced in the revised HPM which no substantive data available, this variable was omitted.

Health-Promoting Behavior

Health promoting behavior is the end point or action outcome in the HPM. The health-promoting behaviors refer to continuing activities that must be an integral part of an individual lifestyle that reflects an expression of the actualizing tendency and a movement toward higher level of health. It should be noted that health-promoting behavior is ultimately directed toward attaining positive health outcomes for the patient. Exercise is an important component of health-promoting behavior, which provides physiologic and psychosocial benefits to the elderly (Chodzko-Zajko, Ed., 1997: 3-5)

Pender (1996: 201) has defined exercise as lifestyle exercise and leisure-time exercise. Lifestyle exercise is defined as physical activity that can be integrated and planned into activities of daily living such as brisk walking, stair climbing, gardening, yard work, playing with children, and household work. Leisure-time exercise on the other hand, is defined as a structured, repetitive, and planned physical activity that

focuses on intensity, duration, and frequency. It consists of sports and formal conditioning exercises.

This revised HPM was thoroughly reconceptualized to incorporate the outcome expectancies of expectancy-value theory and self-efficacy expectancies for mastery of social cognitive theory. Pender (1996: 73) has recommended that this revised model need to be tested empirically and relationships among the variables should be tested in predictive studies to exact the usefulness of the model in explaining, predicting, and altering health-promoting behaviors.

The structural equation model that reflects causal relationship among variables is illustrated in Figure 2 and further details will be discussed in Chapter 2.

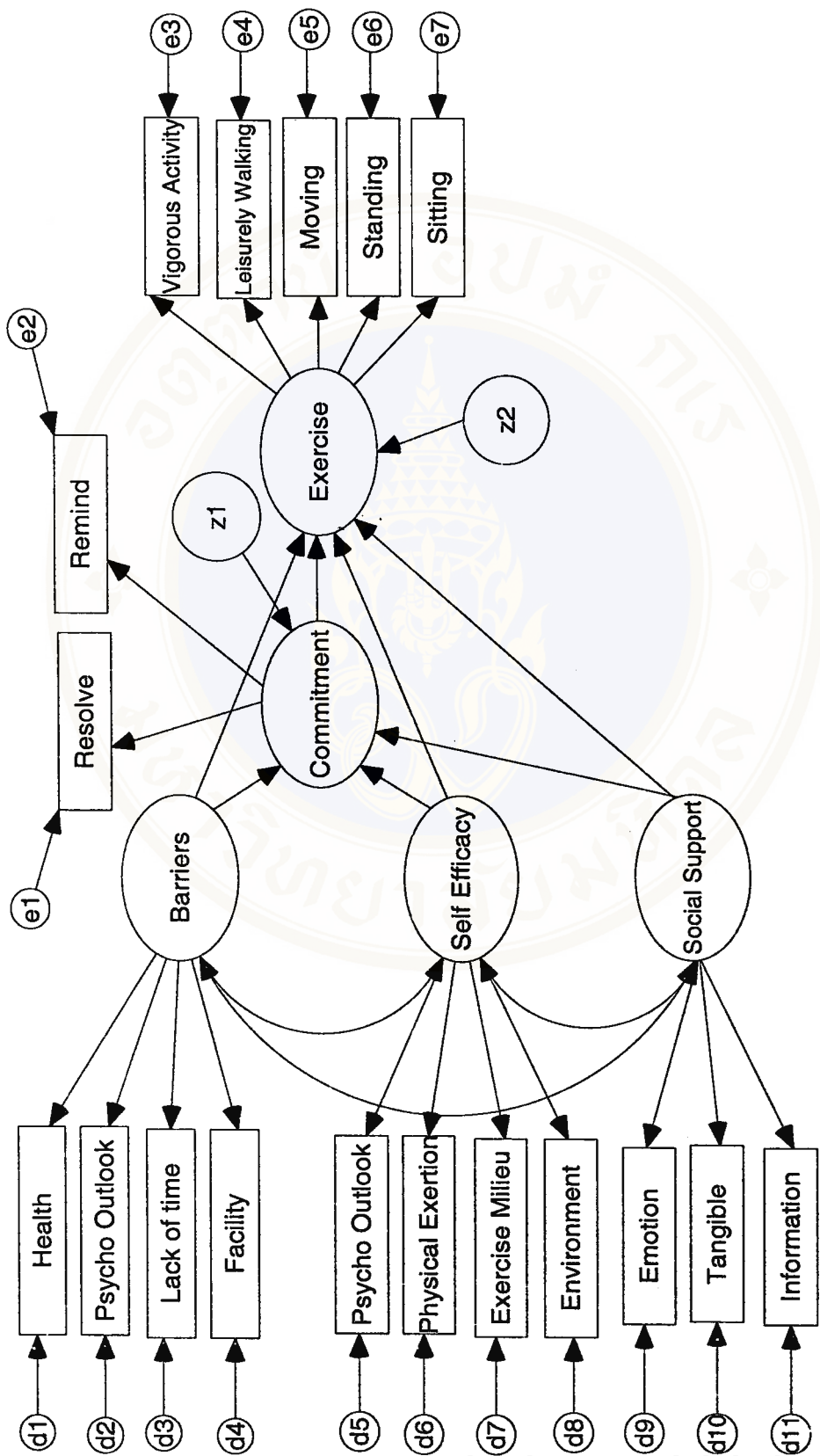


Figure 2: A Causal Model of Exercise Behavior of the Elderly

Hypotheses

The following hypotheses were formulated to test the causal effects proposed in this study:

1. Commitment to a plan of exercise has a positive direct influence on the elderly's exercise behavior.
2. Social support for exercise has a positive direct effect on exercise behavior as well as an indirect effect on the elderly's exercise behavior through commitment to a plan of exercise.
3. Perceived barriers to exercise has a negative direct effect on the elderly's exercise behavior as well as an indirect effect on the elderly's exercise behavior through commitment to a plan of exercise.
4. Perceived self-efficacy for exercise has a positive direct effect on the elderly's exercise behavior as well as an indirect effect on exercise behavior through commitment to a plan of exercise.

There was an additional hypothesis pertaining to the comparison of the two causal models for leisure-time exercise behavior and lifestyle exercise behavior as follows: there is a difference in causal relationships among variables between leisure-time exercise behavior and lifestyle exercise behavior.

Scope of the Study

The study is a cross-sectional study to develop and test the causal model of exercise behavior of the elderly, who were 60 years or over and lived in Bangkok Metropolis.

Definition of Terms

Social Support for Exercise

Social support for exercise is defined as the evaluation of the elderly about frequency of receiving informational, emotional, and tangible assistance to exercise from family members and friends as evaluated by the modified Social Support for Exercise Questionnaire which was originally constructed by Pender (1996). The Social Support for Leisure-time Exercise Questionnaire consists of 13 items and the Social Support for Lifestyle Exercise Questionnaire is composed of 12 items. The greater the scores, the greater social support for exercise received by the elderly.

Perceived Barriers to Exercise

Perceived barriers to exercise refers to the elderly's evaluation of internal and external constraints to exercise behavior measured by a modified Perceived Barriers to Exercise Questionnaire, which was originally constructed by Pender (1996). The Perceived Barriers to Leisure-time Exercise Questionnaire is composed of 18 items and the Perceived Barriers to Lifestyle Exercise Questionnaire consists of 16 items. The greater the scores, the greater barriers to exercise that the elderly perceive.

Perceived Self-efficacy for Exercise

Perceived self-efficacy refers to the elderly's judgment of the ability to perform exercise behavior under a variety of internal and external conditions as measured by a modified Perceived Self-efficacy for Exercise Questionnaire which was

originally constructed by Pender(1996). The Perceived Self-efficacy for Leisure-time Exercise Questionnaire and the Perceived Self-efficacy for Lifestyle Exercise Questionnaire consists of 14 items measured separately by a 5-point Likert scale. The greater the scores, the greater self-efficacy for exercise that the elderly perceive.

Commitment to a Plan of Exercise

Commitment to a plan of exercise is defined as the elderly's micro-behaviors that supports consistency in exercise overtime as measured by a Commitment to a Plan of Exercise Questionnaire (Pender, 1996). Commitment to a Plan of Leisure-time Exercise Questionnaire and Commitment to a plan of Lifestyle Exercise consist of 11 items measured separately by a 3-point Likert scale. The greater the scores, the greater the commitment for a plan of exercise that the elderly have.

Exercise Behavior

Exercise behavior is defined as the elderly's leisure-time and lifestyle physical activity (Pender, 1996) as determined by intensity, frequency, and duration of five activities -- vigorous activities, leisurely walking, moving, standing, and sitting, which significantly improve and maintain well-being and health status evaluated by the Yale Physical Activity Scale (YPAS; DiPietro, et al., 1993). The 7-item questionnaire asks for the duration and frequency of these activities using 7- rating scale questions, while intensity weighting factors range from 1 to 5. The possible final index ranges from 0 to 137. The greater the index, the greater the activity level.

CHAPTER II

LITERATURE REVIEW

This research was aimed to pursue understanding of the determinants of exercise behavior among the elderly. This chapter, therefore, provides a review of literature regarding conceptualization of exercise behavior, exercise behavior of the elderly in Bangkok, benefits of exercise among the elderly and factors influencing exercise behavior including commitment to a plan of exercise, social support for exercise, perceived self-efficacy for exercise, and perceived barriers to exercise as follows:

Conceptualization of Exercise Behavior

To understand exercise among the elderly, the definition of exercise, exercise recommendation, and exercise prescription for the elderly were discussed as follow:

Definition of Exercise

Casperson et al. (1985: 128-129) stated that exercise is a subcategory of physical activity which is bodily movements of skeletal muscles that create energy expenditure. These activities are planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness pattern is an objective.

As described above, it can be stated that both exercise and physical activity have common elements (Casperson, et al., 1985: 128). Both of them are behavior, involve any bodily movement produced by skeletal muscles that expends energy, are measured by kilocalories ranging continuously from low to high, and are positively correlated with physical fitness. However, they are different in the level of physical fitness achievement. Exercise is more related to physical fitness than physical activity.

Pender (1996: 185) has categorized exercise into leisure-time exercise and lifestyle exercise. Leisure-time exercise is a structured, repetitive, and planned physical activity. It consisted of sports and formal conditioning exercise such as jogging, bicycling, swimming, or a myriad of other recreational activities. Commonly referred to as endurance exercise, leisure-time exercises generally consist of three phases: warming-up, endurance exercise, and cool down. Together they constitute a program of exercise that can be sustained over time, and can increase fitness and cardiorespiratory function. Lifestyle exercise is defined as physical activity that can be planed and integrated numerous short bouts into activities of daily living, and it has been suggested as a new strategy for promoting physical activity in population. It is composed of household activities, stair climbing, walking, gardening, care for children or disabled person, and work related activities for pay and volunteer.

Exercise Recommendation

Pate et al. (1995: 404-405) has previously provided an exercise recommendation and proposed the new recommendation as follows:

Previous Exercise Recommendations

In the past, traditional or structured exercise recommendations (including those from the American College of Sports Medicine:ACSM) were based on scientific studies that investigated dose-response improvements in performance capacity after exercise training, especially the effects of endurance exercise training on maximal aerobic power (maximum oxygen consumption). The recommendations usually involved 20 to 60 minutes of moderate-to-high-intensity endurance exercise (60% to 90% of maximum heart rate or 50% to 85% of maximal aerobic power) performed three or more times per week. This approach as described by the ACSM involves rather specific recommendations regarding type, frequency, intensity, and duration of activity. Moreover, it is linked to specific settings (e.g., health club, recreation centers, health centers), leisure-time activity occurs within a specific, often short-term, and time frame.

Although the earlier exercise recommendations are based on documented improvements in fitness, they probably provide most of the disease prevention benefits associated with an increase in physical activity. However, it now appears that the majority of these health benefits can be gained by performing moderate-intensity physical activities outside of formal exercise programs.

Unique Aspects of the New Recommendation

Lifestyle approach is the new recommendation, which extends the traditional exercise-fitness model to a broader physical activity-health paradigm. The recommendation is distinct in two important ways. First, the health benefits of

moderate-intensity physical activity are emphasized. Second, accumulation of physical activity in intermittent short bouts is considered an appropriate approach to achieving the activity goal. These unique elements of the recommendation are based on mounting evidence indicating that the health benefits of physical activity are linked principally to the total amount of physical activity performed. This evidence suggests that amount of activity is more important than the specific manner in which the activity is performed (e.g. mode, intensity, or duration of the activity bouts).

The health benefits of physical activity appear to accrue in approximated proportion to the total amount of activity performed, measured as either caloric expenditure or minutes of physical activity.

Health care providers must rely on the most reasonable interpretation of existing data to guide their action. The most reasonable interpretation of the currently available data is that: 1) caloric expenditure and total time of physical activity are associated with reduced cardiovascular disease incidence and mortality; 2) there is a dose-response relationship for this association; 3) regular moderate physical activity provides substantial health benefits; and 4) intermittent bouts of physical activity, as short as 8 to 10 minutes, totaling 30 minutes or more on most days, provide beneficial health and fitness effects.

In conclusion, recent physical activity recommendations thus acknowledge both the traditional and lifestyle approaches to increasing physical activity. Either traditional or lifestyle approaches can be beneficial for individuals so their interests and opportunities should be used to determine which is used (U.S. Department of Health and Human Service, 1996: 28).

The Exercise Prescription for the Elderly

Allison and Keller (1997: 63) have noted that it becomes more important to engage in exercise directed to promote health and physical function, rather than fitness. They have suggested exercise prescription for the elderly consisting of four interrelated components: intensity, frequency, duration, and mode of activity. The choice of exercise intensity or degree of energy (work) required performing an activity is particularly important when working with older adults. The physical work capacity of the older adult is often low. Because many older adults have been sedentary for a long time, specific muscle groups are often severely deconditioned, and many older adults have musculoskeletal limitations as well. For these clients, it is particularly important to begin with low-intensity activities (2 to 3 MET) or activities that they are comfortable performing. Adding activities of higher intensity should be done slowly when the individual's self-monitoring skills are established. Highly conditioned older adults may be able to perform high intensity exercise without difficulty.

The frequency of the activity refers to the number of times the activity is performed. When exercise intensity levels are low, participants are encouraged to increase the frequency of the exercise, perhaps to even three or four times a day. In contrast, when participating in physical training or performing higher intensity activities, the client may be encouraged to alternate training activities with walking or cycling on every other day. Recent strategies for lifestyle exercise recommends numerous bouts of exercise throughout the day for an accumulation of energy expenditure.

Duration of the exercise period refers to the amount of time involved in the activity. By increasing the frequency and duration of a low- to moderate-intensity activity, health benefits can be realized without risking injury. It appears that the duration of a single activity is far less important than the accumulation or volume of activities.

The choice of activity should not only be based on the client's fitness level but also on his or her interest and resources. In selecting a mode or form of activity for older adults, it is important to consider activities that would be enjoyable and have a minimal potential for injury. Any low-to-moderate-intensity activity such as walking, gardening, or cycling can be considered for an exercise program. Exercise opportunities can be incorporated into everyday life. For example, parking several blocks from the grocery store, walking to get the mail, or taking the stairs instead of the elevator are easy ways to increase activity in the elderly. Choosing activities to enhance endurance or strength that are familiar and occur routinely may diminish the negative perception of exercise.

Exercise Behavior of the Elderly in Bangkok

There were a few researchers who have explored exercise behavior including leisure-time exercise and lifestyle exercise among the elderly in Bangkok.

Tongwichien and Silapasuan (1989) studied self-care of the elderly in Bangkok and found that over ten percent of the subjects were irregularly performed leisure-time exercise and 47.4% did not engage in leisure-time exercise. Over 39% were regularly engaged in leisure-time exercise such as leisure-time walking, sports,

and running. For lifestyle exercise, the results revealed that the subjects engaged in laundry (40.5%), care for children (11.9%), food preparation (16.6%), household activities (13.6%), gardening (1.9%), and occupation (28.4%).

The findings of Mins' study (1996) showed that most of the elderly were engaged in exercise and had some hobbies. According to the answers obtained, the types of exercise were classified into six groups and hobbies into eight groups. There were 29.5% of the elderly who did stretching exercise, 20% did tai chi/breathing exercise, 4% played sports such as badminton, or golf, 7% regarded housework as exercise, and 9% had no exercise. As for hobbies, 30% watched TV or listened to the radio, 15% read books, 4.5% did knitting, sewing, or weaving, 7% raised pets, 33% did housework and 8% took care of grandchildren. Those who had no hobbies accounted for 15.5%.

Tounwong (1997) found that over 57% of the elderly did not engage in leisure-time exercise but 43.5% did. The leisure-time exercise was composed of walking, stretching, tai chi, running, aerobics, and using instrument for exercising. The results also revealed that 37% reported watching television, 24.8% talking with their friend, 14.5% listening to radio, 5.8% travelling, 5.0% reading, 4.7% praying, and 2.6% shopping as their lifestyle activities.

Benefits of Exercise among the Elderly

Maintaining physical activity is known to provide a myriad of specific physiologic and psychosocial benefits to the elderly (Shephard, 1997: 28-29). While data from intervention studies demonstrate the effect of more vigorous, aerobic or



strength training on changes in physiologic variables in the elderly, the benefits of moderate activity, such as that routinely performed as part of active lifestyle, are less clear (DiPietro, 1996: 596). Therefore, the purpose of this review is to describe the benefits of exercise that can be categorized as follows:

Physical Benefits

Exercise is known to be beneficial to the elderly with the problem of hypertension, diabetes, lipid disorders, obesity, coronary artery disease, osteoporosis, and mental health. Physically active and fit individuals with hypertension have lower rates of mortality than sedentary, unfit, hypertensive individuals (American College of Sports Medicine, 1993: 25). Data from a meta-analysis study (Arroll, 1992: 439) revealed that aerobic exercise prevents hypertension and reduces blood pressure and mortality in hypertensive patients.

Lower plasma insulin concentrations and increased sensitivity to insulin in the skeletal muscle and adipose tissue of individuals with non-insulin-dependent (Type II) diabetes are associated with physical training. Baan et al. (1999: 219) studied physical activity in elderly subjects with impaired glucose intolerance and newly diagnosed diabetes mellitus. The results indicated that physical activity and glucose intolerance are associated among older adult similar to the way they are associated among middle-aged adult. Pinyochon (1992) studied aerobic exercise on biochemistry substances in blood. They found that aerobic dance exercise was effective in decreasing plasma glucose among the Thai older women.

Exercise is widely believed to induce favorable changes in lipid profiles; in particular, it increases the high-density lipoprotein (HDL) fraction (Shahady, In Richmond & Shahady, Eds., 1996: 10). The study by Chaoruehak (1992) found that walking exercise is effective in decreasing cholesterol, LDL-C, and triglyceride and increasing HDL-C among female elders.

Although obesity is traditionally considered a disorder of energy intake, accumulating evidence underscores the importance of energy expenditure in treatment. Caloric restriction in overweight persons produces more weight loss than does exercise, although more of the weight loss by dieting is from lean body mass. The addition of exercise to diet produces more weight loss than does diet alone (Shahady, In Richmond & Shahady, Eds., 1996: 10). Visser (1997: 752) studied the total sports activity in older men and women in relation to body fat distribution. The results showed that physical activity and specifically intensive activity is negatively associated with abdominal fat in older adult.

The reduction in coronary disease risk attributable to regular exercise is particularly large among older persons. A study by Limacher (1994: s13) found that the elderly who exercise regularly had lower resting heart rate and blood pressure. Those who maintain a pattern of routine exercise are at a lower risk for cardiovascular event as well. However, the intensity of exercise required to promote cardiovascular health among older persons has remained a source of controversy. Siscovick et al. (1997: 977) studied the exercise intensity and subclinical cardiovascular disease in the elderly. The authors concluded that among physically able older men and women the intensity of exercise in later life is associated both with coronary disease risk factor

levels and subclinical disease. The elderly who engage in high-intensity exercise have the most favorable risk factor levels and the least subclinical disease.

The incidence of osteoporotic fractures rises with age (U.S. Department of Health and Human Service, 1996: 130). Physical activity has great potential to reduce the risk of osteoporotic fracture. Exercise, therefore, not only reduces fracture risk by preventing bone loss, but it decreases the risk of falling and increases the effectiveness of the neuromuscular response (Shahady, In Richmond & Shahady, Eds., 1996: 11). The study by Coupland et al. (1999: 241) has identified two forms of physical activity, namely stair-climbing and brisk walking which are associated with increased bone mineral density at the hip and whole body in postmenopausal women.

Skeletal muscle strength, muscle mass, and psychomotor performance decline with age. Resistance exercise training is generally safe and effective to improve muscle strength and increase muscle mass in the elderly (Graves, et al., 1994: s17). The study of Nichols et al. (1993: 206) found that heavy-resistance weight training is safe and enjoyable for older women and that meaningful gains in muscular strength and body composition can be made in women who are already highly active.

Psychosocial Benefits

It is expected that exercise is associated with psychological well-being. It increases levels of endorphines, which are natural opiates, thereby increasing feeling of well-being and euphoria. It may regulate norepinephrine release, and thus decrease depression (Cronan & Howley, 1984: 122; Siever & Davis, 1985:1017), and may be associated with psychological well-being through psychosocial mechanisms such as

improving self-esteem, feelings of achievement and accomplishment, improving body image, stress reducing, anxiety, alcoholism and substance abuse (Taylor, et al., 1985: 195-196; Willis & Campbell, 1992: 51-58).

Data from a research study of Tinsley et al. (1985: 172) have indicated that leisure-time activities might be grouped into meaning cluster on the basis of their psychosocial benefits. The clusters on psychosocial benefits include companionship, compensation, temporary disengagement, expressive solitude, expressive service, and comfortable solitude. Ross and Hayes (1988: 762) studied exercise and psychological well-being in the community. They concluded that exercise is associated with decreased symptoms of depression (feeling that life is not worthwhile, low spirit, etc.), anxiety (restlessness, tension, etc.) and malaise (rundown feeling, trouble sleeping, etc.) in the general population, most of which is not severely depressed, and in which many persons are engaged in moderate, nonaerobic exercise. In addition, the study by Shin (1999) showed that the effects of an outdoor walking exercise program on emotional state of the elderly Korean women are improved.

Factors Influencing Exercise Behavior among the Elderly

There are several factors that affect exercise behaviors in the elderly. However, in this study the researcher will focus on selected factors: commitment to a plan of exercise, social support for exercise, perceived self-efficacy for exercise, and perceived barriers to exercise. Commitment to a plan of exercise acts as a cognitive mediator linking three motivating factors (social support for exercise, perceived self-efficacy for exercise, and perceived barriers to exercise) influencing exercise

behavior. Thus, commitment to a plan of exercise is mainly controlled by the interplay of three motivating factors.

Commitment to a Plan of Exercise

Based on a behavioral perspective, a person generally performs organized rather than disorganized behavior. Pender (1996: 72) has described commitment to a plan of action implied underlying cognitive process. She further stated that this concept was micro behaviors that support and enhance consistency in action overtime (Pender, 1999). Furthermore, the micro behaviors would carry on specific time, place, and person.

Commitment to a plan of action is associated with intention, which determines volitional behavior. Volitional process is cognitive function that transforms motivations into a detailed set of instructions on how to perform the action (Schwarzer & Fuchs, 1995 cited by Fuchs, 1996: 1954). Therefore, commitment must be translated into intention. The person must prepare for action by formulating a plan that would render his or her event actions efficacious for reaching the goal of action. In short, a strategy must be devised (Geen, 1995: 55).

In addition, a commitment is associated with sustained lines of activity across situation. Commitment is typically conceptualized in two ways, one emphasizing behavior and the other emphasizing identity as the locus of individual action (Bielby, 1992: 284-286).

According to the behavioral approach, commitment is determined by the rational calculation of benefits and cost. An individual commits to a line of behavior

so long as it provides resources for meeting personal needs and values. Specifically, commitment to an activity is a function of the net rewards from the activity. In this view, commitment is a process that stabilizes behavior only to the extent that the balance of net costs and benefits is stable over time. In addition, noncognitive responses to committing situations emphasize the degree to which subjective orientation and intention are habitual. Family and work activities would be viewed as habitual rather than intentional. Thus, those activities are neither recognized as binding, nor evaluated with respect to the net benefit to be derived from them.

Corresponding to the identity approach, commitment is a strong personal dedication to a decision to carry out a line of action. Individuals find themselves engaged in a particular pattern of employment and family responsibilities such as household activities and occupation, and subjective attachments are changed to be consistent with those engagements. The commitment to work and family responsibility are functions of one's past and current experience, responsibilities, and statuses. In this view, commitments are reflected variability in cumulative impact of prior committing behavior, not differences in the current balance of their cost and benefit.

Relationship between Commitment to a Plan of Exercise and the Exercise Behavior among the Elderly

Commitment to a plan of action is a factor that motivates a person to engage in regular activity. The elderly would exercise regularly if they set the exercise strategies at all time. Therefore, commitment to plan of exercise is an important element that

pushes and motivates the elderly to exercise consistently (Dishman, 1994: s80); Stevenson, In Swanson & Tripp-Reimer, Eds., 1997: 41).

According to the rational calculation of net future benefits (Bielby, 1992: 286), the elderly's commitment to a plan of leisure time exercise may be solely on the basis of their current assessment of the benefits of performance in exercise activities. The benefits of exercise are categorized to include detrimental or beneficial physical effects, positive and negative social consequences, and internalized self-incentives. The elderly commits to participate in exercise behavior to improve their health status, receive social approval, and experience self-satisfaction, respectively. Once the commitment for exercise participation has been shaped, it is necessary to transform motivation into a detailed set of guidance to exercise behavior (e.g., fixing a start date, time, and place; telling everyone they would start exercise; and considering exercise so important in their life that they allocate time for it, etc.). Finally, the elderly engage in exercise by initiating their strategic behavior.

Commitment to work is seen as an attachment that is initiated and sustained by the extent to which an individual's identification with a role or value is considered to be central among alternatives as a source of identity (Bielby, 1992: 284). Work is important to most people not only as the source of livelihood, but as an important element of identity (Willis & Campbell, 1992: 31). Thus, the identity is more likely to be enacted and has consequences for behavior consistency in line of activity. Elderly's commitment to a plan of lifestyle exercise (e.g., household activities, religious activities, volunteer work and occupation) is a function of the elderly's past and current experiences, responsibilities, and role functions. In this view, this

commitment is conceptualized with respect to personal meaning, which is a process that binds the elderly to engage in lifestyle exercise. When commitment for exercise participation has been formed, it is necessary to transform motivation into a detailed set of plan to lifestyle exercise behavior.

Using multiple regression analysis, Howze, et al. (1989) studied the factors that had an effect on acceptance of exercise among the aged who had sedentary activity. The results showed that commitment to exercise had a statistically significant effect on the exercise behavior ($\beta = 0.39$, $p < 0.05$). It further indicated that the aged with higher commitment to exercise had greater exercise behavior. The only commitment to exercise factor was accounted for 6 percent of the variance in acceptance of exercise. Keith and Schafer (1997) studied dietary change among younger and older men. The finding revealed that commitment to the importance of dietary practices and the food selection had significant effect on dietary change ($\beta = .27$, $p < .01$; $\beta = .17$, $p < .05$), respectively. Finally, Fuchs (1996) studied causal models of physical exercise participation among adults and older adults. The findings revealed that intention had a significantly positive direct effect on exercise behavior ($\beta = .18$, $p < .05$). In the adoption process, the exercise intention explained 18% of the variance in exercise behavior.

Social Support for Exercise Behavior

Several studies have found that social support plays vital tasks in protecting health (Cobb, 1976: 311), preventing health hazard behaviors (Zimmerman & Connor, 1989: 58), changing health behavior such as reducing smoking, alcohol (Mermelstein,

et al., 1986: 447; Bruhn & Philips, 1987: 214) as well as promoting health behavior (O'Brien Cousins, 1995: 273; Pender, 1996: 259) such as changing eating behavior and exercise (Cohen & Syme, 1985: 6).

According to functions of social support, Schaefer et al. (1981: 385-386) have stated that emotional support is the provision of value, praise, care, love, attachment, intimacy, reassurance and listening -- all of which contribute to the feeling that one is loved or cared about, or even that one is a member of the group, not a stranger. Tangible or instrumental support involves direct aid or services and can include loans, gifts of money or goods, and provision of services such as taking care of needy persons or doing a chore for them. Information and advice, which could help a person, solve a problem and provide feedback which may help a person maintain a social identity and a sense of social integration.

Social support for exercise is defined as frequency of receiving emotional, tangible, and informational assistance to exercise from the members in the social network including family members, friends, neighbors, co-workers, and exercise program leaders and participants (Duncan & McAuley, 1993: 202; Sallis, et al., 1987: 827; U.S. Department of Health and Human Service, 1996: 214). Social support networks of the elderly have been shown to provide health behavior changes, and the maintenance of changes (Stroller & Pollow, 1994). Many elders have lost life partners and may utilize family and friends for encouragement of positive health behaviors. A primary factor predictive of nonadherence in exercise programs is the lack of supports from significant others (Allison & Keller, 1997: 63).

Direct Relationship Between Social Support for Exercise and Exercise Behavior among the Elderly

Social support is a major motivational factor that affects exercise behavior among the elderly (Allison & Keller, 1997: 63). Social support for physical activity can be emotional support, as in calling to see how someone is faring with a new walking or bicycling program, praising for exercise or other physical activities, and encouraging to perform exercise; or appraising, as in providing feedback and reinforcement in learning a new skill; informational, as in telling someone about walking program in the neighborhood, maintaining occupation and volunteer activity, and developing a plan to exercise; and tangible, as in giving or aiding the equipment and finance for exercise (Fuchs, 1996: 1954; U.S. Department of Health and Human Service, 1996: 214).

Studies with adults and elders have repeatedly demonstrated that social support may facilitate the adoption of new exercise habits and their maintenance (O'Brien Cousins, 1995: 274; Sallis, et al., 1992). It would appear that, in as much as leisure-time exercise is under the individual's control and must be maintained over extended periods of time, the provisions of social relationships, such as attachment, social integration, and guidance, would be particularly appropriate in aiding individuals in their challenge to engage in their exercise program (Dunan & McAuley, 1993: 201).

Results from several correlation studies have shown that social support is associated with leisure-time exercise behavior among adults and elders. Intharapanich (1993), has indicated that social support has statistically significant correlation with

health promoting behaviors ($r = 0.35$, $p < 0.001$). Likewise, Sallis et al. (1987: 831) found that support from friends who exercise together, support from family by joining the program together and giving reward and punishment, have statistically significant relation with exercise behavior. In addition, the study of Fuchs (1996) has revealed that social support has a direct effect on exercise behavior in the adoption process. However, data from the latent growth modeling technique in the study of Duncan and McAuley (1993: 211) indicated that social support failed to directly influence exercise behavior. The study indicated that social support might have an indirect effect on exercise behavior through other motivating factors.

Despite Duncan and McAuley's finding, the researcher concluded that the elderly who have high support from their social surrounding have good exercise behavior. The findings of these studies suggest that having active friends and family and being encouraged by at least one person are the most influential forces in choosing types of recreation.

The Indirect Effect of Social Support for Exercise on Exercise Behavior through Commitment to a Plan of Exercise

Pender (1996: 71) has proposed that commitment to a plan of action operates as a cognitive mediator in the relation between social support and health promoting behavior. Locke and Ltham (1990: 136-137) have indicated that social support (e.g. peer group) is associated with commitment. Studies with adults and elderly have repeatedly demonstrated that social support may facilitate setting a plan of exercise.

The study of Schuster, Petosa, and Petosa (1995) has revealed that perceived social support have statistically significant influence on intentional exercise. Thus, when the elderly have a friend or family member who serve as behavior model, encourage to start an activity, or help them to organize the activity, that seems to provide the situation cues and opportunities relevant for developing concrete action plan to initiate behavior (when, where, what, and which whom to exercise).

This is similar to the study of Fuchs (1996: 1954) whose results indicated that in the adoption process of basic model, exercise behavior is not only a function of intentions, but it is also influenced by social support. The findings showed that social support has statistically significant direct effect on intentional exercise. The direct effect of social support on exercise behavior is relevant to not only setting up intention or commitment to exercise, but also transforming this intention into concrete action. Therefore, this study illustrates that social support has an effect on exercise behavior and its effect is completely mediated by commitment to a plan of exercise.

Perceived Self-efficacy for Exercise

Bandura (1997: 6) has pointed out that behavior is affected by environmental influences, attributes of the behavior itself, and personal factors. Each may affect or be affected by either of the other two. This cognition control of behavior is based on certain beliefs including: self-efficacy expectation or perceived self-efficacy which are persons' beliefs in their capabilities to perform a course of action to attain a desired outcome: and specific outcome expectations which are beliefs that a certain consequence will be produced by personal action.

There are four major psychological processes through which self-beliefs of efficacy affect human function. They are 1) cognitive process -- the effect of self-efficacy beliefs on cognition process take a variety forms. Most of the courses of action are initially organized in thought, a major function of thought is to enable people to predict events and develop ways to control those that affect their lives; 2) motivational process -- self-efficacy play a key role in the self-regulation of motivation. People motivate themselves and guide their actions anticipatory by exercise of forethought; 3) affective process -- people's beliefs in their coping capabilities affect how much stress and depression they experience in threatening or difficult situations; and 4) Selection process -- belief of personal efficacy can shape the course of lives taken by influencing the types of activities and environment people choose.

Bandura (1997: 39) has contended that stronger self-efficacy beliefs are related to higher goal setting, firmer commitment, more successful anticipatory scenarios, more appropriate behavior selection, greater perseverance, more effort expended to engage in the behavior, more use of the helpful thought patterns, more facilitative emotional reaction to the behavior, and lower likelihood of being dissuaded by difficulties. Finally, self-efficacy is capable of influencing many health behaviors, including cigarette smoking, weight control, contraception, alcohol abuse and exercise behavior (Strecher, et al., 1986: 78-87).

Direct Relationship Between Perceived Self-efficacy and Exercise Behavior among the Elderly.

Self-efficacy has received much attention in studies of exercise behavior among the elderly in community-based settings and in clinical settings (Clark, 1995; Conn, 1998; Grembowski, et al., 1993; Howze, ET al., 1989; McAuley, 1993; Resnick, et al., 2000). Perceived self-efficacy was most relevant to mobilize persons to exercise regularly in the face of a variety of personal, social, and situational impediments (Sallis, et al., 1988). People who distrust their self-efficacy poorly adhere to organized exercise programs. They attend exercise irregularly, they have difficulty getting themselves to exercise at the intensity and duration required to achieve health benefits, and they are quick to drop out (Bandura, 1997: 408-409).

Formal conditioning exercise, walking, stair climbing, and carrying packages are examples of daily activities that young persons often take for granted. As the persons grow older, however, these simple activities of daily living may become difficult because of a reduction of physical function (Graves, et al., 1994: s17). With development of functional limitation overtime, the elderly who lack confidence in their ability or have a low perceived self-efficacy will have fewer tendencies to exercise (Dishman, 1994: s80). However, the elderly who have a high sense of efficacy may be more successful in maintaining their exercise habit (McAuley, 1993: 111-112). In this view, self-efficacy for exercise has been operationalized as efficacy to overcome exercise barriers.

McAuley (1993: 104) has argued that as individuals adapt physiologically and psychologically to the demands placed upon them by exercise participation, and as

exercise becomes part of their daily schedule and possibly less demanding, the role of efficacy cognitions is diminished. This perspective is in keeping with Bandura's (1997) contention that cognitive control systems play their most important role in the acquisition of behavioral proficiencies. When behaviors are less demanding and more easily engaged in, cognition control systems such as self-efficacy give way to regulation by lower control systems. However, when routine behaviors are in some manner disrupted, thus creating a higher demand on the resources of the individual, cognitive control systems come into play once again.

Garcia and King (1991) studied the predictability of perceived self-efficacy to adherence with aerobic exercises among adults aged 50 to 64. They found that perceived self-efficacy has a statistically significant relationship with adherence to exercise. These findings yielded support to the study results of McAuley (1993) who studied the influence of perceived self-efficacy on maintaining exercise behavior among the elderly. At the end of a 4-month period, perceived self-efficacy showed statistically significant influence on maintenance of exercise ($\beta = 0.42$, $p < 0.01$). However, Howz et al. (1989) showed that perceived self-efficacy has no statistically significant effect on the adoption period to exercise more than any other period ($\beta = 0.0485$, $p > 0.133$). Data from the path analysis study of exercise behavior among older adults (Conn, 1998b: 185) illustrated that perceived self-efficacy had a stronger direct impacts on exercise behavior more than perceived benefits, outcome expectancy, lifelong exercise and age ($B = 0.35$, $p < 0.0001$). However, the study of Vannarit (1999) revealed that perceived self-efficacy did not have a direct influence on exercise behavior among the Thai elderly in rural areas.

The Indirect Effect of Perceived Self-efficacy for Exercise on Exercise Behavior through Commitment to a Plan of Exercise

Commitment to a plan of action acts as the mediator jointing perceived self-efficacy to health promoting behavior (Pender, 1996: 70). Bandura (1997:39) has stated that perceived self-efficacy plays a major role in keeping people commit to a course of action, motivating themselves, and putting more effort expended to perform behavior, especially when pursuing that course of action involves persisting longer overcoming setbacks, failure, and obstacle. Therefore, the elderly with high sense of self-efficacy not only tend to set up an intention to exercise, but also transform this intention into a concrete action plan of exercise and commitment to their plan.

There is research that studied the effect of perceived self-efficacy on commitment to a plan of exercise and intention to exercise among adults and the elderly. The study of Schuster et al. (1995) indicated that perceived self-efficacy influences the intention to exercise among the elderly. Similarly, according to the study of DuCharme and Brawley (1995), perceived self-efficacy is found to influence the exercise behavior. Furthermore, the study of Fuchs (1996) revealed that perceived self-efficacy affects intention or commitment to a plan of exercise in the maintenance process. Therefore, perceived self-efficacy has an indirect effect on exercise behavior via commitment to a plan of exercise.

Perceived Barriers to Exercise

Perceived barrier is defined as a belief that reduces the motivation to do exercise. The barriers may be imagined or real. Perceived barriers have been identified in the literature relating to exercise and can be classified as external and internal barriers. The structural barriers or external barriers include lack of facility, bad weather, and characteristic of exercise. Personal barriers or internal barriers include health problem, lack of energy, psychological outlook, and lack of knowledge (Dishman 1994: 80; Jones & Nies, 1996: 153; Mockenhaupt & Boyle, 1992: 35-36; Nies, Vollman, & Cook, 1998: 268-270; O'Neil & Reid, 1991: 392-393; Sechrist, Walker, & Pender, 1987: 359; Steinhardt & Dishman, 1989: 540; Willis & Campbell, 1992: 15-17; Ziebland, et al., 1998: 462). The barriers to exercise among the elderly are composed of external barriers and internal barriers as follows:

External Barriers

External barriers for exercise in the elderly consisted of four barriers as follows: Firstly, time constraint is the most prevalent reason for failing to exercise or dropping out of an exercise program (Nies, et al., 1998: 268). The study of Nies et al. (1998) indicated that time constraint is a situation created by the family needs in home such as caregiving duty, household work. Secondly, inadequate facility includes inconvenient travelling and lack of equipment and resources. Specific location of leisure-time exercise (e.g. health clubs, recreational centers, and health centers) is inconvenient to travel to because it is far away from the elderly's home (O'Neill & Reid, 1991: 393). Lack of equipment includes sport supplies, clothing and shoes,

bicycles, and exercise machines in the elderly's home, while insufficient resources include parks, bicycle lanes, swimming pools, fields for outdoor games, and courts for indoor games (U.S.Department of Health and Human Service, 1996: 246-247). Thirdly, weather conditions influence choices and seasonal feasibility of outdoor leisure-time activities, but it still is unknown to what extent climate affects overall activities level (Dishman, et al., 1985: 167). Lastly, nature of exercise behaviors is the impediments to exercise adherence (Dishman, et al., 1985: 167; Bandura, 1997: 408-409). Vigorous and moderate leisure-time exercise is performed regularly at certain type, intensity, times and places, while lifestyle exercise involves increasing the amount and level of physical activity in one's routines. The elderly are more likely to remain physically active if exercise is imbedded in habitual routines and is enjoyable (Conn, 1998a: 376). However, Graves, et al. (1994: s17) indicated that some lifestyle exercise (e.g. stair climbing, walking, and carrying packages) may become barriers to engaging in activity among the elderly because of a reduction in their physical function.

Internal Barriers

There are three internal barriers to exercise among the elderly including psychological outlook, health problems, and knowledge of exercise (Dishman, 1994: s80; Lee, 1993; Nies, et al., 1998; O'Neill & Reid, 1991). Psychological state is an impediment to exercise including problem of self-image, boredom of exercising, laziness to join the exercise program or engage in lifestyle activities, feeling too old to exercise, fear of falling, lack of motivation, and lack of interest in exercise. In

addition, attitude constraint is related to the state of mind of the individual. These constraints are often derived from broader social or culture norms or customs (Edginton, et al., 1995: 24). The study of Tongwichien and Silapasuwan (1989) and Min (1996) showed that the elderly had to look after their grandchildren when their parents went out to work. The social attitude that the elderly should be the primary caretakers of children -- focusing on other's needs before their own -- still prevails in much of society in Thailand. This attitude can be a constraint for the elderly to engage in leisure-time exercise. Health problem is another main reason that the elderly do not exercise. The physical inability is related to lack of physical energy and joint problem or soreness (Conn, 1998a: 375; Nies, et al., 1998: 270; O'Neil & Reid, 1991:392;). Knowledge of appropriate exercise is associated with exercise in the adoption phase (Lee, 1993: 325). An understanding of safe and effective exercise may be particularly important among the elderly who are quite likely to have preexisting injuries and may risk further injury without appropriate exercise. Some elderly believe that exercise must be strenuous and painful, and that misconception acts as a barrier to attempt to begin an exercise program (Mobily, 1982).

The Direct Relationship Between Perceived Barriers to Exercises and Exercise Behavior among the Elderly

Perceived barriers to exercise have been associated with adults and the elderly's physical activity (Lee, 1993: 328; U.S Department of Health and Human Service, 1996: 216). Perceived barriers are a factor that reduces the elderly's motivation to engage in exercise behavior (Dishman, 1994: s80).

Many studies consistently revealed that perceived barriers to exercise is a determinant of a negative relationship to exercise behavior among the elderly. Jones and Nies (1996:155) studied the perceived barriers to exercise and exercise behavior among aged women. The results showed that perceived barriers had a significant influence on exercise behavior ($r = -0.45 < 0.05$). This is similar to the study of Inpang (2000) whose findings demonstrated that the overall barriers were significantly negatively related to moderate level of exercise behavior among the urban and rural Thai elderly ($r = -0.42$; $r = -0.49$), respectively. Also, Conn (1998b:187) conducted a path analysis study to explain exercise using factors from social cognitive theory. The results illustrate that perceived barriers to exercise had a significantly direct negative effect on exercise behavior ($\beta = -0.28, p < 0.001$) and a significantly negative indirect effect on exercise behavior through self-efficacy ($\beta = -0.21, p < 0.05$).

The Indirect Effect of Perceived Barriers to Exercise on Exercise Behavior through Commitment to a Plan of Exercise

According to Pender's HPM (1996: 69), commitment to a plan of exercise is a cognitive mediator linking perceived barriers to exercise influences to exercise behavior. According to the expectancy theory, the perceived difficulty in performing a behavior influences commitment to a plan of action (Locke & Latham, 1990: 147), or intention to engage in exercise behavior (Pender, 1996: 69).

Studies have found that a person's commitment declines as the plan becomes more difficult and/or as the person's perceived chances of engaging in behavior declines. The study of Schuster et al. (1995) showed that perceived barriers had

affected intention to exercise among the elderly. When the elderly assess the obstacles as barriers to exercise and do not manage difficult environment, they could not set a plan to exercise because their motivation is reduced. In addition, Fuchs (1996) stated that situational barriers have an influence on action plan and action control, which is the commitment to a plan of action. When detailed set of guidance on how to perform exercise fails to occur, the elderly do not engage in exercise regularly. Therefore, Fuchs (1996) has suggested that exercise intention is a mediator linking between perceived barriers to exercise and exercise behavior. Thus, cognitive factors may recede in importance, as exercise behaviors becomes more routine.

Summary

This chapter has presented a review of the literature focusing on conceptualization of exercise, exercise behavior of the elderly in Bangkok, benefits of exercise, and factors influencing exercise behavior.

For physical activity recommendations, the elderly can increase their exercise in many ways. The traditional, structured approach or leisure-time exercise described by the ACSM and others involve rather specific recommendations regarding type, frequency, intensity, and duration of activity. More recently, physical activity recommendations have adopted a lifestyle exercise or lifestyle approach as an increasing activity. Recent physical activity recommendations thus acknowledge both the structured and lifestyle approaches to increase physical activity. Both approaches can be beneficial for individuals if interests and opportunities are taken into consideration to determine which should be used.

For benefits of exercise, both leisure-time and lifestyle exercises are known to provide a myriad of specific physiologic and psychosocial benefits to the elderly. While data from intervention studies have demonstrated the effect of leisure-time exercise on changes in physiologic and psychosocial variables in the elderly, the benefits of more moderate activity, such as that routinely performed as part of active lifestyle, are less clear.

Data from previous studies have revealed that perceived self-efficacy, social support, perceived barriers, and commitment to a plan have a direct effect on leisure-time exercise behavior, while the data of these factors affecting on lifestyle exercise behavior are less clear. Nevertheless, the study of causal model of exercise behavior of the Thai elderly can not be found. Therefore, there is a lack of fundamental understanding of the exercise behavior process. To fill this gap, the study of a causal model of exercise behavior is useful to understand direct and indirect affects between predictor factors and exercise behavior of the elderly.

In this study, the exercise behavior model of the elderly is based on Pender's HPM (1996). Commitment to a plan of exercise is mainly controlled by the interplay of three motivating predictor variables: social support for exercise, perceived self-efficacy for exercise and perceived barriers to exercise. Commitment to a plan of exercise operates as a cognitive mediator linking the three-predictor variables to exercise behavior of the elderly.

Pender (1996) has stated that exercise is composed of two activities including leisure-time exercise and lifestyle exercise. It has been anticipated into causal models of leisure-time exercise and lifestyle exercise. However, there is no significant

evidence supporting this separation of the models in this study. The researcher has set the hypotheses to explore whether or not the two causal models of leisure-time exercise and lifestyle exercise are similar.

Thus, the researcher hypothesized that social support for exercise, perceived self-efficacy for exercise and perceived barriers to exercise have a direct effect and an indirect effect via commitment to a plan of exercise, on exercise behavior. Based on Pender's suggestion (1996), there is an additional hypothesis pertaining to the comparison of the two causal models for leisure-time exercise and lifestyle exercise behavior as follows: there will be a difference in causal relationships among variables between leisure-time exercise and lifestyle exercise behavior.

CHAPTER III

METHODOLOGY

A causal model was proposed in cross-sectional research to investigate causal relationships among social support for exercise, perceived barriers to exercise, perceived self-efficacy for exercise, commitment to a plan of exercise, and exercise behavior in elderly people.

Population and Sample

Population of the Study

The population of this study were the elderly aged 60 years or over who were residing in the metropolitan area of Bangkok and were accounted for health personnel at the Health Center, Department of Health, the Civil of Bangkok Metropolitan.

Sample of the Study

The following criteria and techniques were used to determine qualified sample in this study. The criteria for eligibility to be recruited into this study were as follows:

1. Age 60 years or over.
2. Having no cognitive impairment and achieving the CMT score of at least 15 points.
3. Willingness to participate in this study.

Sampling Technique

The determination of the sample size in the Multiple Regression and Correlation Analysis was used to calculate the power analysis for adequate approximation of the sample size for LISREL. The formula for the calculation of the sample size was illustrated as follows (Cohen , 1988:445):

$$N = \frac{\lambda}{f^2}$$

where,

N = Sample size

λ = The noncentrality parameter which was tabled over the most useful range for typical MRC applications

$$f^2 = \text{Effect size index} = \frac{R^2_{Y.B}}{1 - R^2_{Y.B}} = .15 \text{ (Cohen, 1988: 419)}$$

Corresponding to this method, the researcher used the λ value of F-test from λ table, which was determined by the parameters of a , u , v , and desire power as follows: (Cohen, 1998: 448-449)

a = significance criterion which the significant level of .01 was used.

U = degree of freedom of the numerator of the F ratio which was simultaneously the number of independent variables equal to 7 for this study.

v = degree of freedom of the denominator of the F ratio which was equated to 120.

Desired power of the test = .99

According to the assigned parameters, they yielded λ value of 39.4 when considering the λ table. Then, calculation of the samples was as follows:

$$\begin{aligned} N &= 39.4/0.15 \\ &= 262.66 \end{aligned}$$

Therefore, the minimum sample size of this study was 263 subjects. According to this critical N, the sample size was added up to 300 subjects for proper proportionally sampling assignment in this study. To obtain the sample, the following multi-stage random sampling technique was used as illustrated in Figure 3.

The following steps were followed to obtain the subjects and to maximize the normal distribution of the sample:

1. Bangkok was divided to three zones including inner, middle, and outer zones. These zones were grouped according to their population density. The sampling began with identification of districts from the three zones of Bangkok -- inner (14 districts), middle (24 districts) and outer zone(8 districts). Based on similarity of demographic and socioeconomic characteristics of the three zones, one district was selected by simple random sampling from each zone. Patumwan, Bang Kho Laem, and Lad Krabang districts were representatives of the inner zone, middle zone, and outer zone, respectively, and 100 participants were recruited from each representative district.

2. One health center was selected to represent each district using simple random sampling. Health Center 16 (Lum Penee), Health Center 12 (Wat Chan Teang), and Health Center 46 (Kan Tarat) were selected from Patumwan, Bang Kho Laem, Lad Krabang districts, respectively.

3. The simple random technique was used to select one of the communities from each Health Center. Bon Kai, Wat Chan Nai, and Rom Klua community were selected from Health Center 16 (Lum Penee), Health Center 12 (Wat Chan Teang), and Health Center 46 (Kan Tarat), respectively.

4. A quota of four blocks was randomly selected from each community through location map.

5. Through the canvassing technique, only 25 households that had the elderly member were selected from each block. Only one elderly was recruited from each household according to the inclusion criteria.

Settings

Data collection was executed in the field place at the selected elderly's household.

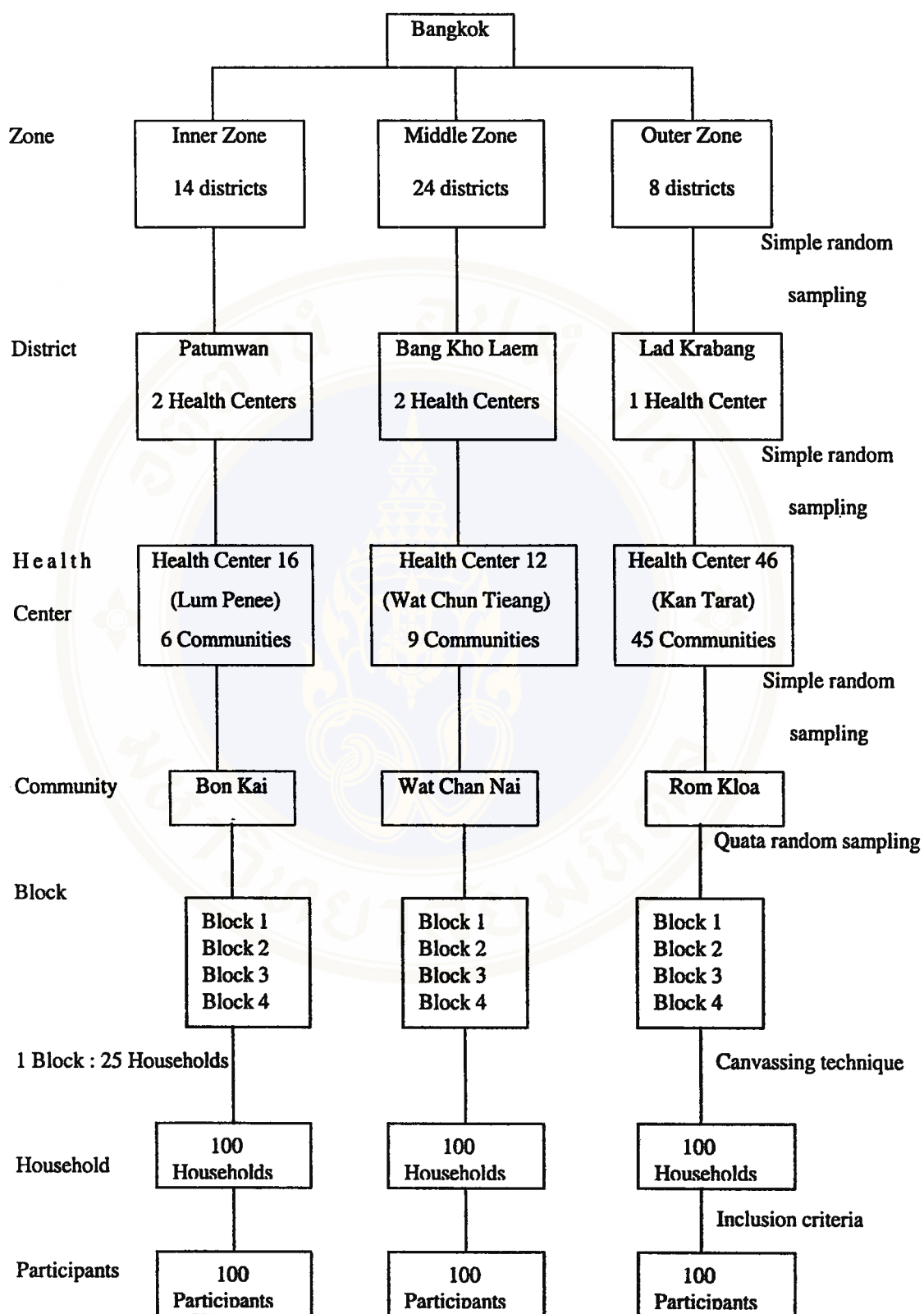


Figure 3 : Multi-Stage Random Sampling

Instrumentation

All of the interview questionnaires were originally developed in the English language; therefore, they were translated into the Thai language by the investigator. The translation was validated by the back-translation method (Burns & Grove, 1993: 385). The Thai version questionnaires were translated back into the English by a bilingual expert that had the ability to use both the Thai and English languages. Discrepancies between the two language versions were identified and the procedure was repeated until problems were resolved.

Six sets of instruments were used in this study including: 1) the Personal Data Form; 2) the Perceived Barriers to Exercise Questionnaire; 3) the Perceived Self-Efficacy for Exercise Questionnaire; 4) the Social Support for Exercise Questionnaire; 5) the Commitment to a Plan of Exercise Questionnaire (Pender, 1996); and 6) The Yale Physical Activity Survey (YPAS) (DiPietro, et al., 1993). Details of each instrument are presented below.

1. Chula Mental Test (CMT)

The Chula Mental Test for the Elderly was developed by Jitapunkul et al. (1996) to assess cognitive function of the elderly who had difficulties in reading and writing (See Appendix B). There were 13 items of listing cognitive function. The responses to the item were coded on a dichotomous scale of 0 (incorrect) and 1 (correct) in which item 5 and item 12 had two sub-scales, and item 3 and item 13 had three sub-scales. Then, the possible summation of all items to represent the cognitive

function was ranged from 0-19. The sum score represented cognitive function of the elderly. The interpretations of the categorical cognitive function were as follows:

Score 0-4 referred to severe cognitive impairment.

Score 5-9 referred to moderate cognitive impairment.

Score 10-14 referred to mild cognitive impairment.

Score 15-19 referred to normal cognitive function.

Validity

The content validity of the CMT was determined by the expert panel -- two neurologists, two psychiatrists, and two psychologists. The CMT was applied to 212 residents of the Home of the Elderly in Bangkok (Jitapunkul, et al., 1996). The results showed that concurrent validity was indicated by the strong correlation with both the Mini-Mental State Examination (MMSE) ($r = 0.78$) and the Abbreviated Mental Test (AMT) ($r = 0.78$). Criterion validity was demonstrated by the ability of the CMT to detect clinical diagnosed dementia with a sensitivity of 100 percent and a specificity of 90 percent.

Reliability

The result of the CMT reliability testing using test-retest kappa coefficient and an internal consistency coefficient (Cronbach's Alpha) were 0.65 and 0.81, respectively (Jitapunkul, et al., 1996: 718). In the present study, the reliability testing was calculated from the trial data of 30 elderly who resided in their home at Klong Toey community. The KR 20 reliability coefficient obtained was .84.



2. Personal Data Form

This form comprised of 9 items to collect data concerning sex, age, marital status, educational level, occupation, income, sources of income, family members, and chronic illness diagnosed by the physician of the sample (See Appendix C).

3. Social Support for Exercise Questionnaire

The Social Support for Exercise Questionnaire was modified from the Social Support for Exercise Questionnaire originally developed by Pender (1996). The original instrument was unidimensional scale of 12 items, of which 7 items were for support from family member -- spouse, sibling or cousin, and 5 items for support from friends and teachers (Pender 1996).

Since the original instrument was established to apply with the adolescent groups, the researcher revised the network component according to the elderly context by reducing some loss of social network along with the life cycle. Therefore, the modified Social Support for Exercise Questionnaire was comprised of emotional, tangible, and informational supports from the family members and friends.

Furthermore, the researcher expanded the original scale into a 13-item scale in order to evaluate the functional support from the two networks according to its suitable condition for the elderly (See Appendix D). This social support instrument measured the elderly's evaluation of frequency upon informational, emotional, and tangible assistant that they received from the family members and friends. The answer of each item was coded on a 4-point scale ranging from 0 = don't know, 1 = never, 2 = sometimes, to 3 = often. The modified questionnaire was designed to

collect the data on the two parts of leisure-time exercise and lifestyle exercise. Only the Social Support for Leisure-time Exercise Questionnaire with the 13-item of social support from the two networks was applied. The Social Support for Lifestyle Exercise Questionnaire was evaluated by the contained 12 items of social support. The item 21 and item 47 – *play games/sports with me* - were omitted due to its inability to measure the elderly's lifestyle exercise.

The possible range of sub-scale score – *emotional, tangible, and informational* of Social Support for Exercise Questionnaire was 0-30, 0-30, and 0-18, respectively for the Social Support for Leisure-time Exercise Questionnaire, whereas the sub-scale score of the Social Support for Lifestyle Exercise Questionnaire was 0-30, 0-24, and 0-18, respectively. Therefore, the possible total score of the Social Support for Leisure-time Exercise Questionnaire and the Social Support for lifestyle exercises Questionnaire ranged from 0 to 78, and 0 to 72, respectively.

As the score for each item ranged from 0 (never) to 3 (often), then the average social support for exercise score was classified into three categories as follows:

- 1) low score was between 0 to 1.66;
- 2) moderate score was between 1.67 to 2.33; and
- 3) high score was between 2.34 to 3.00

Validity

The final 13-item Social Support for Leisure-time Exercise Questionnaire and 12-item Social Support for Lifestyle Exercise Questionnaire was validated by 7 experts. The content validity indices of the Social Support for Leisure-time Exercise

Questionnaire and the Social Support for Lifestyle Exercise Social Support for Leisure-time Exercise Questionnaire were 1 and .92, respectively.

Reliability

The modified questionnaire was administrated to the 30 elderly in Klong Toey community for reliability testing. The Chronbach's Alpha Coefficient were .89 for the Social Support for Leisure-time Exercise Questionnaire and .83 for the Social Support for Lifestyle Exercise Questionnaire. For the sample of 300 elderly people, the Chronbach's Alpha coefficient yielded .90 for the Social Support for Leisure-time Exercise Questionnaire and .83 for the Social Support for Lifestyle Exercise Questionnaire.

4. Perceived Barriers to Exercise Questionnaire

The Perceived Barriers to Exercise Questionnaire was modified from the Perceived Barriers to Exercise Questionnaire developed by Pender (1996). The 10-item Perceived Barriers to Exercise Questionnaire was a unidimensional scale whose score ranged from 1 (not at all true) to 5 (very true). The possible total score was 10-50, with the greater score representing higher perceived barriers to exercise.

Pender's Perceived Barriers to Exercise Questionnaire was modified to make it proper to the Thai elderly context as follows:

1. The original items listed in the questionnaire were modified by changing some words such as – *I might not exercise if I had too much homework* was changed into – *I might not exercise if I had too much work*.

2. Based on literature review, new 8 items of perceived barriers were added. Of these 18 items, the questionnaire was designed to collect the data on two parts of the leisure-time and the lifestyle behaviors. To measure the barriers to leisure-time exercise behavior, all 18 items were used. However, to measure the barriers to lifestyle exercise behavior, item 12 – *I might not exercise if I had too many chores to do*, and item 15 – *If I had too much work* were excluded due to their inaccurate representation of the lifestyle of the elderly.

The Perceived Barriers to Exercise Questionnaire was composed of two sub-scales including 8 items of internal barriers and 10 items of external barriers. Then, the possible range of sub-scale score of the internal barriers to leisure-time exercise was 8-40 while that of the external barriers were 10-50. According to the omission of 2 items: one from the internal barrier sub-scale and another from the external barrier sub-scale, then the possible ranges of sub-scale score of both internal and external barriers to lifestyle exercise were 8-40 equally. Thus, the possible range of the total score of Perceived Barrier to Leisure-time Exercise Questionnaire was 18-90, whereas that of the Perceived Barriers to Lifestyle Exercise Questionnaire was 16-80 (See Appendix E).

As the score for each item ranged from 1 (not at all true) to 5 (very true), the average perceived barriers to exercise score was classified into three categories as follows:

- 1) low score was the score lined between 1.00 to 2.33;
- 2) moderate score was the score lined between 2.34 to 3.67; and
- 3) high score was the score lined between 3.68 to 5.00

Validity

Content validity of the final 18-item Perceived Barriers to Leisure-time Exercise Questionnaire and the 16-item Perceived Barriers to Lifestyle Exercise Questionnaire for the elderly was evaluated by 7 experts. The content validity indices of the Perceived Barriers to Leisure-time Exercise and the Lifestyle Exercise Questionnaires were 1 and .83, respectively.

Reliability

The revised questionnaire was administered to the 30 elderly in Klong Toey community for reliability testing. The Cronbach's Alpha Coefficient was .88 for the Perceived Barriers to Leisure-time Exercise Questionnaire and .91 for the Perceived Barriers to Lifestyle Exercise Questionnaire. For the sample of 300 elders, the Cronbach's Alpha Coefficient yielded .88 for the Perceived Barriers to Leisure-time Exercise Questionnaire and .92 for the Perceived Barriers to Lifestyle Exercise Questionnaire.

5. Perceived Self- efficacy for Exercise Questionnaire

Pender's Perceived Self-efficacy for Exercise Questionnaire (Pender, 1996), originally used to evaluate judgment of ability performing exercise behavior under variety of circumstances among the adolescent (Pender 1996), was modified to use with the Thai elderly. This so-called a unidimensional scale contained 8 items of a 5-point Likert scale ranged from 1 (not at all) to 5 (very true). The possible total score was 8-40.

The other 6 items concerning perception of internal and external conditions to exercise of the elderly were added to a modified Perceived Self-efficacy for Exercise Questionnaire. The 5-point Likert scale was provided for the response to each item. These 14 items were similarly used to assess both parts of leisure-time and lifestyle exercises. The Perceived Self-Efficacy for Exercise Questionnaire was comprised of two sub-scales including internal and external conditions. The possible ranges of sub-scale scores for either the internal conditions to leisure-time exercise or external conditions were 7-35. In the same rate, the possible ranges of sub-scale scores of the internal conditions to lifestyle exercise were 7-35 and the external conditions were 7-35. The possible total scores of the Perceived Self-efficacy for Leisure-time Exercise Questionnaire and the Lifestyle Exercise Questionnaire ranged from 14 to 70 (See Appendix F).

As the score for each item rated from 1 (not at all true) to 5 (very true), then the average perceived self-efficacy for exercise score was classified into three categories as follow:

- 1) low score was between 1.00 to 2.33;
- 2) moderate score was between 2.34 to 3.67; and
- 3) high score was between 3.68 to 5.00

Validity

Content validity of the final 14-item Perceived Self-efficacy for Leisure-time Exercise Questionnaire and the Lifestyle Exercise Questionnaire was evaluated by 7

experts. The content validity indices of both parts of Perceived Self-efficacy Questionnaire were 1 and .93, respectively.

Reliability

The revised questionnaire was administered to the 30 elderly in Klong Toey community for reliability testing. The Cronbach's Alpha Coefficient was .92 for the Perceived Self-efficacy for Leisure-time Exercise Questionnaire and .93 for the Perceived Self-efficacy for Lifestyle Exercise Questionnaire. For the sample of 300 elders, the Cronbach's Alpha Coefficient yielded .92 for the Perceived Self-efficacy for Leisure-time Exercise Questionnaire and .93 for the Perceived Self-efficacy for Lifestyle exercise Questionnaire.

6. Commitment to a Plan of Exercise Questionnaire

The Commitment to a Plan of Exercise Questionnaire was also developed by Pender (1996) to measure micro-behaviors that promoted the regular performance exercise behavior among adults. The questionnaire could be used to evaluate the commitment to a plan of any kinds of exercise. This unidimensional scale contained 11 items with a Likert scale ranging from 1 = never, 2 = sometimes, to 3 = often. Summarizing the responsive scores from all items yielded the possible total score ranged from 11 to 33.

In the present study, formulation of measurement sub-scales among the Commitment to a Plan of Exercises was based upon substantive theory and explanatory factor analysis. This measurement was composed of two sub-scales

including resolved and reminded aspects. The possible ranges of sub-scale score of resolved aspect was 6-18 while that of the reminded aspect was 5-15 when separately applied to both parts of leisure-time and lifestyle exercise. Then, the Thai version of the Commitment to a Plan of Leisure-time Exercise Questionnaire and the Commitment to a Plan of Lifestyle Exercise Questionnaire consisted of 11 items measured separately by a 3-point Likert scale (See Appendix G). The possible total score ranged from 11 to 33 in each kind of exercises.

As the score for each item ranged from 1 (never) to 3 (often), the average commitment to a plan of exercise score was classified into three categories as follows:

- 1) low score was between 1.00 to 1.66;
- 2) moderate score was between 1.67 to 2.33; and
- 3) high score was between 2.34 to 3.00

Validity

The final 11-items scales of the Commitment to a Plan of Leisure-time Exercise Questionnaire and the Commitment to a Plan of Lifestyle Exercise Questionnaire was validated by 7 experts. The content validity index of the Commitment to a Plan of Leisure-time Exercise Questionnaire and the Commitment to a Plan of Lifestyle Exercises Questionnaire were .73, and .64, respectively.

Reliability

The modified Commitment to a Plan of Exercise Questionnaires was administrated to 30 elderly in Klong Toey community for reliability testing. The

Chronbach's Alpha Coefficient were .88 for the Commitment to a Plan of Leisure-time Exercise Questionnaire and .78 for the Commitment to a Plan of Lifestyle Exercise Questionnaire. For the sample of 300 elders, the Chronbach's Alpha coefficient yields .92 for the Commitment to a Plan of Leisure-time Exercise Questionnaire and .80 for the Commitment to a Plan of Lifestyle Exercise Questionnaire.

7. Exercise Behavior Questionnaire

Yale Physical Activity Survey (YPAS) (DiPietro, et al., 1993), which was specifically developed to assess the range of the elderly's physical activities, was used to measure the exercise behavior of the elderly in this study. This YPAS instrument could appropriately evaluate both structured and unstructured exercise as it was observed that the elderly in the community performed three patterns of exercise: sedentary, leisure-time and lifestyle exercises. This instrument could be used to evaluate low to high intensity of the exercise, too.

The YPAS comprised of two sections:

1. Activity checklists, in which work, exercise, and recreational activities were assessed by the time spent in each activity during a typical week in the past month and expressed in hours per week. Time in each checklist activity was multiplied by the intensity code to be energy expenditure. The summation of the numbers of energy expenditure in each activity indicated an energy expenditure summary index that was expressed in kilocalories per week.

2. The second section comprising of seven questions was designed to assess recent current participation in various different types of specific activity. The

dimension of five activities included vigorous activity, leisurely walking, moving, standing, and sitting. All of them were believed to reflect leisure-time exercise and lifestyle exercise. Each question asked about the frequency and duration of activities in all dimensions and was measured by the 7-point rating scale. The frequency and duration scores were multiplied by a weighting factor, which was based on the relative intensity of the activity dimension. The assigned weights of vigorous activity, leisurely walking, moving, standing, and sitting were 5, 4, 3, 2, 1, respectively. The summation of these multiplication of weighted factor and rating score on each dimension created the total score. Then, the possible range of score was from 0 to 137. Only the second section of YPAS was used in this study (See Appendix H).

Validity

To test the criterion related validity, DiPietro et al. (1993: 630) administered the YPAS to 25 participants. The results showed that the YPAS activity dimension summary index was found to be significantly associated with VO_{2max} ($r = 0.58$, $p = 0.004$) and percentage of body fat ($r = -0.43$, $p = .03$). This revealed that the activity dimension summary index had adequate validity by correlating with physiologic variables reflecting habitual physical activity and may be useful to assess a certain dimension of physical activity with specific health indicator.

In this study, content validity of the 7 questions YPAS for the elderly was evaluated by 7 experts. The content validity index of the YPAS was 1.

Reliability

The YPAS was administered to the 76 participants who answered the YPAS twice with a 14-day interval between the first and the second administration (DiPietro, et al., 1993: 632). The test-retest correlation was used for reliability testing, which yielded .42 for the first administration and .65 for the second one.

Vannarit (1999) translated the physical activity dimension into the Thai language and validated it by using the back-translation method. The test-retest reliability of the Thai version YPAS yielded the Spearman-Brown correlation coefficient of .89.

In this study, reliability was determined by the 2-week, test-retest reliability. The Spearman-Brown correlation coefficient in the pilot study and the actual study were .87 and .89, respectively.

Data Collection

All structured interviews were used in data collection, which took place from June to October, 2000. The data collection was executed as follows:

1. The letter asking for the permission to collect the data from the Faculty of Nursing was sent to Bangkok Public Health. After the permission was granted, the researcher visited the Bangkok Public Health and the three centers selected as settings in this study (Health Center 12 Wat Chan Teang, Health Center 16 – Lum Pennee, and Health Center 46 – Kan Tarat) to introduce the project before commencing data collection.

2. The researcher identified the target sample according to the sampling procedure with the assistance of the nurses and elderly volunteers from each center.

3. Rapport between the researcher and each participant was established. The researcher introduced herself and clearly explained the research purpose and its benefits to the participants before asking for their consent to participate in this study. Those who agreed to participate in this study were asked to sign the form on protection of human subjects (See Appendix I). The following steps were followed in the data collection.

4. The five consecutive interviews using different instruments designed in this study were conducted by the researcher. The data collection was followed the order of each variable, which was recommended by Pender's HPM (1996). Therefore, the participants were asked to answer five sets of questionnaires in the following respective order: 1) the Social Support for Exercise Questionnaire; 2) the Perceived Barriers to Exercise Questionnaire; 3) the Perceived Self-efficacy for Exercise Questionnaire; 4) the Commitment to a Plan of Exercise Questionnaire; and 5) the Exercise Behavior Questionnaire. In addition, the participants were asked to think specifically about leisure-time exercise and lifestyle exercise while responding to each item of all predicting variables which reflected both exercises. During each of the interviews, the researcher tried to maintain the interaction link with the participants. The participants could ask the researcher anytime if they failed to understand certain questions or aspects asked in the instruments. An average time spent for each interview was about one and a half hour.

5. After the interview had finished, the researcher would check the data filled in each instrument for its completeness and correction before leaving the house of the participant.

6. Data from all instruments were then processed using the statistical method designed in this study.

Protection of Human Subjects

This study was reviewed by the Faculty of Nursing Review Committee and the Human Research Board of Health Department. In addition, approval for the investigator to contact the potential participants at the communities had been obtained from the Director of Bangkok Public Health. Potential participants were informed about the purpose of the study and their right to decline participation or to withdraw from the study at any time. Their names and addresses were not attached to the data. A code number was used on the questionnaires instead. There were no known risks of participation in this study. The only known inconvenience was the time (90 minutes) they spent completing the questionnaires. There was no cost to, nor was there any payment to, participants in the study.

Data Analysis

The preliminary data were analyzed by using the Statistical Package of the Social Science for Personal Computer (SPSS/PC) as follows:

1. The description of the sample was analyzed by descriptive statistics.

2. The assumption of the statistic procedure was determined by the central tendencies, inter-relationship, multi-colinearity among the variables.

3. Cronbach's Alpha Coefficient, test-retest, and KR 20 tested the reliability of the measurement

4. The construct of variable was performed by factor analysis.

5. The measurement model of variable was confirmed by factor analysis run by LISREL program.

6. The covariance matrix among variables of exercise models were computed by PRELIS program

Principal analyses were performed as follows:

1. Description of the variables and the correlation matrix of variables were initiated by using SPSS/PC.

2. The partial effects of independent variables on dependent variable were tested by regression analysis executed with the LISREL program.

3. The LISREL was used to test the causal model based on the covariance matrix among the variables.

CHAPTER IV

RESULTS

The results of this study are presented in three sections. The first section demonstrates the characteristics of the sample. The second section displays the independent variables affecting exercise behavior. The last section discusses the test of the proposed models and examines the fit of the data with the models. The results of the research hypothesis testing are also explained.

Sample Characteristics

A summary of the demographic characteristics is shown in Table 1 and descriptive statistics of selected demographic variables are presented in Table 2.

Table 1 Demographic Characteristics of the Sample (n = 300).

Demographic characteristics	n	Percent
Gender		
Male	120	40.00
Female	180	60.00
Age (Years)		
60-70	204	68.00
71-80	84	28.00
81-90	12	4.00
Income (Baht per Month)		
0 -2,000	128	42.70
2,001-4,000	87	29.00
4,001-6,000	32	10.60
6,001-8,000	22	7.40
8,001-10,000	12	4.00
10,001-20,000	14	4.60
over 20,001	5	1.70
Sources of Income*		
Offspring/Grandchild	265	74.65
Occupation	77	19.00
Pension/Trust Money	17	4.79
Spouse	10	2.82
Relatives	7	1.97
Foundation	1	0.28
Friend	1	0.28
Marital Status		
Married	144	48.00
Widowhood	116	38.70
Separated/Divorced	30	10.00
Single	10	3.30
Educational Level		
None	67	22.30
Primary school	179	59.70
Secondary school	45	15.00
Vocational	6	2.00
Bachelors	3	1.00
Living arrangement		
Alone	18	5.70
Spouse	27	9.30
Offspring and grandchild	135	45.00
Spouse, Offspring, and Grandchild	118	39.30
Friends	2	0.70

Table 1 Demographic Characteristics of the Sample (n = 300). (Continued)

Demographic characteristics	n	Percent
Family members		
1	18	5.70
2-3	89	29.70
4-5	108	36.00
Over 6	85	28.30
Number of Chronic Illness		
0	75	25.00
1	147	49.00
2	45	15.00
3	22	7.30
4	10	3.30
5	1	0.40
Chronic Illness**		
None	75	17.30
Hypertension	86	20.33
Low Back Pain	60	14.18
Diabetes Mellitus	60	14.18
Cardiovascular problems	30	7.09
Hyperlipidemia	25	5.91
Respiratory problems	19	4.49
Visual problems	17	4.02
Peptic Ulcer	13	3.08
Neuromuscular problems	13	3.08
Thyroid disease	5	1.18

Note * = One person could give more than one answers.

Note ** = One person could give more than one answer.

Table 2 Descriptive Statistic of the Sample's Characteristics (n = 300).

Characteristics	Min-Max	Mean	SD	Median	Skewness	Kurtosis
Age (Years)	60-87	68.01	6.04	67.00	0.81	0.98
Income (Baht per Month)	0-800,000	4,478.00	7,236.99	3,000.00	6.32	53.62
Number of Chronic Illness	0-5	1.16	1.01	1.00	1.08	1.13

The study participants consisted of 180 women (60%) and 120 men (40%). The age of the participants ranged from 60 (the minimum age set in the selection criteria) to 87 years, with the mean of 68.01(SD=6.04). The majority of the participants (68%) were in the 60 - to -70- year age group, and 28% were in the 71- to- 80- year age group. Four percent of the participants were over 81 years old.

Over 40% of the participants had a low annual income, ranging from 0 to 2500 baht per month. Two of them had high income ranging from 50,000 to 80,000 baht per month. The mean of income was 4,478 baht per month with the standard deviation of 7,236.99. Most of the participants (74.65%) received income from their offspring/grandchild, while 19% had income from their work.

Approximately 39% of the participants were widowed, and 48% were married. Almost 60% of the participants reported having four years of primary education, and 22.30 % had no education.

Forty-five percent of the participants lived with their offspring or grandchild, 39% lived with their spouses and offspring/grandchild (28.60%), and 5.70 % lived alone. Regarding family members, 36% of the participants reported having 4 to 5 persons in the family, 29.70% had 2 to 3 persons, and 28.30% had over 6 persons.

A majority of the participants (75%) reported at least one chronic illness, a quarter of them reported no chronic illness, 15% had two chronic illnesses, and 0.40% had five chronic illnesses. Hypertension (20.33%), low back pain (14.18%), diabetes mellitus (14.18%), cardiovascular problem (7.09%), and hyperlipidemia (5.91%) were reported as common health problems among the participants.

Characteristics of Exercise Behavior

A summary of the exercise characteristics including leisure-time exercise and lifestyle exercise is illustrated in Table 3 and Table 4.

Table 3 Leisure-time Exercise Characteristics of the Sample (n = 300).

Characteristics	n	Percent
Leisure-time exercise		
Not participate	177	59.00
Participate	123	41.00
Type of leisure-time exercise*		
<u>Light intensity</u>		
Stretching	68	22.70
Flexibility	47	15.70
Weight bearing	5	1.70
<u>Moderate intensity</u>		
Tai chi	21	7.00
Stationary bicycle (general)	3	0.90
Aerobic	7	2.30
Swimming	1	0.30
<u>Vigorous intensity</u>		
Jogging	21	7.00
Running	1	0.30
Exercise Companion*		
Alone	71	23.70
Friends	50	16.70
Family Members	3	0.90
Place of Exercise *		
Home	59	37.82
Public Park	39	25.00
Elderly Club	57	36.57
Private Club	1	0.61

Note * = One person could give more than one answer.

Regarding leisure-time exercise, 59% of the participants did not engage in this exercise. Most of them engaged in leisure-time exercise with light and moderate intensity. Stretching (22.70%), and flexibility (15.7%) were reported as common exercise with light intensity and Tai chi (7%), stationary bicycle (0.90%) were reported as common exercise with moderate intensity among the participants. Twenty-three percent reported exercising alone, and 16.70% reported doing exercise with friends. Only 9% engaged in exercise with family members. In addition, over 37% of the participants preferred exercising at home, 36.57% exercise at an elderly club, and 25 % at a public park.

Table 4 Lifestyle Exercise Characteristics of the Sample (n = 300).

Characteristics	n	Percent
Household Work		
No	55	11.70
Yes	265	88.30
Caretaking		
No	198	66.00
Yes	102	34.00
Recreation		
No	17	5.70
Yes	283	94.30
Yardwork		
No	132	44.00
Yes	168	56.00
Occupation		
No	223	74.30
Yes	77	25.70

Table 4 Lifestyle Exercise Characteristics of the Sample (n = 300) (continued).

Characteristics	n	Percent
Work related volunteer		
No	270	90.00
Yes	30	10.00
Leisure walking		
No	156	52.00
Yes	144	48.00
Stair climbing (Let 10 steps = 1 flight		
No	165	55.00
Yes	135	45.00
<u>Light intensity</u>		
Household Work*		
Light housework: tidying, dusting, sweeping; Collecting trash in home; ironing	222	74.00
Dish washing (10+ mins in duration)	190	63.30
Food preparation (10+ mins in duration)	159	53.00
Recreational activities*		
Watching TV and listening to radio	200	60.00
Sitting-talking with relatives and friends	132	44.00
Muslim religious activity	86	28.70
Reading, sewing, light wrapping	55	18.30
Dancing	7	2.30
Occupation		
Commerce (sitting-standing)	49	16.30
Employee (e.g., light assembly repair)	15	5.00
Driver	4	1.50
Volunteer activities		
Walking on job	25	8.30
Sitting-light office work	11	3.70
<u>Moderate intensity</u>		
Household work*		
Shopping	190	63.30
Laundry (hand washed laundry)	187	62.30
Heavy home repair (e.g. carpentry, painting)	11	3.70
Recreational activity		
Leisure walking (10 mins+ in duration)	144	48.00
Bicycling to daily activity	17	5.70
Brisk walking (10 mins+ in duration)	15	5.00

Table 4 Lifestyle Exercise Characteristics of the Sample (n = 300) (continued)

Characteristics	n	Percent
Yardwork		
Clearing walks/driveway (e.g., sweeping)	93	31.00
Gardening (e.g., planting, weeding, digging)	31	10.30
Occupation		
Carpentry	5	1.80
Caretaking		
Childcare (lifting, carrying)	86	28.70
Older or disabled person (lifting, pushing wheelchair)	16	5.30
<u>Vigorous intensity</u>		
Occupation		
Masonry, concrete	4	1.30
Others		
Stair climbing while carry load	37	12.30

Note* = One person could give more than one answer.

The participants engaged in various different types of lifestyle exercise including doing household chores, recreation, volunteer work, caregiving activities, occupation and yard work. Most of the participants performed lifestyle exercise with light and moderate intensity. Light housework (74%), dish washing (63.30%), and food preparation (53%) were reported as common activities with light intensity and shopping (63.30%), laundry (62.30%), leisure walking (48%), clearing walkway/driveway (31%), and childcare (28.70%) were reported as common activities with moderate intensity among the participants.

The Predictor Variables of Exercise Behavior

The predicting variables (social support for exercise, perceived barriers to exercise, perceived self-efficacy for exercise, and commitment to a plan of exercise) and exercise behavior are constructed based on descriptive statistics by summing all items in each variable. Descriptive statistics for all variables are shown in Table 5 and Table 6.

Table 5 Descriptive Statistic for Exercise Behavior and the Predicting Variables of the Sample (n = 300).

Variables	Possible Range	Actual Range	Mean	SD	Median	Skewness	Kurtosis
Dependent variable							
Exercise behavior							
Vigorous activity	0-60	0-60	7.24	14.76	0.00	2.16	3.92
Leisurely walking	0-48	0-48	11.01	12.74	8.00	1.03	0.40
Moving	0-15	3-15	6.43	2.09	6.00	1.36	4.40
Standing	0-10	1-8	3.48	1.29	4.00	0.44	0.03
Sitting	0-4	1-4	2.56	0.85	2.00	0.45	-0.73
Total	0-137	7-104	30.73	19.54	28.00	1.00	0.55
Independent variables							
Social support for exercise							
Leisure-time exercise							
Emotional	0-30	3-30	20.16	6.56	21.00	-0.54	-0.56
Tangibles	0-30	5-25	12.84	2.97	13.00	1.03	1.91
Information	0-18	3-18	10.75	3.67	11.00	0.23	-0.95
Total	0-78	11-73	43.74	11.48	44.00	-0.04	-0.50
Lifestyle exercise							
Emotional	0-30	3-30	18.57	5.22	19.00	-0.14	-0.56
Tangibles	0-24	4-19	11.20	2.35	11.00	0.30	0.50
Information	0-18	3-18	9.12	2.85	9.00	0.92	0.66
Total	0-72	10-66	38.88	8.37	39.00	0.16	0.44

Table 5 Descriptive Statistic for exercise behavior and the Predicting Variables of the Sample (n-300) (continued).

Variables	Possible Range	Actual Range	Mean	SD	Median	Skewness	Kurtosis
Perceived barriers to exercise							
Leisure-time exercise							
<u>Internal barriers</u>	8-40	8-40	19.32	9.07	18.00	0.41	-0.93
Health	5-25	5-25	11.18	5.51	10.00	0.72	-0.38
Psychological outlook	3-15	3-15	8.14	4.10	8.00	0.25	-1.38
<u>External barriers</u>	10-50	10-50	25.00	8.96	25.00	0.16	-0.54
Lack of time	5-25	5-25	13.41	5.64	13.00	0.01	-1.09
Facility	5-25	5-25	11.67	5.07	11.00	0.61	-0.13
Total	18-90	18-90	44.40	16.40	44.50	0.20	-0.69
Lifestyle exercise							
<u>Internal barriers</u>	8-40	8-40	16.33	9.15	14.50	1.04	0.26
Health	5-25	5-25	9.83	5.49	9.00	1.17	0.52
Psychological outlook	3-15	3-15	6.50	3.98	6.00	0.97	-0.34
<u>External barriers</u>	8-40	8-40	15.46	6.59	15.00	1.14	1.31
Lack of time	3-15	3-15	6.07	3.99	6.00	1.79	0.07
Facility	5-25	5-25	9.40	4.41	9.00	1.32	-2.06
Total	16-80	16-80	31.80	14.73	27.00	1.12	0.64
Perceived self-efficacy for exercise							
Leisure-time exercise							
<u>Internal conditions</u>	7-35	7-35	22.09	9.45	22.00	-0.04	-1.35
Psychological outlook	3-15	3-15	8.34	5.17	6.50	0.23	-1.71
Physical exertion	4-20	4-20	13.75	5.18	14.00	-0.40	-1.02
<u>External conditions</u>	7-35	7-35	23.52	7.83	25.00	-0.37	-0.83
Exercise milieu	4-20	4-20	12.88	5.10	13.00	-0.16	-1.14
Environment	3-15	3-15	10.64	3.56	11.00	-0.57	-0.56
Total	14-70	14-70	45.61	16.44	46.00	-0.19	-1.11
Lifestyle exercise							
<u>Internal conditions</u>	7-35	7-35	26.04	9.01	29.00	-0.65	-0.87
Psychological outlook	3-15	5-15	10.25	5.17	13.00	-0.44	-1.60
Physical exertion	4-20	4-20	15.79	4.59	17.00	-1.08	0.41
<u>External conditions</u>	7-35	7-35	28.30	7.26	30.00	-1.36	1.20
Exercise milieu	4-20	4-20	16.30	4.50	18.00	-1.30	0.76
Environment	3-15	3-15	12.00	3.37	13.00	-1.18	0.62
Total	14-70	14-70	54.35	15.27	59.00	-0.98	0.15

Table 5 Descriptive Statistic for Exercise Behavior and the Predicting Variables of the Sample (n = 300) (Continued)

Variables	Possible Range	Actual Range	Mean	SD	Median	Skewness	Kurtosis
Commitment to a plan of exercise							
Leisure-time exercise							
Resolve	6-18	6-18	10.71	4.86	9.00	0.31	-1.64
Remind	5-15	5-15	5.92	1.70	5.00	2.27	-0.42
Total	11-33	11-32	16.63	6.07	14.00	0.54	-1.13
Lifestyle exercise							
Resolve	6-18	6-16	9.76	2.62	9.00	0.18	-0.96
Remind	5-15	5-14	7.56	1.84	7.00	0.21	-0.45
Total	11-33	11-29	17.32	3.96	18.00	0.07	-0.72

Table 6 Level of the Predicting Variables of Exercise Behavior

Variables	Level		
	Low n (Percent)	Moderate n (Percent)	High n (Percent)
Social support for exercise			
Leisure-time exercise			
Emotional	81 (27.00)	109 (36.30)	110 (36.70)
Tangibles	273 (90.70)	25 (8.70)	2 (0.60)
Information	118 (39.30)	132 (44.00)	50 (16.70)
Total	139 (46.30)	140 (46.70)	21 (7.00)
Lifestyle exercise			
Emotional	112 (37.30)	133 (44.40)	55 (18.30)
Tangibles	255 (85.00)	44 (14.70)	1 (0.30)
Information	190 (63.30)	96 (32.00)	14 (4.70)
Total	192 (64.00)	100 (33.30)	8 (2.70)

Table 6 Level of the Predicting Variables of Exercise Behavior (continued)

Variables	Level		
	Low n (Percent)	Moderate n (Percent)	High n (Percent)
Perceived barriers to exercise			
Leisure-time exercise			
<u>Internal barriers</u>	151 (50.70)	62 (20.60)	87 (28.70)
Health	178 (50.30)	81 (27.00)	41 (13.70)
Psychological outlook	147 (49.00)	70 (23.30)	83 (27.70)
<u>External barriers</u>	62 (20.70)	70 (23.30)	168 (56.00)
Lack of time	109 (36.30)	128 (42.70)	63 (21.00)
Facility	155 (51.70)	118 (39.30)	27 (9.00)
Total	137 (46.00)	130 (43.00)	33 (11.00)
Lifestyle exercise			
<u>Internal barriers</u>	210 (70.00)	45 (15.00)	45 (15.00)
Health	218 (72.70)	51 (17.00)	31 (10.30)
Psychological outlook	212 (70.70)	39 (13.00)	49 (16.30)
<u>External barriers</u>	218 (72.70)	68 (22.60)	14 (4.70)
Lack of time	223 (74.30)	59 (19.70)	18 (6.00)
Facility	221 (73.70)	65 (21.60)	14 (4.70)
Total	213 (71.00)	63 (21.00)	24 (8.00)
Perceived self-efficacy for exercise			
Leisure-time exercise			
<u>Internal conditions</u>	59 (19.70)	51 (17.00)	190 (63.30)
Psychological outlook	157 (52.30)	29 (9.70)	114 (38.00)
Physical exertion	70 (23.30)	86 (28.70)	144 (48.00)
<u>External conditions</u>	22 (7.30)	39 (13.00)	239 (79.70)
Exercise milieu	90 (30.00)	80 (26.70)	130 (43.30)
Environment	56 (18.70)	108 (36.00)	136 (45.30)
Total	74 (24.70)	107 (35.60)	119 (39.70)
Lifestyle exercise			
<u>Internal conditions</u>	30 (10.00)	30 (10.00)	240 (80.30)
Psychological outlook	109 (36.30)	24 (8.00)	167 (55.70)
Physical exertion	32 (10.70)	64 (21.30)	204 (68.00)
<u>External conditions</u>	15 (5.00)	16 (5.30)	269 (89.70)
Exercise milieu	35 (11.70)	42 (14.00)	223 (74.30)
Environment	42 (14.00)	64 (21.30)	194 (64.70)
Total	32 (10.70)	82 (27.30)	186 (62.00)

Table 6 Level of the Predicting Variables of Exercise Behavior (continued)

Variables	Level		
	Low n (Percent)	Moderate n (Percent)	High n (Percent)
Commitment to a plan of exercise			
Leisure-time exercise			
Resolve	154 (51.30)	48 (16.00)	98 (32.70)
Remind	276 (92.00)	18 (6.00)	6 (2.00)
Total	180 (60.00)	101 (33.70)	19 (6.30)
Lifestyle exercise			
Resolve	87 (29.00)	131 (43.70)	82 (27.30)
Remind	295 (98.30)	5 (1.70)	0 (0.00)
Total	176 (58.70)	122 (40.60)	2 (0.70)

Exercise Behavior

A total scores of the exercise activity ranged from 7 to 104, with the mean of 30.73 and the standard deviation Of 19.54. This group of elderly people had low scores on the activity dimensions of vigorous activity (mean = 7.24, SD = 14.76), leisure walking (mean = 11.01, SD = 12.74), moving (mean = 6.43, SD = 2.09), and standing (mean = 3.48, SD = 1.29), but they had a moderate score on sitting (mean = 2.56, SD = 0.85). As the skewness values of exercise behavior score and its activity dimension were above 0.20, the results indicated that most participants had a low level of engagement in exercise.

Social Support for Exercise

Based on the data concerning leisure-time exercise, it was apparent that the participants reported a moderate and low level of social support ranging from 11 to 73, with a total mean score of 43.74 (SD = 11.48). As regards its sub-scales, the participants reported a high and moderate level of emotional support (mean = 20.16, SD = 6.56); however, they had a moderate and low level of tangible support (mean = 12.84, SD = 2.97). In addition, they had a moderate and low level of informational support (mean = 10.75, SD = 3.67).

Regarding social support for lifestyle exercise, the findings of the study revealed that the participants score was at a low level when it came to the total score of social support (mean = 38.88, SD = 8.37). The participants reported moderate level of emotional support (mean = 18.57, SD = 5.22), and a low level of tangible support (mean = 11.20, SD = 2.35) and informational support (mean = 9.12, SD = 2.85).

When comparing social support for leisure-time exercise with lifestyle exercise, the results showed that the participants scored higher on social support for leisure-time exercise than they did on social support for lifestyle exercise.

Perceived Barriers to Exercise

The results of perceived barriers to leisure-time exercise showed that the participants had a low level of total score on perceived barriers (mean = 44.40, SD = 16.40), and the sub-scale of internal barriers (mean = 19.32, SD = 9.07). However, they had a high level of external barriers (mean = 25.00, SD = 8.96). Furthermore, the participants had a low level of scores on three dimensions: health (mean = 11.18, SD

= 5.51), psychological outlook (mean = 8.14, SD = 4.10), and facility (10.62, SD = 4.58), whereas they had a moderate score on lack of time dimension (mean = 11.67, SD = 5.07).

As for the perceived barriers to lifestyle exercise, most of the participants reported a low total score on perceived barriers (mean 31.80, SD = 14.73), internal barriers sub-scale (mean = 16.33, SD = 9.15), and external barriers sub-scale (mean = 15.46, SD = 6.59). Moreover, the participants had a low level of score on all dimensions of both perceived barriers sub-scales: health (mean = 9.83, SD = 5.49), psychological outlook (mean = 6.50, SD = 3.98), lack of time (mean = 6.07, SD = 3.99), and facility (mean = 9.40, SD = 4.41).

The total score for the perceived barriers to lifestyle exercise were compared with the score from the perceived barriers to leisure-time exercise. The findings demonstrated that both of them were low score, but the score of the perceived barriers to leisure-time exercise was higher than that of the other one.

Perceived Self-efficacy for Exercise

Descriptive statistics for perceived self-efficacy for leisure-time exercise showed that the participants scored highly on both total score of this variable (mean = 45.61, SD = 16.44), and its sub-scales of internal conditions (mean = 22.09, SD = 9.45) and external conditions (mean = 23.52, SD = 7.83). With regard to the dimensions of internal and external sub-scales, the subjects reported a low score on the dimension of psychological outlook (mean = 8.34, SD = 5.17); nevertheless, they

had a high score on physical exertion (mean = 13.75, SD = 5.18), exercise milieu (mean = 12.88, SD = 5.10), and environment (mean = 10.64, SD = 3.56).

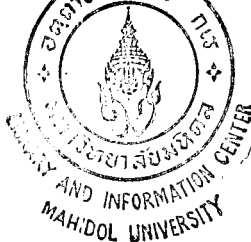
Regarding the perceived self-efficacy for lifestyle exercise, the participants had a high score on the total scores of the variable (mean = 54.35, SD = 15.27), and its sub-scales of internal (mean = 26.04, SD = 9.01), and external conditions (mean = 28.30, SD = 7.26). In addition, the participants scored highly on all dimensions of the sub-scales: psychological outlook (mean = 10.25, SD = 5.17), physical exertion (mean = 15.79, SD = 4.59), exercise milieu (mean = 16.30, SD = 4.50), and environment (mean = 12.00, SD = 3.37).

A comparison of both perceived self-efficacy for leisure-time exercise and lifestyle exercise showed that the scores for lifestyle exercise were higher than the other ones.

Commitment to a Plan of Exercise

The participants reported their commitment to a plan of leisure-time exercise at a low level, ranging from 11 to 32, with the mean of 16.63 (SD = 6.07). When considering its sub-scales, the participants scored low on resolved sub-scale (mean = 10.71, SD = 4.86), and reminded sub-scale (mean = 5.92, SD = 1.70).

The study revealed that the participants had a low score on the commitment to a plan of lifestyle exercise, ranging from 11 to 29, with the mean of 17.32 (SD = 3.96). Regarding sub-scales, it was found that the participants had a low score on resolved sub-scale (mean = 9.76, SD = 2.62), and reminded sub-scale (mean = 7.56, SD = 1.84). The results demonstrated that the scores for both leisure-time exercise and



lifestyle exercise were low when it came to the commitment to a plan of exercise.

However, the scores of leisure-time exercise was higher than that of the other one.

Factors Influencing Exercise Behavior

Using multiple regression with the Enter method, two sets of models: leisure-time behavior and lifestyle exercise behavior were regress on all predictors. All predictors were proposed as variables directly influencing exercise behavior. These four predictor variables included social support for exercise, perceived barriers to exercise, perceived self-efficacy for exercise, and commitment to a plan of exercise. Summaries of the results of regression analysis for leisure-time exercise and lifestyle exercise are illustrated in Table 7 and Table 8.

Table 7 Regression Analysis for Leisure-Time Exercise (n=300)

Independent Variables	b	SE	β	t-value	p
Constant	-0.15	1.92		-0.01	.994
Social Support	0.67	0.57	0.08	0.17	.243
Perceived Barriers	-0.38	0.37	-0.09	-1.05	.295
Perceived Self-Efficacy	0.94	0.28	0.29	3.41	.001
Commitment to a plan	2.16	0.60	0.31	3.60	.000
R	0.44				
R ²	0.19				
Adjusted R ²	0.18				
F	17.37				
df	4				
p	.000				

Regarding the leisure-time exercise model (as shown in Table 7), the model variables explained a modest 20% ($R^2 = 0.19$, $F = 17.37$, $p = 0.000$) of variance in exercise behavior. Perceived self-efficacy for leisure-time exercise and commitment to a plan of leisure-time exercise entered the equation at a significant level. However, social support for leisure-time exercise and perceived barriers to leisure-time exercise did not enter the initial regression equation at significant levels. The LISREL was then employed to explore possible indirect effects.

Table 8 Regression Analysis for Lifestyle Exercise (n=300)

Independent Variables	b	SE	β	t-value	p
Constant	0.38	1.85		0.21	.835
Social Support	1.45	0.67	0.13	2.16	.031
Perceived Barriers	- 0.31	0.33	-0.07	-0.95	.341
Perceived Self-Efficacy	0.31	0.29	0.09	1.05	.294
Commitment to a plan	1.79	0.75	0.17	2.40	.017
R	0.34				
R^2	0.12				
Adjusted R^2	0.10				
F	9.57				
df	4				
p	.000				

The R^2 of the regression in the lifestyle exercise (as shown in Table 8) model was 0.12 ($F = 9.57$, $p = .000$). The set of predicting variables accounted for 12% of the variability in exercise behavior among the elderly. Social support for lifestyle exercise and commitment to a plan of lifestyle exercise were found to be significant predictors ($p < .05$). However, perceived barriers to lifestyle exercise and perceived self-efficacy for lifestyle exercise did not enter the initial regression equation at

significant levels. The LISREL was subsequently done to explore possible indirect effects.

Preliminary Analysis: Assumption Testing

Testing the assumption underlying multivariate analysis for the structural equation model (SEM) must be met to reduce the potential distortion and bias and to facilitate an estimation process or the interpretation of the results. The three assumptions of the SEM that should be achieved are as follows: (1) normality; (2) the linearity of all relationships; and (3) multicollinearity. The results are as follows:

Normality

Normality was met by the data collection method and a random sampling technique. Univariate normality statistics, related to the indicator variables for the underlying latent constructs, are summarized in Table 5. Most of these variables in leisure-time exercise and lifestyle exercise revealed slight evidence of skewness and kurtosis. By using the PRELIS program (Joreskog & Sorbom, 1996b: 4), the tests of multivariate normality among leisure-time exercise and lifestyle exercise were significant ($\chi^2 = 445.16$, $p = .000$), and ($\chi^2 = 479.13$, $p = .000$), respectively. The results of the relation multivariate kurtosis among leisure-time exercise and lifestyle exercise model were 1.10 and 1.08, respectively.

Homoscedasticity is an assumption related to normal distribution, which exhibits equal variance across all data values. To test this assumption, the residuals from regression analysis must be plotted against the predicted values and against the

independent variables. For leisure-time exercise and lifestyle exercise, standardized predicted values are plotted against observed values, and the data displayed a straight line from the lower left corner to the upper right corner, so the model fit the data well. In general, the data were normally distributed.

The Linear of all Relationships Testing

Leisure-time Exercise Model

Correlation coefficients among predicting variables and leisure-time exercise as well as lifestyle exercise model are displayed in Table 9.

For leisure-time exercise scores, the results showed that correlation coefficients between all combination of variables were in low to high levels. The results demonstrated significant positive relationships between exercise behavior and social support for leisure-time for exercise ($r = .14, p = .01$), perceived self-efficacy for leisure-time exercise ($r = .38, p < .001$), and commitment to a plan of leisure-time exercise ($r = .38, p < .001$). However, perceived barriers to leisure time exercise was significantly and negatively correlated with exercise behavior ($r = -.30, p < .001$), while social support for leisure-time exercise was significantly and positively correlated with perceived self-efficacy for leisure-time exercise ($r = .31, p < .001$), commitment to a plan of leisure-time exercise ($r = .59, p < .001$), and was significantly and negatively correlated with perceived barriers to leisure-time exercise ($r = -.39, p < .001$). The results of the study demonstrated significant and negative relationships between perceived barriers to leisure-time exercise on the perceived self-efficacy for leisure-time exercise ($r = -.75, p < .001$), and commitment to a plan of leisure-time

exercise ($r = -.67, p < .001$). Perceived self-efficacy for leisure-time exercise was significantly and positively correlated with commitment to a plan of leisure-time exercise ($r = .63, p < .001$).

Lifestyle Exercise Model

As regards the correlation coefficients of lifestyle exercise model, the coefficients among all combination of variables were at low to moderately values. A statistically significantly negative correlation was found between exercise behavior and perceived barriers to lifestyle exercise ($r = -.21, p < .001$). Exercise behavior was significantly and positively correlated with social support for lifestyle exercise ($r = .23, p < .001$), perceived self-efficacy for lifestyle exercise ($r = .24, p < .001$), and commitment to a plan of lifestyle exercise ($r = .30, p < .001$). In addition, social support for life style exercise was significantly and positively correlated with perceived self-efficacy for lifestyle exercise ($r = .18, p < .01$), and commitment to a plan of lifestyle exercise ($r = .41, p < .001$). Social support for lifestyle exercise was significantly and negatively correlated with perceived barriers to lifestyle exercise ($r = -.18, p < .01$). Perceived barriers to lifestyle exercise was significantly and negatively associated with perceived self-efficacy for lifestyle exercise ($r = -.68, p < .001$), and commitment to a plan of lifestyle exercise ($r = -.37, p < .001$). Finally, there was a significant and positive correlation between perceived self-efficacy for lifestyle exercise and commitment to a plan of lifestyle exercise ($r = .531, p < .001$).

In general, both the leisure-time exercise model and the lifestyle exercise model showed evidence of a linear relationship

Table 9 Correlation Matrix of the Studied Variables of Leisure-time and Lifestyle Exercise (n=300).

Variables	SSF	BF	SEF	CF	SSIF	BIF	SEIF	CIF	TPA
SSF	1.000								
BF	-.389***	1.000							
SEF	.313***	-.751***	1.000						
CF	.588***	-.672***	.628***	1.000					
SSIF	.584***	-.194**	.167**	.332***	1.000				
BIF	-.034	.187**	-.231***	-.079	-.180**	1.000			
SEIF	.051	-.156**	.396***	.107	.181**	-.678***	1.000		
CIF	.133*	-.135*	.243***	.206***	.406***	-.374***	.531***	1.000	
TPA	.143**	-.298***	.376***	.377***	.227***	-.208***	.238***	.292***	1.000

** p < .05 *** p < .001

Note: SSF = Social support for leisure-time exercise, BF = Perceived barriers to leisure-time exercise,
SEF = Perceived self-efficacy for leisure-time exercise, CF = Commitment to a plan of leisure-time exercise,
SSIF = Social support for lifestyle exercise, BIF = Perceived barriers to lifestyle exercise,
SEIF = Perceived self-efficacy for lifestyle exercise, CIF = Commitment to a plan of lifestyle exercise,
TPA = Exercise behavior

Multicollinearity

Three indicators were used to assess multicollinearity: (1) Correlation coefficients between variables are above 0.85; (2) Tolerance values are less than 0.19 and large variance inflation factor (VIF) are more than 5.3; and (3) All condition indices are above a threshold value of 30, and identifying variables with variance proportion are .90 or above, if there are two or more coefficients, indicating the evidence of multicollinearity (Hair, et al., 1998: 220-222).

The results (as shown in Table 10 and Table 11) indicated no evidence of multicollinearity because of three reasons. First, for independent variables of the leisure- time exercise model and the lifestyle exercise model, the results demonstrated that the strength of correlation coefficients between all combinations of variables were from a very low (-.04) to moderate (-.75) levels (See Table 9). Second, all tolerance values were more than 0.19, so there were no VIF values higher than 5.3. Finally, all condition indexes were under the threshold values of 30 and all proportion of variance of coefficients were under 0.90.

Table 10 Testing for Multicollinearity in Multiple Regression of Leisure-time Exercise

Variable		Tolerance		Variance Inflation Factor (VIF)	
Social Support		0.65		1.55	
Perceived Barriers		0.38		2.66	
Perceived Self-Efficacy		0.39		2.55	
Commitment to a Plan		0.38		2.64	

Model Dimension	Eigenvalue	Condition			Variance Propotion			
		Index	Constant		SSF	BF	SEF	CF
1	4.65	1.00	0.00		0.00	0.00	0.00	0.00
2	0.26	4.21	0.00		0.00	0.11	0.03	0.03
3	0.05	9.44	0.01		0.29	0.01	0.42	0.10
4	0.07	13.06	0.00		0.61	0.06	0.08	0.84
5	0.00	23.67	0.99		0.10	0.83	0.46	0.03

Note: SSF= Social support for leisure-time exercise,
BF= Perceived barriers to leisure-time exercise,
SEF= Perceived Self-efficacy for leisure-time exercise,
CF= Commitment to a plan of leisure-time exercise.

Table 11 Testing for Multicollinearity in Multiple Regression of Lifestyle Exercise

Variable	Tolerance	Variance Inflation Factor (VIF)
Social Support	0.84	1.20
Perceived Barriers	0.53	1.88
Perceived Self-Efficacy	0.44	2.26
Commitment to a Plan	0.63	1.60

Model Dimension	Eigenvalue	Condition Index	Variance Propotion				
			Constant	SSIF	BIF	SEIF	CIF
1	4.70	1.00	0.00	0.00	0.00	0.00	0.00
2	0.23	4.54	0.00	0.00	0.29	0.03	0.01
3	0.04	11.46	0.00	0.65	0.09	0.29	0.00
4	0.02	14.24	0.03	0.15	0.00	0.16	0.99
5	0.01	21.80	0.96	0.19	0.62	0.52	0.00

Note: SSIF= Social support for lifestyle exercise,

BIF = Perceived barriers to lifestyle exercise,

SEIF= Perceived self-efficacy for lifestyle exercise,

CIF= Commitment to a plan of lifestyle exercise,

Preliminary Analysis Using LISREL: Establishing the Measurement Model

Before evaluating the full model, the assessment of the measurement models was a primary concern whether it was valid enough since it was critical that the measurement of each latent variable was psychometrically sound.

Formulation of measurement sub-scales among independent variables was based on the substantive theory and explanatory factor analysis. A schematic presentation of the full structural equation model is presented in Figure 2

Confirm factor analysis (CFA) was employed to verify that the theoretical constructs contained in the model were acceptably represented by observed variables.

CFA was computed by LISREL (Joreskog & Sorbom, 1996a). Measurement model evaluation was composed of two methods as follows: (1) overall fit; and (2) measurement model fit. In the first method, overall model fit indicated that the fit of the measurement model to the data, Chi-square (χ^2), the ratio of Chi-square and df, and Goodness-of-fit index (GFI). Adjusted goodness of fit index (AGFI) and Root mean square error of approximation (RMSEA) were means to judge overall fit.

Jorekog and Sorbom (1996a: 28) viewed Chi-square (χ^2) as both a goodness-of-fit and badness-of-fit, based on the notion that large Chi-square (χ^2) values correspond to bad fit and small Chi-square (χ^2) values to good fit. Low Chi-square (χ^2) values, which resulted in nonsignificant difference level .05, was recommended as the minimum acceptable value. However, the use of Chi-square (χ^2) was appropriated for the sample size of 100 to 200 with the significance test becoming less reliable with the sample size outside this range (Hair, et al., 1998: 654-655). A χ^2/df ratio was developed goodness-of-fit indices that took a more pragmatic approach to

the evaluation process (Pethazur, 1991: 651; Byrne, 1998: 111; Hair, et al., 1998: 623). The χ^2/df ratio should fall within the recommended level of 1.00 to 2.00 as a criterion of good fit. The GFI was based on properties of the observed and reproduced correlation (covariance matrix). It represented the over all degree of fit. The AGFI referred to an adjusted GFI for degree of freedom in the model. Both indices ranged from zero to 1.00, with values close to 1.00 indicating a good fit. RMSEA was the discrepancy, which was expressed per degree of freedom in terms of the population. Value ranging from .05 to .08 was deemed acceptable (Hair, et al., 1998: 656). The values less than .05 indicated a good fit, and values as high as .08 represented reasonable errors of approximation in the population (Byrne, 1998: 112).

The measurement model fit was the second method. In this method, each of the constructs could be evaluated separately. The first step was to examine the observed variable loading for statistic significance level of .05 related to their specific constructs, and verified the posited relationships among indicators and construct (Hair, et al., 1998: 623). The second was to examine the squared multiple correlation (R^2) of observed variable ranging from zero to 1.00. The squared multiple correlation (R^2) served as reliability indicators of the extent to which each adequately measured its respective underlying construct (Byrne, 1998: 104). The statistic overall fit and measurement model fit are presented in Table 12 and Table 13, respectively.

Table 12 Statistical Overall Fitted Index Values of Measurement Model (n=300).

Traits	Chi-square (χ^2)	df	p	GFI	AGFI	RMSEA
TPA	0.23	1	0.62	1.00	1.00	0.00
SSF	6.07	1	0.01	0.99	0.92	0.13
BF	1.55	1	0.21	1.00	0.97	0.04
SEF	0.33	2	0.85	1.00	1.00	0.00
CF	0.00	0	1.00	-	-	0.00
SSIF	1.38	1	0.24	1.00	0.98	0.04
BIF	3.27	1	0.07	0.99	0.95	0.09
SEIF	2.08	1	0.15	1.00	0.97	0.06
CIF	0.00	0	1.00	-	-	0.00

Note: GFI = Goodness of fit index, AGFI = Adjusted goodness of fit index,

RMSEA = Root mean square error of approximation

SSF= Social support for leisure-time exercise,

BF= Perceived barriers to leisure-time exercise,

SEF= Perceived self-efficacy for leisure-time exercise,

CF= Commitment to a plan of leisure-time exercise,

SSIF= Social support for lifestyle exercise,

BIF= Perceived barriers to lifestyle exercise,

SEIF= Perceived self-efficacy for lifestyle exercise,

CIF= Commitment to a plan of lifestyle exercise,

TPA = Exercise behavior

Table 13 First-Order Measurement Model of Studied Variables

Indicator (Parameter)	Leisure-time Exercise					Lifestyle Exercise				
	Loading	(t-value)	S.E.	Factor Score	R ²	Loading	(t-value)	S.E.	Factor Score	R ²
<u>Perceived Barriers</u>										
<u>Internal Barriers</u>										
Health	1.00	(13.89)	0.07	0.44	0.76	1.01	(16.02)	0.06	0.22	0.69
Psychological Outlook	0.96	(13.13)	0.07	-0.01	0.60	0.84	(15.60)	0.05	0.23	0.67
<u>External Barriers</u>										
Lack of time	1.05	14.92)	0.07	0.55	0.85	0.80	(15.51)	0.05	0.30	0.64
Facility	0.48	(8.18)	0.06	-0.01	0.23	0.69	(15.11)	0.05	0.31	0.61
<u>Perceived Self-efficacy</u>										
<u>Internal Conditions</u>										
Psychological Outlook	1.29	(14.66)	0.09	0.09	0.56	1.28	(14.42)	0.09	0.07	0.55
Physical Exertion	1.16	(19.07)	0.06	0.34	0.80	1.09	(20.14)	0.05	0.60	0.90
<u>External Conditions</u>										
Exercise Milieu	1.10	(18.08)	0.06	0.26	0.75	0.92	(16.21)	0.06	0.14	0.66
Environment	0.86	(13.96)	0.06	0.12	0.52	0.79	(13.28)	0.06	0.06	0.50
<u>Social Support</u>										
Emotional	1.06	(16.29)	0.06	0.32	0.66	0.55	(8.83)	0.06	0.14	0.28
Tangible	0.44	(13.43)	0.03	0.46	0.54	0.35	(10.40)	0.03	0.32	0.36
Information	0.98	(15.65)	0.06	0.30	0.63	0.82	(18.03)	0.05	0.74	0.75
<u>Commitment to a plan</u>										
Resolve	0.71	(21.70)	0.03	1.18	0.89	0.52	(20.52)	0.03	1.58	0.85
Remind	0.18	(10.76)	0.02	0.30	0.60	0.09	(6.07)	0.01	0.26	0.13
<u>Exercise Behavior</u>										
Vigorous Activity	0.43	(6.81)	0.06	0.07	0.19					
Leisurely Walking	0.05	(0.77)	0.06	0.01	0.00					
Moving	0.91	(11.41)	0.08	0.78	0.84					
Standing	0.66	(3.36)	0.07	0.16	0.43					
Sitting	-0.22	(-3.51)	0.06	-0.02	0.05					

The results of CFA demonstrated that there were six measurement models indicating overall good fit as follows: exercise behavior, perceived barriers to leisure-time exercise, perceived self-efficacy for leisure-time exercise, social support for lifestyle exercise, and perceived self-efficacy for lifestyle exercise. All of them had low chi-square values resulting in nonsignificant difference level of .05. The χ^2 /df ratio fell within the recommended level of 2 to 3, with both GFI and AGFI values closing to 1.00 or equal to 1.00, and RMSEA values ranged from 0.00 to 0.08, indicating validity of measurement constructs. Based on GFI and AGFI, social support for leisure-time exercise and perceived barriers to lifestyle exercise were in an acceptable level of overall fit. However, measurement models of commitment to a plan of leisure-time exercise and lifestyle exercise had quite poor overall fit because chi-square and degree of freedom values were equal to zero.

Table 13 illustrates the loading with t-values and squared multiple correlation among each observed variables for exercise behavior measurement, leisure time exercise and life style exercise measurements. Based on an accepted level of .05, t-test statistic needed to be $> +1.96$ or -1.96 before the hypothesis could be rejected. The results revealed that all sub-scales of perceived barriers, perceived self-efficacy, social support, and commitment to exercise, especially both leisure-time exercise and lifestyle exercise models, had low to high parameter estimates with significance, which were related to their specific constructs and validated the relationships among observed variables and their latent variables. As for the measurement of exercise behavior, most of the dimensions had low to moderate parameters with statistical significance of parameter estimates. However, the leisure walking dimension had

non-significant loading ($t = 0.77$). This result indicated that the leisure walking dimension should be considered unimportant to the measurement model of exercise behavior.

Table 13 illustrates squared multiple correlation (R^2) for each observed variable of the latent variables, ranging from low scores (0.00) to high scores (.90). Examination of the R^2 of perceived barriers to leisure-time exercise's sub-scales revealed low (0.23) to high (0.85) strength of linear relationships. The R^2 of perceived barriers to lifestyle exercise was a moderately (0.61 to 0.69) strong indicators. The R^2 of perceived self-efficacy for leisure-time exercise's sub-scales showed moderately (0.52) to highly (0.80) strong indicators, and the R^2 of perceived self-efficacy for lifestyle exercise's sub-scales had moderately (0.50) to highly (0.90) strong indicators. The R^2 of social support for leisure-time exercise sub-scales showed low (0.30 to 0.46) strong indicators and the R^2 of social support for lifestyle exercise's sub-scales had lowly (0.28) to moderately (0.75) strong indicators. The R^2 of commitment to a plan of leisure-time exercise sub-scales showed moderately (0.60) to highly (0.89) strong indicators and the R^2 of commitment to a plan of lifestyle exercise's sub-scales had lowly (0.13) to highly (0.85) strong indicators. Finally, for exercise behavior, the results revealed that no R^2 value was found in the leisure walking dimension, low R^2 value (0.05) was found in the sitting dimension, and R^2 values of moving was the highly strongest indicator.

Principal Analysis: Testing the Hypothesized Model of Causal Structure

The researcher used the LISREL program to analyze the structural and measurement model in both the hypothesized leisure-time exercise and lifestyle exercise behavior models. In order to interpret all parameters, unit of measurements of the latent variables must also be defined. An indicator of measurement for a latent variable was determined to be fixed as non-zero coefficients or 1 in the relationship for one of its observed indicator. This assignment which used the indicator variable as reference variables should be the one that measures the underlying factor best (Joreskog & Sorbom, 1993: 173). The results of the hypothesized model of leisure-time exercise and lifestyle exercise are illustrated as follows.

Table 14 Path Coefficients, Standard Error, T-Values of Parameter Estimates of Leisure-time Exercise Model (N=300)

Path	Path Coefficients	Standard Errors	T-Values
LAMBDA-Y			
CF→ Resolve	1.00	-	-
CF→ Remind	0.25	0.02	10.59***
TPA→ Vigorous	4.14	0.84	4.92***
TPA→ Leisure walking	0.65	0.62	1.04
TPA→ Moving	1.00	-	-
TPA→ Standing	0.51	0.09	5.59***
TPA→ Sitting	-0.16	0.04	-3.69**
LAMBDA-X			
SSF→ Emotion	1.00	-	-
SSF→ Tangible	0.45	0.04	12.50***
SSF→ Information	0.99	0.08	13.12***
BF→ Health	1.12	0.07	17.07***
BF→ Psychological outlook	0.95	0.06	15.19***
BF→ Lack of time	1.00	-	-
BF→ Facility	0.51	0.06	8.24***
SEF→ Psychological outlook	1.00	-	-
SEF→ Physical exertion	0.87	0.06	15.71***
SEF→ Exercise milieu	0.87	0.05	16.10***
SEF→ Environment	0.65	0.05	12.50***
BETA			
CF→ TPA	0.31	0.45	0.69
GAMMA			
SSF→ CF	0.50	0.07	6.90***
BF→ CF	-0.35	0.08	-4.62***
SEF→ CF	0.31	0.05	2.59**
SSF→ TPA	0.18	0.37	1.17
BF→ TPA	-0.23	0.35	-1.48
SEF→ TPA	0.67	0.21	3.21**

Note: $t > |1.96|$, * $p < .05$; $t > |2.58|$,** $p < .01$; $t > |4.00|$, *** $p < .001$;

Note: SSF= Social support for leisure-time exercise,
BF= Perceived barriers to leisure-time exercise,
SEF= Perceived self-Efficacy for leisure-time exercise,
CF= Commitment to a plan of leisure-time exercise,
TPA = Exercise behavior

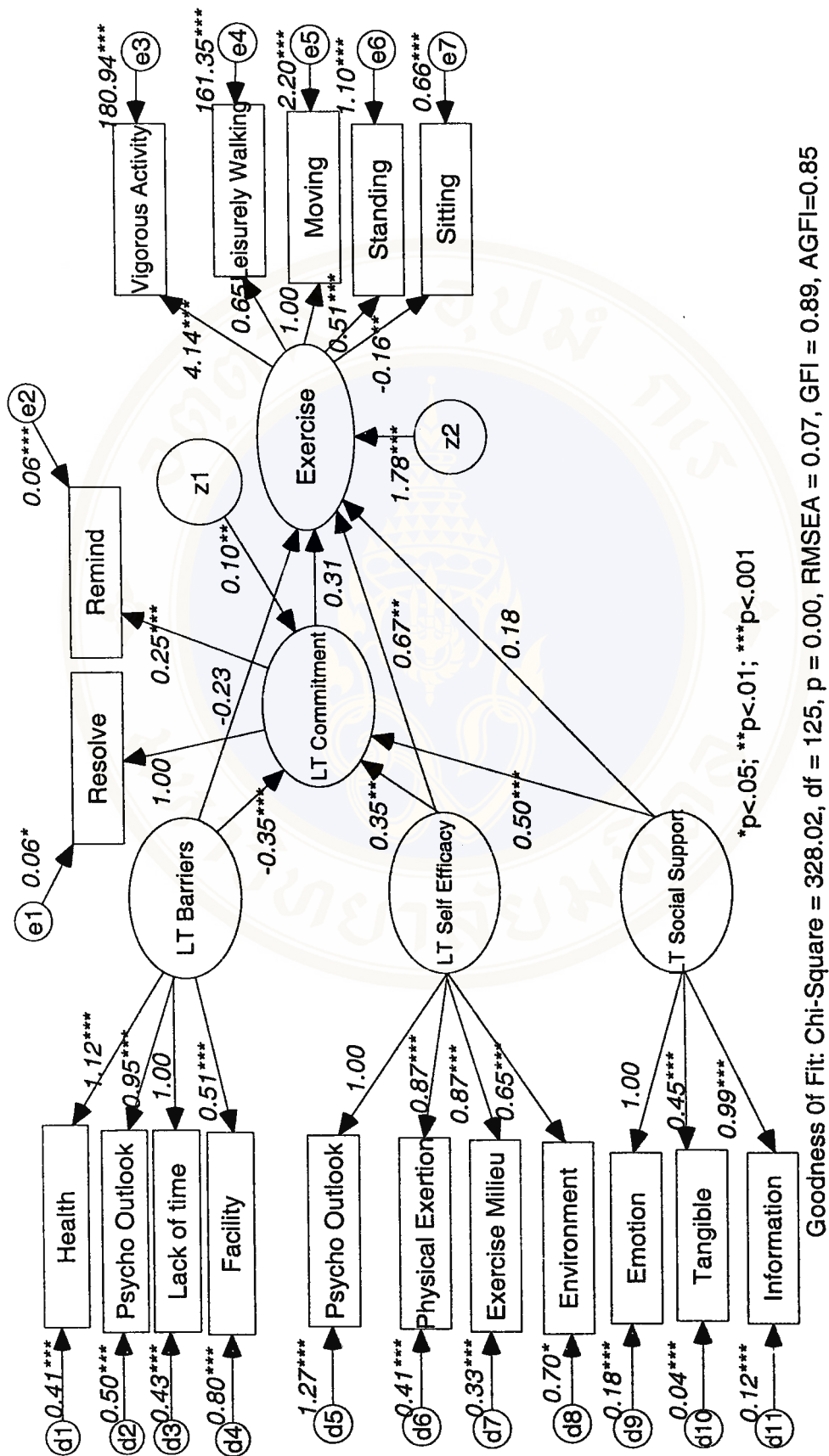


Figure 4: A Hypothesized Model of Leisure-time Exercise Behavior

Evaluation of Hypothesized Model of Leisure-time Exercise Behavior

The three processes of model evaluation and assessment of fit were focused on the adequacy of: (1) parameter estimates; (2) measures of overall fit of the model; and residuals, standardized residual, and the modification indices.

When examining parameter estimates in the hypothesized model of leisure-time exercise behavior, most of them were significant parameters and their directions were in accord with the theoretical model. However, there was evidence of a misspecified parameter among observed variables for exercise behavior. Sitting activity indicated that opposite sign and leisure walking was considered nonsignificant parameter (See Table 14). Corresponding to the path coefficients, three paths were nonsignificant -- the path from commitment to a plan of leisure-time exercise to exercise behavior ($\beta = 0.31, p > .05$), the path from social support for leisure-time exercise to exercise behavior ($\beta = 0.18, p > .05$), and the path from perceived barriers to leisure-time exercise to exercise behavior ($\beta = -0.23, p > .05$).

When examining the squared multiple correlation (R^2) for each observed variable, the findings revealed that most of the R^2 indicated to be quite well and to serve as measure of the latent variable. However, the R^2 for leisure walking (0.01) and sitting activity (0.08) were indicated as poor observed variables. Both of them had weakness of linear relationship to their latent variables. This model accounted for and explained variance on commitment to a plan of exercise of 80 percent ($R^2 = 0.80$), and exercise behavior of 18% ($R^2 = 0.18$), indicating weakness of several linear relationships for structural equation fit for the leisure-time exercise model.

The second method examined the measures of overall fit of the model, a poor fit of the data was indicated. There was large nonsignificant chi-square ($\chi^2 = 328.02$, $p = .000$) relative to degree of freedom ($df = 125$). The goodness of fit index (0.89) and adjusted goodness of fit index (0.85) were not in the accepted range. However, RMSEA (0.07) and χ^2/df (1.80) revealed that data were fit to the model (Table 15).

Finally, specification search was employed to identify any areas of misfit in the model. In fact, this procedure suggested the way to modify the model to fit the data, and to indicate parameters that had real significance and substantive meanings. In this regard, LISREL yielded two types of information bearing on model misspecification-- the standardized residuals and the modification indices. There was evidence of misspecification parameters, particularly large negative and positive standardized residual (-0.58, 5.08 respectively) indicating that covariance was not well explained by the model. In principal, value of the standardized residual, which was above 2.58, are considered to be large (Pethazur, 1991: 655).

Therefore, the original model should be modified by freeing some parameters (Schemacker & Lomax, 1996: 107). Modification indices were used in the process of the model evaluation and modification. It provided indications of misspecification only in terms of correlated measurement errors. The results showed that the largest modification index (39.00) was associated with a correlated error or to be freely in the Theta Epsilon matrix which represented the expected drop in over all chi-square value. In conclusion, the original leisure-time exercise model did not fit the sample data, as reflected by the poor goodness of fit coefficients and the misspecified parameters.

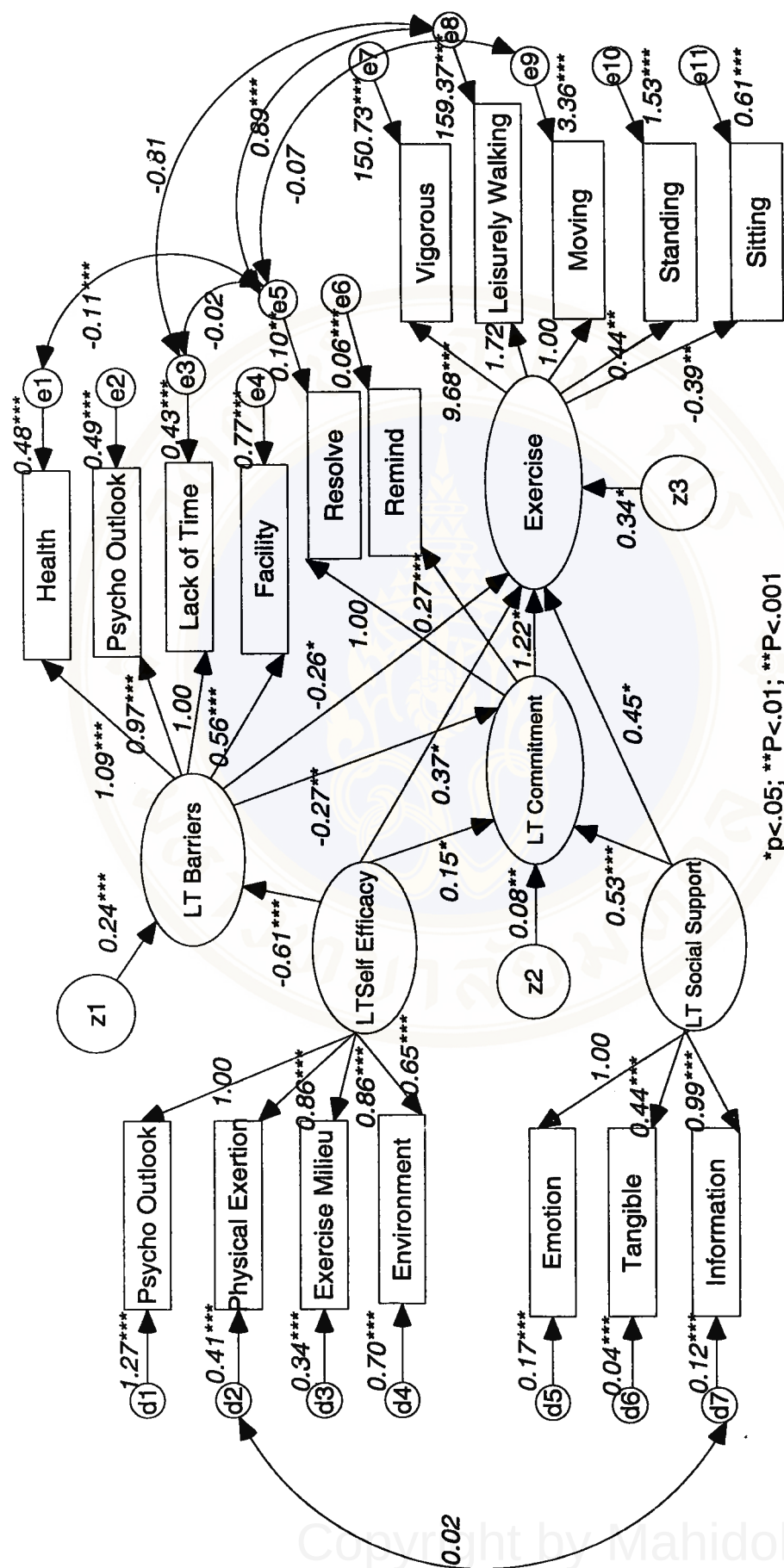


Figure 5: A Modified Model of Leisure-time Exercise Behavior

Table 15 Total, Indirect, and Direct Effects of Causal Variables on Affected Variables of Hypothesized Model of Leisure-time Exercise (n=300)

Affected Variables Causal Variables	CF			TPA		
	TE	IE	DE	TE	IE	DE
Chi-Square(χ^2) = 328.02, df=125, p=0.00, GFI=0.89, AGFI=0.85, RMSEA=0.07						
SSF	0.50***	-	0.50***	0.53	0.36	0.18
BF	-0.35***	-	-0.35***	-0.63	-0.40	-0.23
SEF	0.13***	-	0.13***	0.70**	0.04	0.66**
CF	-	-	-	0.31	-	0.31
Structural equation fit	R ² = 0.80			R ² = 0.18		

Table 16 Total, Indirect, and Direct Effects of Causal Variables on Affected Variables of Modified of Leisure-time Exercise (n=300).

Affected Variables Causal Variables	BF			CF			TPA		
	TE	IE	DE	TE	IE	DE	TE	IE	DE
Chi-Square(χ^2) = 206.50, df=112, p=0.00, GFI=0.93, AGFI=0.90, RMSEA=0.05									
SSF	-	-	-	0.53***	-	0.53***	0.97*	0.52*	0.45*
BF	-	-	-	-0.27**	-	-0.27**	-0.86	-0.60*	-0.26*
SEF	-0.61***	-	-0.61***	0.32***	0.17*	0.15*	0.39*	0.03	0.36*
CF	-	-	-	-	-	-	1.22*	-	1.22*
Structural equation fit	R ² = 0.72			R ² = 0.81			R ² = 0.52		

* p < .05; ** p < .01; ***p < .001

Note: GFI = Goodness of fit index, AGFI= Adjusted goodness of fit index

RMSEA = Root mean square error of approximation,

TE = Total effect, IE = Indirect effect, DE = Direct effect,

SSF= Social support for leisure-time exercise,

BF= Perceived barriers to leisure-time exercise,

SEF= Perceived self-efficacy for leisure-time exercise,

CF= Commitment to a plan of leisure-time exercise, TPA = Exercise behavior

Model Modification

The next step was modification of the model, which was composed of two methods: (1) adding paths or parameters with a large modification index which can be interpreted substantively; and (2) eliminating parameters with small t-value or nonsignificant path from the model. The steps of modification of the leisure-time exercise model are presented as follows.

The researcher added parameters according to standardized residuals and the modification indices, associating them with a correlated error in the model. In this step, epsilon and delta should be correlated between sets of latent variable but not within sets (Joreskog & Sorbom, 1996a: 217). Moreover, the researcher added the path from perceived self-efficacy for leisure-time exercise to perceived barriers to leisure-time exercise because Pender (1996: 70) has stated that perceived self-efficacy influences perceived barriers. When dropping in chi-square (206.50), degree of freedom (112), RMSEA (0.05), and increasing in GFI (0.93) and AGFI (0.90), the modified model was improved to fit the data.

Corresponding to the path coefficients for the modification of the leisure-time exercise model, the path were more statistically significant than the original one, including the path from perceived barrier to leisure-time exercise to commitment to a plan of leisure-time exercise ($\beta = -0.27, p < .05$), the path from perceived barriers to leisure-time exercise to exercise behavior ($\beta = -0.26, p < .05$), the path from commitment to a plan of leisure-time exercise to exercise behavior ($\beta = 1.22, p < .05$), the path from perceived self-efficacy for leisure-time exercise to perceived barriers to leisure-time exercise ($\beta = -0.61, p < .05$), the path from social support for leisure-time

exercise to commitment to a plan of leisure-time exercise ($\beta = 0.53, p < .05$), the path from social support for leisure-time exercise to exercise behavior ($\beta = 0.45, p < .05$), and the path from perceived self-efficacy for leisure-time exercise to commitment to a plan of leisure-time exercise ($\beta = 0.15, p < .05$) (See Table 16).

The structural equation fit (R^2) of the modified model was also increased from the hypothesized model as revealed in Table 16. The modified model accounted for explained variance on perceived barriers to exercise 72% ($R^2 = 0.72$), commitment to a plan of exercise 81% ($R^2 = 0.81$), and exercise behavior 52% ($R^2 = 0.52$).

In conclusion, a comparison between the hypothesized and the modified models indicated that the modified model had better fit to empirical data than the hypothesized model. The schematic presentation of the modified structural equation model of leisure-time exercise behavior is presented in Figure 5.

The results of testing the hypothesized model of lifestyle exercise behavior is presented in Table 17, Table 18 and Figure 6.

Table 17 Path Coefficients, Standard Error, T-Values of Parameter Estimates of Lifestyle Exercise Model (N=300)

Path	Path Coefficients	Standard Errors	T-Values
LAMBDA-Y			
CIF→ Resolve	1.00	-	-
CIF→ Remind	0.32	0.04	7.20***
TPA→Vigorous	4.01	0.78	5.17***
TPA→Leisurely walking	0.47	0.60	0.79
TPA→Moving	1.00	-	-
TPA→Standing	0.53	0.08	6.56***
TPA→Sitting	-0.14	0.04	-3.27**
LAMBDA-X			
SSIF→Emotion	0.86	0.11	7.86***
SSIF→Tangible	0.54	0.07	8.30***
SSIF→Information	1.00	-	-
BIF→ Psychological outlook	0.82	0.04	21.35***
BIF→ Health	1.00	-	-
BIF→Lack of Time	0.69	0.04	16.32***
BIF→Facility	0.59	0.04	15.61***
SEIF→Psychological outlook	1.00	-	-
SEIF→Physical exertion	0.80	0.05	15.72***
SEIF→Exercise milieu	0.75	0.05	15.13***
SEIF→Environment	0.67	0.05	13.32***
BETA			
CIF→ TPA	2.40	2.39	1.01
GAMMA			
SSIF→CIF	0.58	0.10	6.08***
BIF→CIF	-0.04	0.04	-0.93
SEIF→CIF	0.21	0.04	5.70***
SSIF→TPA	0.60	1.47	0.41
BIF→TPA	-0.30	0.21	-1.47
SEIF→TPA	0.15	0.54	0.28

Note: $t > |1.96|$, * $p < .05$; $t > |2.58|$, ** $p < .01$; $t > |4.00|$, *** $p < .001$

Note: SSIF= Social support for lifestyle exercise,

BIF= Perceived barriers to lifestyle exercise,

SEIF= Perceived self-efficacy for lifestyle exercise,

CIF= Commitment to a plan of lifestyle exercise, TPA = Exercise behavior

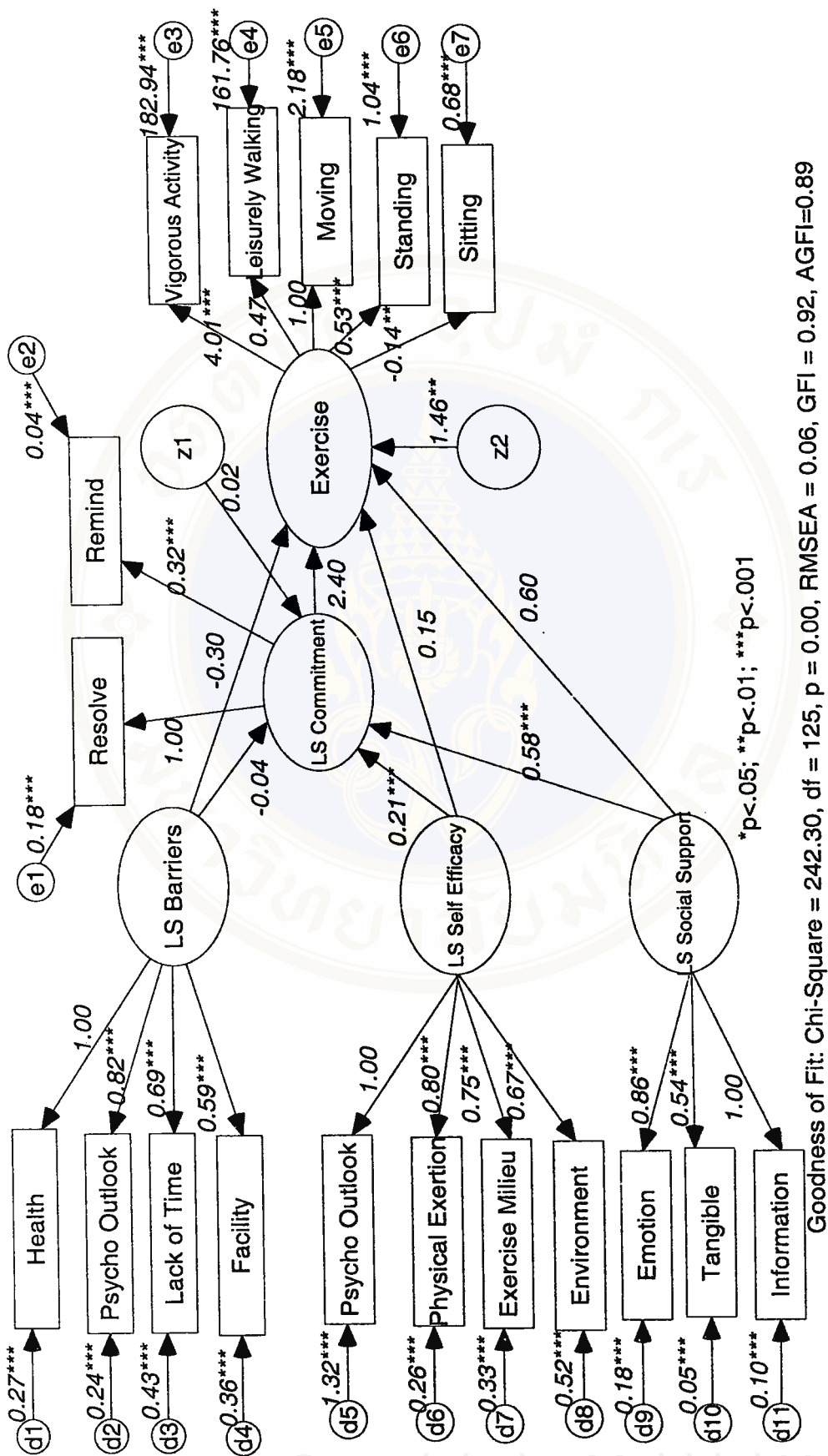


Figure 6: A Hypothesized Model of Lifestyle Exercise Behavior

Evaluation of the Hypothesized Model of Lifestyle Exercise Behavior

When testing the hypothesized model of lifestyle exercise behavior, the results revealed that parameter estimates of observed variables were similar to the leisure-time exercise model. Most of the measurements of the model parameters were significantly different and showed the right signs according to the theory. There was evidence of misspecified parameters among the observed variables for exercise behavior. Sitting activity was an opposite sign and leisure walking was a nonsignificant parameter. According to the path coefficients, there were no significance in five paths, including the path from commitment to a plan of lifestyle exercise to exercise behavior ($\beta = 2.40, p > .05$), the path from social support for lifestyle exercise to exercise behavior ($\beta = 0.60, p > .05$), the path from perceived barriers to lifestyle exercise to commitment to a plan of lifestyle exercise ($\beta = -0.04, p > .05$), and to exercise behavior ($\beta = -0.30, p > .05$), and the path from perceived self-efficacy for lifestyle exercise to exercise behavior ($\beta = 0.15, p > .05$) (See Table 17 and Table 18).

It was found that most of the observed variables were good predictors or indicators and could be served as strong measure of the latent variable. However, the squared multiple correlation (R^2) for leisure walking (0.00) and sitting activity (0.06) indicated poor indicators for exercise behavior. This model accounted for and explained variance on commitment to a plan of exercise for 83 % ($R^2 = 0.83$), and exercise behavior for 33% ($R^2 = 0.33$), indicating slight several linear relationships for structural equation fit for the lifestyle exercise model.

This study found that the original lifestyle exercise model had a very good fit because most of the overall fit indexes were accepted. There were medium nonsignificant chi-square ($\chi^2 = 242.30$, $p = .000$) relative to degree of freedom ($df = 125$). The χ^2/df ratio (1.94) met the criteria value. Finally, GFI (0.92), AGFI (0.89), and RMSEA (0.06) were achievement to be accepted (See Table 18).

However, there were some indicators of model misspecification. There was evidence of misspecification parameters, particularly large negative standardized (-4.91) and positive standardized residual (4.33). This meant the estimation of the hypothesized model should be modified by freeing some parameters.

The results of modification indices revealed that the maximum modification index was 22.37 for element of THETA-DELTA, which was determined to set a correlated error or to be free in the Theta Epsilon matrix. This procedure affected the reduction of overall chi-square value. In conclusion, the original lifestyle exercise model presented a good model. In the next step, the researcher modified the model to become the best-fitted model.

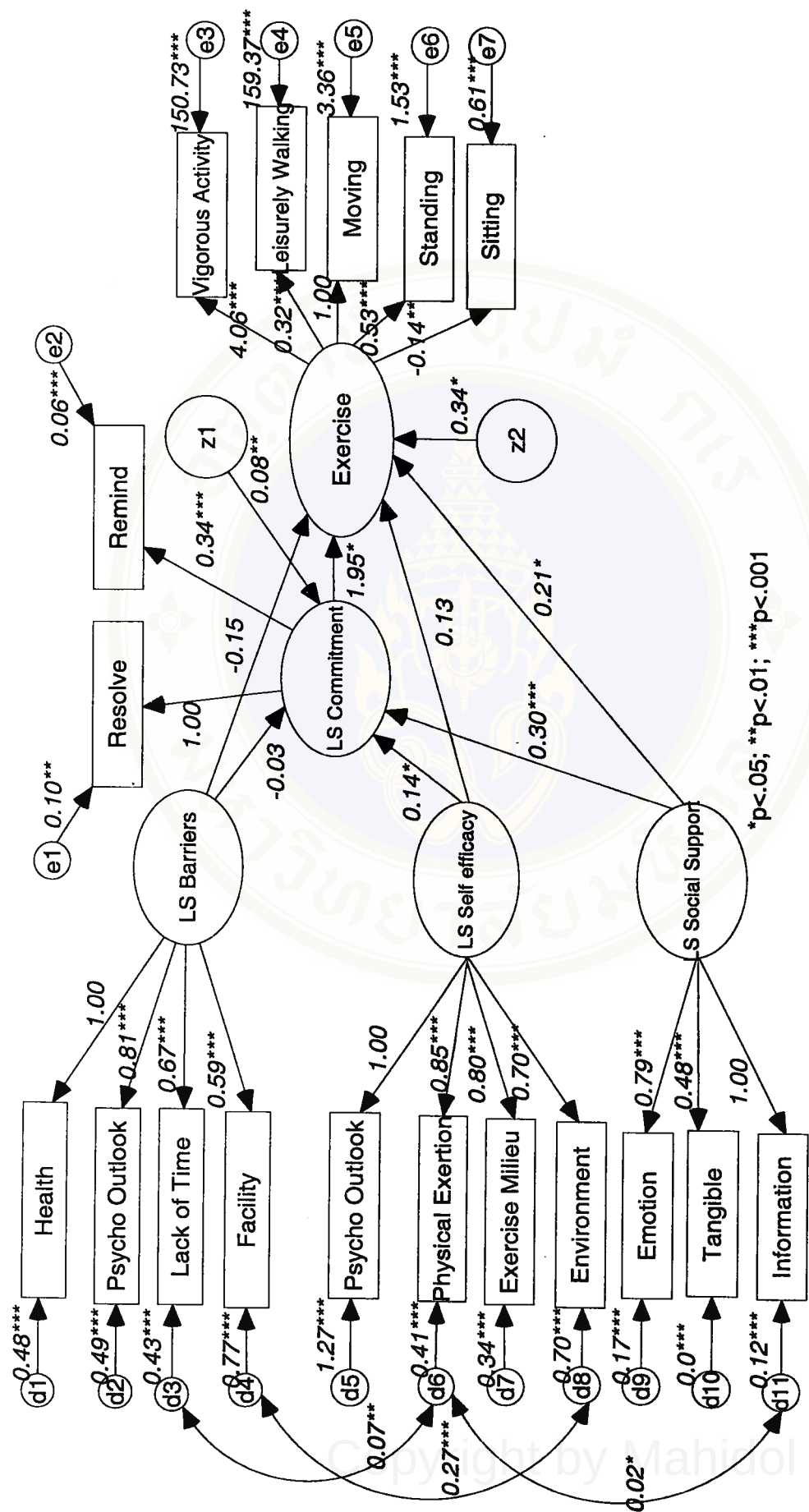


Figure 7: A Modified Model of Lifestyle Exercise Behavior

Table 18 Total, Indirect, and Direct Effects of Causal Variables on Affected Variables of Hypothesized Model of Lifestyle Exercise (n=300)

Affected Variables Causal Variables	CIF			TPA		
	TE	IE	DE	TE	IE	DE
chi-square (χ^2) = 242.30; df=125, p=0.00, GFI=0.92, AGFI = 0.89, RMSEA=0.06						
SSIF	0.58***	-	0.58***	1.39*	0.79	0.60
BIF	-0.04	-	-0.04	-0.39	-0.09	-0.30
SEIF	0.21***	-	0.21***	0.51*	0.36	0.15
CIF	-	-	-	2.40	-	2.40
Structural equation fit	R ² = 0.83			R ² = 0.33		

Table 19 Total Indirect, and Direct Effects of Causal Variables on Affected Variables of Modified Model of Lifestyle Exercise (n=300)

Affected Variables Causal Variables	CIF			TPA		
	TE	IE	DE	TE	IE	DE
Chi-square(χ^2) = 126.57, df=107, p=0.10, GFI=0.96, AGFI=0.93, RMSEA=0.02						
SSIF	0.30***	-	0.30***	0.58*	0.37*	0.21*
BIF	-0.03***	-	-0.03***	-0.21	-0.06	-0.15
SEIF	0.14*	-	0.14*	0.39*	0.26*	0.13
CIF	-	-	-	1.95*	-	1.95*
Structural equation fit	R ² = 0.84			R ² = 0.32		

Note: * p<.05; ** p < .01; ***p < .001

Note: GFI = Goodness of fit index, AGFI= Adjusted goodness of fit index

RMSEA = Root mean square error of approximation,

TE = Total effect, IE = Indirect effect, DE = Direct effect,

SSF= Social support for lifestyle exercise,

BF= Perceived barriers to lifestyle exercise,

SEF= Perceived self-efficacy for lifestyle exercise,

CF= Commitment to a plan of lifestyle exercise, TPA = Exercise behavior

Model Modification

To modify the original lifestyle exercise model, the researcher added parameters by setting the correlation between error terms of observed variables, corresponding to the standardized residuals and the modification indices. After adding all paths, there was evidence that the model was better fit. The chi-square value (126.57, $p = 0.10$), the degree of freedom (107), and RMSEA (0.02) were diminished. GFI (0.96) and AGFI (0.93) were increased, indicating the effects of the modified model on fitting the data.

Lastly, since five parameters were nonsignificant, the researcher deleted some nonsignificant parameters. The goodness of fit index was decreased, while the chi-square value was increased. Therefore, it was better to keep them in the model even though they were not significant. Finally, the final model of lifestyle exercise behavior was estimated with seven structural paths (See Figure 7).

After adjusting the hypothesized model, there were statistically significant paths as follows: the path from social support for lifestyle exercise to commitment to a plan of lifestyle exercise ($\beta = 0.30$, $p < .001$), the path from commitment to a plan of lifestyle exercise to exercise behavior ($\beta = 1.95$, $p < .05$), the indirect path from perceived self-efficacy for lifestyle exercise to exercise behavior via commitment to a plan of lifestyle exercise ($\beta = .26$, $p < .05$), and the direct path from social support for lifestyle exercise to exercise behavior ($\beta = .21$, $p < .05$), as well as the indirect path from social support for lifestyle exercise to exercise behavior through commitment to a plan of lifestyle exercise ($\beta = .37$, $p < .05$).

There was a slight difference in the structural equation fit (R^2) of the modified model from the hypothesized model (see Table 19). The modified model accounted for explained variance on commitment to a plan of lifestyle exercise 84 % ($R^2 = 0.84$) and exercise behavior 32 % ($R^2 = 0.32$).

In conclusion, a comparison of the hypothesized and the modified lifestyle exercise models indicated that the modified model had better fit to the empirical data than the other one. The schematic presentation of the modified structural equation model of lifestyle exercise behavior is presented in Figure 7.

For some theoretically based reason, the modified leisure-time exercise model (Figure 5) and the modified lifestyle exercise model (Figure 7) were selected as proposed models to answer the research questions and to test the research hypotheses. A summary of path coefficients of both models is presented in Table 16 and Table 19.

Hypothesis 1: This hypothesis stated that commitment to a plan of exercise has a positive direct influence on the elderly's exercise.

Model of Leisure-time Exercise Behavior

The parameter estimated results in Table 16 and Figure 5 showed that commitment to a plan of exercise had a significant and positive direct effect on the elderly's exercise behavior ($\beta = 1.22$, $p < .05$).

Model of Lifestyle Exercise Behavior

The parameter estimated results in Table 19 and Figure 7 revealed that commitment to a plan of exercise had a significant and positive direct effect on the elderly's exercise behavior ($\beta = 1.95$, $p < .05$).

Therefore, Hypothesis One completely supported causal relationships as proposed in Pender's HPM (1996).

Hypothesis 2: This hypothesis stated that social support for exercise has a positive direct effect on exercise behavior as well as an indirect effect on the elderly's exercise behavior via commitment to a plan of exercise.

Model of Leisure-time Exercise Behavior

The parameter estimated results in Table 16 and Figure 5 illustrated that social support for exercise had a significant and positive direct effect on commitment to a plan of exercise ($\beta = 0.53$, $p < .001$). Also, social support for exercise had a significant and positive direct effect on the elderly's exercise behavior ($\beta = 0.45$, $p < .05$) as well as had a significant and positive indirect effect on exercise behavior via commitment to a plan of exercise ($\beta = 0.52$, $p < .05$).

Model of Lifestyle Exercise Behavior

The parameter estimated results in Table 19 and Figure 7 showed that social support for exercise had a significant and positive direct effect on commitment to a plan of exercise ($\beta = 0.30$, $p < .001$). Also, social support for exercise had a significant and positive direct effect on the elderly's exercise behavior ($\beta = 0.21$, $p < .05$) as well as had a significant and positive indirect effect on exercise behavior via commitment to a plan of exercise ($\beta = 0.37$, $p < .05$).

Thus, Hypothesis Two completely supported causal relationships as proposed in Pender's HPM (1996).

Hypothesis 3: This hypothesis stated that perceived barriers to exercise has a negative direct effect on exercise behavior as well as an indirect effect on the elderly's exercise behavior via commitment to a plan of exercise.

Model of Leisure-time Exercise Behavior

The parameter estimated results in Table 16 and Figure 5 illustrated that perceived barriers to exercise had a significant and negative direct effect on commitment to a plan of exercise ($\beta = -.27, p < .01$). Also, perceived barriers to exercise had a significant and negative direct effect on the elderly's exercise behavior ($\beta = -.26, p < .05$) as well as a significant and negative indirect effect on exercise behavior via commitment to a plan of exercise ($\beta = -.60, p < .05$).

Model of Lifestyle Exercise Behavior

The parameter estimated results in Table 19 and Figure 7 illustrated that perceived barriers to exercise had a significant and negative direct effect on commitment to a plan of exercise ($\beta = -.03, p < .05$). Also, perceived barriers to exercise had nonsignificant and negative direct effect on the elderly's exercise behavior ($\beta = -.15, p > .05$) as well as a nonsignificant and negative indirect effect on exercise behavior via commitment to a plan of exercise ($\beta = -.21, p > .05$).

Thus, Hypothesis Three completely supported the causal relationships only in the model of leisure-time exercise behavior as proposed in Pender's HPM (1996).

Hypothesis 4: This hypothesis stated that perceived self-efficacy for exercise has a positive direct effect on exercise behavior as well as an indirect effect on the elderly's exercise behavior through commitment to a plan of exercise.

Model of Leisure-time Exercise Behavior

The parameter estimated results in Table 16 and Figure 5 showed that perceived self-efficacy for exercise had a significant and positive direct effect on commitment to a plan of exercise ($\beta = .32, p < .001$). Also, perceived self-efficacy for exercise had a significant and negative direct effect on the elderly's exercise behavior ($\beta = .36, p < .05$) as well as a nonsignificant and positive indirect effect on exercise behavior via commitment to a plan of exercise ($\beta = .03, p > .05$).

Model of Lifestyle Exercise Behavior

The parameter estimated results in Table 19 and Figure 7 revealed that perceived self-efficacy for exercise had a significant and positive direct effect on commitment to a plan of exercise ($\beta = .14, p < .05$). Also, perceived self-efficacy for exercise had nonsignificant and positive direct effect on the elderly's exercise behavior ($\beta = .13, p > .05$) as well as a significant and positive indirect effect on exercise behavior via commitment to a plan of exercise ($\beta = 0.26, p < .05$).

Thus, Hypothesis Four partially supported the causal relationships as proposed in Pender's HPM (1996).

For some theoretically based reason, the modified leisure-time model (Figure5) and the modified lifestyle exercise model (Figure7) were selected as proposed models to answer the research questions and to test the research hypotheses. A summary of path coefficients of both models is presented in Table16 and Table19.

CHAPTER V

DISCUSSION

In this chapter, the results including characteristics of the sample and exercise behavior are interpreted. Two causal models of exercise behavior will be discussed to test the proposed hypothesized relationships among the variables and to predict exercise behavior. The discussion is as follows:

Characteristics of the Sample

Data in this study revealed that most of the participants (60%) were women, aged between 60 to 87 years, with the highest percentage (68%) of them aged from 60 to 70 years. The findings were similar to what reported in the studies of Chuprapawan Ed. (1995: 43); Incharoensak (1998: 54); Min (1996: 34); Rungsiprakarn (1996: 91); the National Statistical Office (1998: 34); and Tounwong (1997: 60) which indicated that there was a higher number of older women in Bangkok. The longevity of women, decreased rate of infection in women, and an increased rate of death in men from chronic illnesses contributed to the phenomena of older women continue to outnumber older men (Chayovan, Ed., 1998: 58; Lueckenotte, 2000: 7).

As far as the income and the source of income were concerned, it was found that almost half of the participants (42.70%) were in a low-income group and most of them (74.65%) received the income from the offspring or the grandchild. This finding was congruent with the finding that most participants (74.30%) did not work.

However, 25.70% of the participants were still engaged in a part-time job with flexible hours after retirement to generate income. According to the observation, although the participants had lower income, most of them still had good living arrangement. This may be due to the fact that most of the participants (45%) still lived with offsprings or grandchildren, 39.30% lived with the spouse, offspring, and grandchild, with emotional and financial supports from their family members, particularly on health and daily living costs. Data on the number of the family members of the participants revealed that 36% of them lived in a family of 4-5 persons. This finding reflected the traditional family pattern of the nuclear family in the Thai society. The consensus data from the National Statistical Office (1998: 36) indicated that most of the families in Bangkok had 4-5 members. This type of family pattern was conducive to the better support received from the families observed in this study.

Forty-eight percent of the participants were married, and more than half (52%) of them were widowed, separated/divorced, or single. Lueckenotte (2000: 7) indicated that widowhood, separation/divorce, and single have commonly increased in older people, particularly in females. This findings was contrary to the data from Min (1996: 34); the National Statistical Office (1998: 36), and Tounwong (1997: 60) indicated that the number of married elderly in Bangkok were higher than that of, which widowed, separated/divorced, and single elderly. In addition, most of the participants in this study had low educational level, with 24% with no education and 59.70% with only four years of primary education. This finding was similar to the data from Tounwong (1997: 61); and the National Statistical Office (1998: 35).

As for the number of chronic illnesses, the majority of the participants (75%) reported having been afflicted with at least one chronic illness. Hypertension (20.33%), low back pain (14.18%), diabetes mellitus (14.18%), cardiovascular problem (7.09%) and hyperlipidemia (5.91%) were most commonly identified health problems among the participants. This finding was similar to that of a previous study of the population aged 50 and over conducted by Chuprapawan Ed. (1995) in which hypertension, low back pain, diabetes mellitus, cardiovascular problem, and hyperlipidemia were reported. In addition, Chayovan (1995: 146) reported that these health problems were related with the economic factor of the people in the urban area. Usually, the low back pain problem was the common symptom of the laborer who engaged in heavy manual work, such as handling of heavy weight materials or some particular jobs that required the staff to stand or walk most of the time. On the contrary, hypertension, diabetes mellitus, cardiovascular problem, and hyperlipidemia were health problems of those who engaged in sedentary activities.

The participants were representative of such characteristics of elderly population as gender, age, income, source of income, living arrangement, number of family member, educational level, and chronic illness. In conclusion, it can be said that the sample in this study was like the elderly population.

Discussion on Exercise Behavior

This section discusses the properties of dependent variables concerning exercise behavior based on the individual indices for Yale Physical Activity Survey (YPAS). Moreover, leisure-time exercise and lifestyle exercise are also discussed.

Corresponding to the scores on the YPAS, it was found that there was variation in the total sum score of exercise activities among the elderly in this study. The actual score on exercise behavior ranged from 7 to 104, with the mean and standard deviation of 30.73 and 19.54, respectively. This result revealed that the participants had low exercise behavior which was against the finding of Vannarit (1999) who found that the rural Thai female and male elderly had the mean total sum scores of exercise behavior of 47.46 (SD = 31.69) and 64.03 (SD=35.00), respectively. It further indicated that the urban elderly had engaged in less exercise behavior than the rural elderly. Regarding the dimensions of exercise behavior, the elderly had low scores on the dimension of vigorous activities, leisure walking, moving, and standing, but they had moderate score on sitting activities. The discrepancy of exercise behavior of the elderly in rural and urban areas may be due to the nature of work between the agricultural chores engaged by the elderly in the rural area and the household chores and caregiving activities performed by the urban elderly. The agricultural activities such as gardening and farming require more energy expenditure than do the household chores and caregiving activities (Chayovan & Knodel 1998: 61).

Leisure-time Exercise

The findings revealed that there were more participants who did not engaged in leisure-time exercise than those who did (59% as against 41 %). Most of the participants who performed the exercise had leisure-time exercise with light and moderate intensity. Stretching exercise was the exercise which most participants

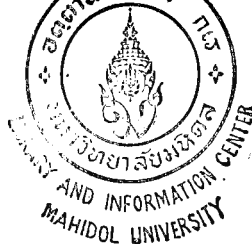
engaged in. This finding was similar to that of the previous studies of Conn (1998a), Inpang (2000), Nunta (1998), and Tounwong (1997), whose results revealed that the elderly in urban areas engaged in leisure-time exercise at a low level.

There were two reasons that prevented the sample to do exercise. Firstly, some parts of the fitness program and type of leisure-time exercise were perceived as unpleasant or very difficult to perform, and may even lead to serious injuries. Leisure-time exercise required some effort in terms of intensity, duration, regularity, specific schedule and location, and needed continuity. This indicated that the exercise pattern could not be appropriately accommodated into the elderly's daily living (Conn, 1998a: 376; Laitakari, et al., 1996: 473).

Secondly, health problems including joint difficulties and/or fatigue were important deterrents to exercise as reported by many participants. The relationship between joint difficulties and fatigue has previously been reported to probably contribute to exercise decision (Conn, 1998a: 376). Leisure-time exercise could be accompanied by increased painful symptoms in the participants with arthritis. Fatigue was mentioned by the participants as a factor that made this exercise difficult. Many participants simply stated that fatigue or lack of energy interfered with their exercise. Therefore, the deterioration of physical ability among the aged (DiPietro, 1996: 598) was not conducive for them to exercise.

Lifestyle Exercise

The results illustrated that household chore, caregiving activity, recreation, occupation, works related volunteer, and stair climbing were lifestyle exercises of the



participants in this study. The finding concerning the participants' leisure-time exercise revealed that most of the participants engaged in exercise with low and moderate intensity. The deteriorating physical ability among the elderly was one reason that made the participants engage in an activity with low and moderate intensity (DiPietro, 1996: 473). The physical work capacity of older persons was often low because they had musculoskeletal limitation, joint problems and soreness (Conn, 1998a: 375). Engaging in simple daily living activities (e.g. stair climbing, walking and carrying with loads) became difficult when the people had reduced muscle mass and strength (Grave, et al. 1994: s17). For these reasons, it was of utmost importance for the participants to engage in lifestyle exercise with low and moderate intensity or comfortable performing activity.

There are three reasons that motivated the participants to engage in this type of exercise. Firstly, lifestyle exercise is repeated behavior that may be largely determined by habit rather than by reason action. Aorts et al. (1997: 365) have indicated that when the lifestyle exercise is performed many times, one does not need to weight pros and cons in order to achieve this exercise because this exercise is repeated and not influenced by obstacles (e.g., inconvenience, special equipment, specific lactation and schedule). In this sense, habit is formed to some degree of the participants' experiences, and of course, additional positive experiences with the type of exercise would enhance the strength of the habit, and thus contribute to further automatically in choosing to engage in the same activity. Therefore, the participants may be engaged in lifestyle exercise regularly because this exercise could integrate into their daily living.

Secondly, as regards beneficial effects, the participants reported that lifestyle exercise could motivate them to engage in it because this exercise enabled them to reap the same physical and psychosocial benefits as leisure-time exercise did. This result is as congruence with the study of Tounwong (1997: 73) which found that the elderly perceived the same benefits of daily work as structured exercise. DiPietro (1996: 598-599); Hunt (1979, 117) and Laitakari et al.(1996: 463) have pointed out that health behavior termed habits or lifestyle activities (household work, occupation, and recreation) could contribute to the overall and some aspects of health fitness.

Lastly, social aspect was one reason that the participants engaged in lifestyle exercise. The results showed that the participants performed housework and looked after the children when their parents went out to work. This was similar to the study of Chayowan (1998) which illustrated that the elderly in Bangkok engaged in household work and caregiving. Willis and Campbell (1992: 31) have stated that this type of work is an important element of identity. The elderly could maintain their role and value, which is a central source of identity by giving tangible support to their family. Thus, this social reason may motivate the elderly to engage in lifestyle exercise.

Discussion of Causal Model of Exercise Behavior

The purpose of this study was to examine a causal model to predict exercise behavior among the elderly. According to Pender (1996), exercise consists of two activities including leisure-time activity and lifestyle activity. Additional hypothesis

is applied to the comparison of the two models of leisure-time exercise behavior and lifestyle exercise behavior. The first model, leisure-time exercise behavior, includes four latent variables: social support for leisure-time exercise, perceived barriers to leisure-time exercise, perceived self-efficacy for leisure-time exercise and commitment to a plan of leisure-time exercise. These variables are hypothesized to have an effect on leisure-time exercise behavior. The second model, lifestyle exercise behavior, also consists of the same four variables, but they are specific to lifestyle exercise. Both models were developed not only to optimize prediction of exercise behavior, but also to investigate causal structures among the predictor variables.

The discussion of the causal structures of modified leisure-time and lifestyle exercise behavior models is composed of model fit, prediction of model, comparison of causal relationships between leisure-time exercise and lifestyle exercise behavior models, and causal relationships among the predicting variables of both models.

Model Fit

Hypothesized model testing was one of the objectives in the present study. Model fitting is to determine the goodness of fit between the hypothesized model and the sample data, indicating the true model is consistent with the model tested (Schumacker & Lomax, 1996:105). This section discusses model fit on the two modified structural equation models, including the models of leisure-time exercise and lifestyle exercise behavior.

The final model of leisure-time exercise behavior was fit well according to its goodness of fit index (Chi-square = 206.50, df = 112, p = 0.00, GFI = 0.93, AGFI =

0.90, RASEA = 0.05). Corresponding to the overall goodness of fit index, the final model of lifestyle exercise behavior was also a good fit to the data (Chi-square = 127.50, df = 108, $p = 0.12$, GFI = 0.95, AGFI = 0.93, RASEA = 0.02). The results from the comparison of the two models indicated that the final model of lifestyle exercise behavior had a better fit to the sample data than the final model of leisure-time exercise behavior. However, more studies are needed for further validation of both models

Prediction of the Models

The hypothesized models were developed to optimize prediction of exercise behavior among the predictor variables. Literature on the testing of HPM variables revealed that the models explain from 19% to 59% of the variance in exercise behavior among adolescents and adults, but only 24% of the variance exercise behavior in a study of community-dwelling elderly (Pender, 1996: 59-61). The predictor variables are in low to moderate explanatory power or strength of structural relationships.

In this study, the findings from the leisure-time exercise behavior model revealed that three selected predictor variables from behavior-specific cognition (perceived barriers to leisure-time exercise, perceived self-efficacy for leisure-time exercise, and social support for leisure-time exercise) and one from behavior outcome (commitment to a plan of leisure-time exercise) explained about 52% of the variance in exercise behavior. The result indicated a moderate strength of the structural relationships in the leisure-time exercise model.

There was a low strength of the structure jointly in the modified model of lifestyle exercise behavior. The results showed that all predictor variables can explain about 32% of the variance in exercise behavior. This model predicts exercise behavior less than the final model of leisure-time exercise behavior because the two nonsignificant parameter paths were eliminated from the model. Moreover, Pender's HPM (1996) could explain leisure-time exercise better than lifestyle exercise.

In conclusion, the modified model of leisure-time exercise behavior explains exercise behavior better than the modified model of lifestyle exercise behavior. In this study, the results revealed that explanation of exercise behavior of both models were similar to that in the existing literature. The revised HPM is beginning to be used as a framework to study exercises among the elderly. Consequently, two modified models of exercise behavior tested within nursing perspective need to be further studied to validate and determine their predictive power of exercise behavior among the elderly.

Comparison of Causal Relationships between Leisure-time Exercise and Lifestyle Exercise Behavior Models

The findings revealed that there was a difference in causal relationships among the variables between model of leisure-time exercise and lifestyle exercise behavior. The discussion in this section deals with both direct and indirect effects of causal relationships among the variables of both models.

There was a difference in direct effects between the leisure-time exercise model and the lifestyle exercise model. The results illustrated that there were four predicting variables of the leisure-time exercise behavior model that had a significant

direct effect on leisure-time exercise including social support for exercise, perceived barriers to exercise, perceived self-efficacy for exercise, and commitment to a plan of exercise, whereas there were only two predicting variables of the lifestyle exercise behavior model that had a significant direct effect on lifestyle exercise, namely social support for exercise and commitment to a plan of exercise.

The results further indicated that perceived self-efficacy for exercise and perceived barriers to exercise had only a direct effect on leisure-time exercise behavior. This indicated that relatively simple lifestyle exercise (e.g. household activity, walking) may be more easily to engage in than leisure-time exercise that is rather difficult (e.g. attending an organized fitness program, exercise milieu) because the latter form of exercise is more subjected to facilities, and probably needs more intentional effort and planning to occur.

As for the leisure-time exercise behavior mode, the findings revealed that social support for exercise and perceived barriers to exercise had an indirect effect on leisure-time exercise behavior via commitment to a plan of exercise. However, for the lifestyle exercise behavior model, the results illustrated that social support for exercise and perceived self-efficacy for exercise had an indirect effect on lifestyle exercise behavior through commitment to a plan of exercise. In other words, commitment to a plan of exercise acted as the mediator of motivating process of exercise behavior in both models.

However, there was a difference in the mediator between the leisure-time exercise model and the lifestyle exercise model. In the lifestyle exercise behavior model, commitment to a plan of exercise acted as a cognitive mediator between

perceived self-efficacy for exercise and exercise behavior, whereas in the leisure-time exercise model, commitment to a plan of exercise operated as a cognitive mediator between perceived barriers to exercise and exercise behavior. The results may indicate that commitment to a plan of leisure-time exercise was determined by the rational calculation of further benefits of leisure-time exercise (Dzewaltowski, 1994; 1396), while commitment to a plan of lifestyle exercise was regulated by benefits of lifestyle exercise and identity aspect (Bielby, 1992: 285-286).

In conclusion, the additional hypothesis was supported in that there was difference in causal relationships among variables between the leisure-time exercise behavior and the lifestyle exercise behavior models.

Discussion of Causal Relationships of Exercise Behavior Models

The discussion of the causal structures of the modified models of leisure-time exercise and lifestyle exercise is as follows:

Model of Leisure-time Exercise Behavior

The Relationship between Commitment to a Plan of Leisure-time exercise to Exercise Behavior

Regarding the leisure-time exercise model, the findings revealed that commitment to a plan of leisure-time exercise had a most significantly positive direct effect on the elderly exercise behavior ($\beta=1.22$, $p<.05$). Therefore, the elderly with higher levels of commitment to a plan of leisure time exercise had higher levels of regular engagement in exercise behavior. The findings in this study were congruent

with those of a prior study by Fuchs (1996) which showed that intention had significantly direct positive effect on exercise behavior in both the adoption and the maintenance processes. This was also similar to the study of Howze et al. (1989) whose findings revealed that commitment to exercise had a significant effect on the exercise behavior among the elderly who had sedentary activity.

Geen (1995: 55) has stated that commitment implied the underlying cognitive process and must be translated into intention. Pender (1996: 72) has also stated that intention is a major determinant of volitional behavior. Volitional process means transforming the intention into concrete actions; therefore, intention can be perceived as involving a high level of cognitive guidance to engage in regular activity (Fuchs, 1996: 1955).

Corresponding to the behavioral approach, Bielby (1992: 286) has proposed that commitment is determined by the rational calculation of net future benefits. An individual committed to a line of behavior so long as it provides resources for meeting personal needs and values. Specifically, commitment to physical activity was a function of the net rewards from this activity. This shows that commitment is a process that stabilizes behavior only to the extent that the balance of net costs and benefits is stable over time (Dzewaltowski, 1994: 1396). The elderly's commitment to a plan of leisure-time exercise may be solely on the basis of their current assessment of the benefits of engaging in this exercise. Therefore, the elderly may motivate themselves to set a plan for leisure-time exercise to improve their health status, received social approval, and experience self-satisfaction.

Once, the elderly have commitment to a plan of leisure-time exercise, they transform this microbehaviors of commitment into regular exercise behavior. This means that when the commitment to a plan of leisure-time exercise has been built, it is necessary to transform this motivation into a detailed set of guideline on how to perform exercise behavior (e.g., planning specific times for exercise, exercising at a specific location, varying the exercise routine to avoid boredom, etc.). Thus, the elderly engage in exercise behavior regularly when they have commitment to a plan of exercise. When they are committed to the plan of exercise, they intend to develop concrete exercise behavior such as sports and formal conditioning exercise. In conclusion, commitment to a plan of leisure-time exercise influences on leisure-time exercise behavior, indicating that regular exercise behavior requires a high level of cognitive guidance (Fuchs, 1996: 1955).

The Direct Relationship between Social Support for Leisure-time Exercise and Exercise Behavior

The finding revealed that social support for leisure-time exercise had a significant positive direct effect on exercise behavior ($\beta = .45, p < .05$). The elderly with higher levels of social support for leisure-time exercise had higher regular leisure-time exercise behavior. These findings were consistent with the results of Fuchs' s causal model study (1996) which found that behavior-specific social support had a significant positive direct effect on exercise participation.

Direct contacts with family members as well as close friends affects greater perceived adequacy of emotional, tangible, and information support for leisure time

exercise. Consistent social support for leisure-time exercise provided by friends or family members has proved to be one of the most facilitators of exercise (Nies, et al., 1998: 266). In the program of exercise behavior, participation may be tiring, painful, inconvenient, and stressful to the system, whereas social support provides and enhances a person's ability to learn to adopt alternative coping strategies (Schaefer, et al., 1981: 385).

Nies et al. (1998) found that the role of friends in the support of leisure-time exercise can be found in neighborhoods and within the group setting, which offers guidance, reinforcement encouragement, and companionship for exercise as well as an opportunity to socialize. As for the role of family support, family can act as facilitators of exercise for the elderly such as by providing exercise's equipment and positive comments about the exercise. As distinguished from the support of friends, family support was structured to best facilitate exercise behavior. However, it would appear that, inasmuch as exercise behavior must be maintained over an extended period of time, social support would be particularly appropriate in aiding or motivating the elderly in their challenges to comply with their exercise program (Duncan & McAuley, 1993: 201). Therefore, the present finding of leisure-time exercise model supported causal relationships between social support for exercise and exercise behavior as proposed in Pender's HPM (1996).

The Indirect Effect of Social Support for Exercise on Exercise Behavior through Commitment to a Plan of Exercise

As for the leisure-time exercise model, the findings revealed that social support for exercise had significant positive direct effects on commitment to a plan of exercise ($\beta = .53, p < .001$). Social support for leisure-time exercise had significant positive indirect effects on the elderly exercise behavior via commitment to a plan of exercise ($\beta = .52, p < .05$). The results revealed that indirect effects on exercise behavior were higher than direct effect. A similar result was reported by Fuchs (1996), who also demonstrated that social support influenced exercise directly, and had an effect on exercise indirectly through the mediating affected of exercise intention

The data showed that leisure-time exercise behavior was not only a function of commitment to a plan of leisure-time exercise, but was also influenced by social support for leisure-time exercise. So, commitment to a plan of leisure-time exercise acted as mediator jointing social support for leisure-time exercises affected exercise behavior. Dishman et al. (1985: 163) has stated that social support is a major motivational factor that affects exercise behavior. Thus, having a friend or family member, who serves as a behavior role model, encourages person to start activity, help to organize exercise behavior, and to provide the situation cues and opportunities relevant for developing plan to initiate the behavior (when, where, what, and with whom to exercise) (Fuchs, 1996: 1954). In this stage, social support for leisure-time exercise has a partial effect on leisure-time exercise behavior and its effect is completely mediated by commitment to a plan of leisure-time exercise.

The results indicated that the direct effect of social support for leisure-time exercise has less strength than the indirect effect. So, commitment to a plan of leisure-time exercise is an important mediator linking psychosocial influence to exercise behavior among the elderly. Thus, the present findings of the leisure-time exercise model support the causal relationship between social support for exercise and exercise behavior as stated in Pender's HPM (1996).

The Direct Relationship between Perceived Barriers to Leisure-time Exercise and Exercise Behavior

The results showed that perceived barriers to leisure-time exercise had a significant negative direct effect on exercise behavior ($\beta = -.26, p < .05$). Thus, the elderly with lower levels of perceived barriers to leisure time exercise had higher levels of exercise behavior. This finding was consistent with those of the study of Garcia, et al. (1995), Conn (1998b), and Inpang (2000) which illustrated that exercise behavior had direct influence on perceived barriers to exercise.

Pender (1996) has stated that perceived barriers are one component of interpreted environment that influences decision about performing behavior. It is indicated that perceived barriers to leisure-time exercise acted as prevention to exercise. McAuley (1992: 83) and Conn (1998a: 375) have proposed that in the process of leisure-time exercise program, participation may be tiring, painful, inconvenient, unpleasant or very difficult to perform, and may lead to serious injury and stress to the system. In addition, King (1994: 1406) and Laitakari et al. (1996: 473) have noted that leisure-time exercise milieu involves some efforts in terms of

intensity, duration, regularity, specific schedule and location, and requires, consequently, some planning and effort from the participant. These barriers prevent the elderly to engage in leisure-time exercise. Therefore, leisure-time exercise could not accommodate into the elderly's daily living. The present findings indicated that the leisure-time exercise model supports a causal relationship between perceived barriers to exercise and exercise behavior as proposed in Pender's HPM (1996).

The Indirect Effect of Perceived Barriers to Leisure-time Exercise on Exercise Behavior through Commitment to a Plan of Leisure-time Exercise

The finding showed that perceived barriers to leisure-time exercise had a significant negative direct effect on commitment to a plan of leisure time exercise ($\beta = -.27, p < .01$) as well as had a significant and negative indirect effect on exercise behavior via commitment to a plan of exercise ($\beta = -.60, p < .05$). This result was consistent with Fuchs' s study (1996) whose finding showed that intention acted as the cognitive mediator linking perceived barriers and exercise behavior.

Exercise behavior is not only influenced by perceived barrier to leisure time exercise, but is also influenced by commitment to a plan of exercise. Pender (1996: 69) has stated that anticipated barriers affect intention to engage in a particular behavior. Nies et al. (1998: 269) have found that unaccommodating schedule in the older women' s daily life is an important inhibitor to set a plan of exercise behavior. A difficult activity is one that is hard to do. Leisure-time exercise could be hard because it is inconvenient, painful, schedule, with specific location, which requires a high level of effort, skill and knowledge and needs much intentional effort or

extensive planning of exercise. Thus, perceived barriers to leisure-time exercise affects the elderly's motivation to commit to a plan of exercise and sustain exercise behavior across situations. The findings indicated that commitment to a plan of leisure-time exercise operated as a cognitive mediator between perceived barriers to exercise and exercise behavior. In conclusion, the model of leisure-time exercise behavior supported a causal relationship as stated in Pender's HPM (1996) that perceived barriers to leisure-time exercise do not only directly influence exercise behavior, but also indirectly influence exercise behavior via commitment to a plan of leisure-time exercise.

The Direct Relationship between Perceived Self-efficacy for Leisure-time Exercise and Exercise Behavior

It was found that perceived self-efficacy for exercise had significant positive direct effects on exercise behavior among the elderly ($\beta = .36, p < .05$). The elderly with higher levels of perceived self-efficacy for exercise had higher levels of exercise behavior. This finding was congruent with those of several studies indicating the role of exercise self-efficacy in the adoption and maintenance of exercise participation (Cardinal, 1997; Conn, 1998b; DuCharme & Brawly, 1995; Garcia & King, 1991; McAuley, 1993; Nanta, 1997; Poag & McAuley, 1992).

Bandura (1997: 43) has stated that individuals judge how well they can get themselves to exercise regularly under various impediments. Laitakari et al. (1996: 473) have proposed that the nature of leisure-time exercise involves, inevitably, some effort in terms of intensity, duration, regularity, specific location, schedule, and

requires some planning and effort from the participant. In addition, participation in a exercise program may be tiring, painful, and stressful to the system, so secured beliefs in one's capabilities to overcome such aversive stimuli are of paramount importance to regimen maintenance or adherence (McAuley, 1992: 481).

Perceived self-efficacy for leisure-time exercise (e.g., overcoming obstacles or conditions) is the mirror image of efficacy for exercise designed to enable the elderly to participate in scheduling/planning for exercise on a weekly basis. The elderly who had stronger self-efficacy beliefs in leisure-time exercise were associated with more successful anticipatory scenarios, more effort expended to perform exercise, lower likelihood of being dissuaded by difficulty, and motivation to engage in exercise regularly. Thus, the model of leisure-time exercise behavior supports a causal relationship between perceived self-efficacy to exercise and exercise behavior as stated in Pender's HPM (1996).

The Indirect Effect of Perceived Self-efficacy for Leisure-time Exercise on Exercise Behavior through Commitment to a Plan of Leisure-time Exercise

The findings showed that perceived leisure-time exercise had a significant positive direct effect on commitment to a plan of leisure time exercise ($\beta = .32, p < .001$). However, it failed to indirectly influence exercise behavior via commitment to a plan of exercise ($\beta = .03, p > .05$).

Bandura (1997) has proposed that self-efficacy plays the major role in keeping people committed to a course of action, especially when pursuing that course of action involves overcoming setbacks, failures, and obstacles. The elderly who have strong

beliefs in their capabilities approach difficult exercise behavior as challenges to be mastered rather than as threats to be avoided. Such an affirmative orientation fosters interest and engrossing involvement in leisure-time exercise. They set themselves challenging plans and maintain strong commitment to them. Thus, perceived self-efficacy for leisure-time exercise has a direct effect on commitment to a plan of leisure-time exercise.

However, the findings showed that perceived self-efficacy for leisure-time exercise had an direct influence on exercise behavior, but did not affect the behavior indirectly via the mediating effect of commitment to a plan of leisure-time exercise. The finding indicated that commitment to a plan of leisure-time exercise failed to acts as a cognitive mediator linking perceived self-efficacy for exercise influence to exercise behavior. It is possible that adding path between perceived barriers to exercise to perceived self-efficacy for exercise may affect the parameter coefficients in the model. Perceived barriers to exercise also operate as cognitive mediator linking between self-efficacy for exercise and exercise behavior, so that it may influence parameter coefficient of indirect effects between perceived self-efficacy for exercise to exercise behavior via commitment to a plan of exercise.

In conclusion, the model of leisure-time exercise behavior partially supports a causal relationship as stated in Pender's HPM (1996) that perceived self-efficacy for leisure-time exercise has a direct influence on exercise behavior, but has not an indirect influence on exercise behavior via commitment to a plan of leisure-time exercise.

Additional Research Finding

The Direct Relationship between Perceived Self-efficacy for Leisure-time Exercise and Perceived Barriers to Leisure-time Exercise

The path from perceived self-efficacy for leisure-time exercise to perceived barriers to leisure-time exercise was derived from LISREL modification indices and had substantive support according to Pender's HPM (1996).

Perceived self-efficacy for leisure-time exercise had significant negative direct effects on perceived barriers to leisure-time exercise ($\beta = -.61, p < .001$). The results revealed that the elderly with higher levels of perceived self-efficacy for leisure time exercise had lower levels of perceived barriers to leisure time exercise.

Bandura (1994: 73) has stated that self-efficacy guides and motivates oneself to get things done that one knows how to do under various impediments. It seems that self-efficacy beliefs affect the motivation process of exercise among the elderly in several ways. They determine the goals of exercise which are set for themselves, how much the effort they should expend to exercise, the time duration they persevere in face of exercise difficulties, and resilience to failure in exercise. When faced with obstacles to exercise, the elderly who have a strong belief in their capabilities exert greater effort when they fail to master the exercise program. Strong perseverance contributes to exercise performance accomplishment. In conclusion, higher exercise efficacy increases the likelihood of mastering challenges and overcoming barriers to continued participation (McAuley, 1993: 112).

Model of Lifestyle Exercise Behavior

The Direct Relationship between Commitment to a Plan of Lifestyle Exercise to Exercise Behavior

The results showed that commitment to a plan of lifestyle exercise also had a strongest significantly positive direct effect on exercise behavior ($\beta=1.95$, $p<.05$). This indicated that the elderly with higher levels of commitment to a plan of lifestyle exercise had higher levels of exercise behavior. The findings in this study were congruent with that of a prior study by Fuchs (1996) which showed that intention has significantly direct positive effect on exercise behavior in both the adoption and the maintenance process. This is also similar to the study of Howze et al. (1989) whose findings revealed that commitment to exercise has a significant effect on the exercise behavior among the elderly who has sedentary activity.

The process of the influence of commitment to a plan of lifestyle exercise on lifestyle exercise is similar to the process of the influence of commitment to a plan of leisure-time exercise on leisure-time exercise. Once the commitment to a plan of lifestyle exercise has been built, it is to change itself into a detailed set of guideline on how to perform exercise behavior (e.g., planning specific times for volunteer or religious activity, exercising in a specific location such as temple or community center, etc.). Thus, the elderly engage in lifestyle exercise behavior regularly when they have commitment to a plan of lifestyle exercise.

Nevertheless, two factors including benefits of physical activity effect and identity aspect may determine commitment to a plan of lifestyle exercise. The first one is beneficial physical effect. The ability of individuals to anticipate outcomes

provides a cognitive representation of a future event that motivates action (Dzewaltowski, 1994: 1396). The participants reported that they preferred to engage in lifestyle exercise because their health could be improved by performing this exercise (e.g., going for a walk or bicycling, taking care of one's home and garden, etc.). Thus, the participants may be motivated to set their strategic lifestyle exercise to improve their health.

The second one is identity aspect. Bielby (1992: 285) has stated that when individuals found themselves engaged in a particular pattern of work and family responsibilities, subjective attachments are changed to be consistent with those engagements. Commitment to work and family is a function of one's past and current experiences, responsibilities, and statuses. In this view, commitments are not determined by rational calculation based on expected costs and benefits of current and future activities, but are determined by cumulative impact of prior commitment behaviors. In this point of view, the participants engaged in occupation, volunteer activity and family's household work, which are important to most participants not only as the source of livelihood, but also as an important element of identity (Willis & Campbell, 1992: 31). Thus, work and family responsibility could motivate the elderly to set the plan of exercise. Thus, the present findings of lifestyle exercise behavior model supports a causal relationship between commitment to a plan of lifestyle exercise and exercise behavior as proposed in Pender's HPM (1996).

The Direct Relationship between Social Support for Lifestyle Exercise and Exercise Behavior

There was evidence that social support for lifestyle exercise had significant positive directed effects on exercise behavior ($\beta = .21, p < .05$). Therefore, the elderly with higher levels of social support for lifestyle exercise had a higher regular exercise behavior. These findings were consistent with the results of Fuchs' s causal model study (1996) which found that behavior-specific social support had significant positive direct effects on exercise participation.

The nature of lifestyle exercise is a short chain of simple behavior act, and involves few or no skills, equipment or facility, and availability of time and place. Laitaakari et al. (1996: 469-472) have proposed that although lifestyle exercise could be engaged in more easily than leisure-time exercise, maintenance to perform lifestyle exercise must be determined by social support. Social support from friend and family members encourages emotional, tangible, and informational support which motivate the elderly to engage in and maintain lifestyle exercise. Emotional support includes intimacy and attachment, reassurance, and ability to confide in and rely on another--all of which contribute to feelings that the elderly is loved and cared for. Tangible support involves direct aids or services including money or household instruments, and provision of services such as doing chores for the elderly. Informational support includes information and advice, which could help the elderly solve a problem and provide feedback about how the elderly is doing. This shows that social support for lifestyle exercise acts as a motivation factor that promotes the elderly to engage in lifestyle exercise. Thus, the present finding of the lifestyle exercise model supports a

causal relationship between social support for exercise and exercise behavior as proposed in Pender's HPM (1996).

The Indirect Effect of Social Support for Lifestyle Exercise on Exercise Behavior through Commitment to a Plan of Lifestyle Exercise

The findings revealed that social support for lifestyle exercise had a significant positive direct effect on commitment to a plan of lifestyle exercise ($\beta = .30, p < .001$). Social support for lifestyle exercise had a significant positive indirect effect on the elderly exercise behavior via commitment to a plan of lifestyle exercise ($\beta = .37, p < .05$). The results revealed that indirect effects on lifestyle exercise behavior were higher than direct effects. This was consistent with the report by Fuchs (1996), which also demonstrated that social support influenced exercise directly, and had an effect on exercise indirectly through the mediating effect of intention.

The results revealed that commitment to a plan of lifestyle exercise acted as a cognitive mediator jointing social support for lifestyle exercise influencing exercise behavior. Locke and Latham (1990: 136-137) have indicated that social support (e.g., peer group) is associated with commitment. Social support for lifestyle exercises provided by family and friends proves to be facilitators, reinforcement, and encouragement of lifestyle exercise among the elderly. The role of friends in the support of lifestyle exercise is to provide informational positive feedback, companionship, as well as an opportunity to socialize (e.g., religious group and volunteer activity) that promoted intrinsic motivation to set a plan of lifestyle exercise. The role of family support as facilitators of set a plan of lifestyle exercise includes

provision of money and goods (e.g., household instrument, money for food preparation and childcare). This revealed that lifestyle exercise behavior is not only a function of commitment to a plan of leisure-time exercise, but is also influenced by social support for lifestyle exercise. In this stage, social support for lifestyle exercise has a partial effect on lifestyle exercise behavior and its effect is completely mediated by commitment to a plan of lifestyle exercise. Thus, the present finding of lifestyle exercise model supports a causal relationship between social support for exercise and exercise behavior as stated in Pender's HPM (1996).

The findings illustrated that the social support for lifestyle exercise had less direct and indirect effects on exercise behavior than the social support for leisure-time exercise. It indicated that the participants had less social support and commitment to a plan of lifestyle exercise than social support for leisure-time exercise. Laitakari et al. (1996: 470) have stated that due to the characteristics of lifestyle exercise, it could be engaged more easily than leisure-time exercise. Therefore the participants need less social support for lifestyle exercise than other one.

The Direct Relationship between Perceived Barriers to Lifestyle Exercise and Exercise Behavior

The finding failed to show a direct relationship between perceived barriers to lifestyle exercise ($\beta = -.15, p > .05$), since the results from descriptive data revealed that the elderly had low scores on perceived barriers to lifestyle exercise. It may not affect engagement in regular lifestyle exercise. The results of this study were different from those of prior studies of Garcia, et al. (1995), Conn (1998), Inpang (2000) which

revealed that overall barriers were significantly negatively related at moderate level of exercise behavior among the urban and rural elderly.

The finding differed from those of previous studies because all of them studied leisure-time exercise. There are two reasons that perceived barriers to lifestyle exercise did not affect exercise behavior. The first reason is accommodation to daily living. Lattakari et al. (1996: 469-471) have stated that lifestyle exercise or moderate-intensity activity is easy to perform because of two reasons: 1) the nature of lifestyle exercise is easy to engage, involves a few or no skills and equipment of facilities; 2) environment connection has plenty of cues available, plenty of opportunities available (time and place), and plenty of reinforcement. This indicated that lifestyle exercise could integrate into the elderly's daily living. Therefore, the elderly had a low level of perceived barriers to lifestyle exercise.

The second reason is habitual exercise. Aarts et al. (1997: 369) have indicated that during habit formation, the sense of development of routinized, automatic decisions to engage in an action is shaped and the same behavior is repeatedly followed by satisfaction but it is not influenced by obstacles. Thus, in a sense, habit is formed to some degree of positive experience. Of course, additional positive experience would enhance the strength of the habit, and therefore, contributes to further automatization of choosing to perform the same behavior. Habitual exercise or lifestyle exercise is incorporated in routinized daily activity patterns so that the perceived barriers to lifestyle exercise had no significant influence on exercise behavior because these activities are integrated into their ongoing daily life (Conn, 1998a: 376). Thus, the model of lifestyle exercise behavior refutes a causal

relationship between perceived barriers to exercise and exercise behavior as stated in Pender's HPM (1996).

The Indirect Effect of Perceived Barriers to Lifestyle Exercise on Exercise Behavior through Commitment to a Plan of Lifestyle Exercise

The findings showed that perceived barriers to exercise had a significant negative influence on commitment to a plan of exercise directly ($\beta = -.03, p < .001$). However, perceived barriers failed to influence exercise behavior via commitment to a plan of exercise ($\beta = -.06, p > .05$). The finding also indicated that commitment to a plan of exercise did not operate as a cognitive mediator between perceived barriers to life style exercise and exercise behavior. This result was contrary to Fuchs's study (1996) whose findings showed that exercise intention was a mediator linking between perceived barriers to exercise and exercise behavior. The findings differed from Fuchs' s results because Fuchs studied only leisure-time exercise. Thus, the type of exercise may affect commitment to a plan to exercise.

Although perceived barriers to lifestyle exercise had effects on a commitment to a plan of lifestyle exercise, its path coefficient was very low. These findings indicated that lifestyle exercise is repetitive nature and is a simple behavior act, thus lifestyle exercise does not need much intentional effort or extensive planning: the lifestyle behavior may thus be consistently and frequently performed for a long period of time (Laitakari, et al., 1996: 468; Aarts, et al., 1997: 370). Therefore, the elderly engaged in repetitive lifestyle behavior because it was some degree of cognitive initiation of action, but once initiated, the action flowed with minimal (but not zero)

cognitive regulation (Locke & Latham, 1990: 5). The present findings indicated that perceived barriers to lifestyle exercise to exercise behavior have no indirect effect on exercise behavior via commitment to a plan of lifestyle exercise, therefore it refutes a causal relationship as proposed in Pender's HPM (1996).

The Direct Relationship between Perceived Self-efficacy for Lifestyle Exercise and Exercise Behavior

The results demonstrated that perceived self-efficacy for lifestyle exercise had no significant direct effects on exercise behavior among the elderly ($\beta = .13, p > .05$). This finding was consistent with those of the prior studies of Howze et al. (1989); Resnick, et al. (2000); and Vannarit (1999) which demonstrated that exercise self-efficacy expectations are not directly related to exercise behavior among the elderly.

There is a reason that supports the findings in this study. Lifestyle exercise is easy to do, involves a few or no skills, and does not require special equipment or facility has plenty of opportunities and available time and place (Laitakari, et al., 1996: 470). This indicated that relatively simple exercise behavior (e.g., walking, cycling, and religious activity) may more easily become habitual and could be incorporated in daily living. Thus, lifestyle exercise could be easy to do, had few planning and used little effort. When behaviors are less demanding and more easily engaged in, cognition control system such as self-efficacy gives away to regulation by lower control system (Bandura, 1997). In conclusion, the path from perceived self-efficacy for lifestyle exercise to exercise behavior refutes a causal relationship as stated in Pender's HPM (1996).

The Indirect Effect of Perceived Self-efficacy for Lifestyle Exercise on Exercise Behavior through Commitment to a Plan of Lifestyle Exercise

The findings showed that perceived self-efficacy for lifestyle exercise had a significantly positive direct effect on commitment to a plan of lifestyle exercise ($\beta = .14, p < .05$). Although perceived self-efficacy for lifestyle exercise failed to directly influence exercise behavior, it had significant and positive indirect effects on exercise behavior via commitment to a plan of lifestyle exercise ($\beta = .26, p < .05$). This was congruent with DuCharme & Brawley's study (1995) whose results revealed that both forms of efficacy overcome barriers and scheduling could significantly predict behavioral intention throughout the exercise program among healthy adults. They indicated that participant's behavioral intention at program onset represented a degree of commitment to use their membership and thus justified the expense of their personal exercise.

The findings indicated that commitment to a plan of lifestyle exercise acted as a cognitive mediator between perceived self-efficacy for exercise and exercise behavior. According to expectancy motivation, Bandura (1997) has stated that perceived self-efficacy plays a major role in keeping people commit to a course of action. Lifestyle exercise is relatively simple exercise behavior, which is less demanding and more easily engaged in; thus, cognition control systems such as self-efficacy gives away to regulation by lowering the control system (Bandura, 1997). In this study, the participants had a high level of perceived self-efficacy. It indicated that the participants judged themselves as highly efficacious, therefore, they had more persistence or commitment to a plan of lifestyle exercise. According to the identity

approach, commitment to a plan of action is a strong personal dedication to a decision to carry out a line of action (Bielby, 1992: 284-286). The participants found themselves engaged in a particular pattern of employment and family responsibilities (e.g. household work, occupation), subjective attachments are changed to be consistent with those engagement. Therefore, before the elderly perform lifestyle exercise behavior regularly, perceived self-efficacy for lifestyle exercise has indirect effects on lifestyle exercise behavior through commitment to a plan of lifestyle exercise, which provides cognitive guidance.

When commitment to a plan is built, the elderly need to transform that commitment into a detailed set of instructions on how to perform this exercise. Some type of lifestyle exercise (e.g., religious activity, occupation, and volunteer activity) needs planning to engage in. For example, the data from the observation revealed that the Muslim elderly had a specific pattern of Muslim religious practice (La-mad), which consisted of plan, purpose, and structure. For the component of plan, they determined both frequencies, amount of time, and place to engage in. Regarding the purpose, they intended to perform religious practice to receive peaceful mind. For the structure component, they must prepare themselves, by cleaning themselves and grooming cleaning clothes.

Contribution to Nursing Science

The results of this study contribute to nursing knowledge development as follows:

1. Generate predictive knowledge

Theory development is one that is derived through the consideration of logically deduced and verified proposition. It is a view that promotes cause and effect relationships and promotes prediction as its explanation as an outcome of prediction (Meleis, in Nicoll, Ed., 1992: 121). Studies should test models proposed by Pender's HPM as explanation of health behavior because it is important in determining the utility of the model in predicting exercise behavior of the elderly and in successfully intervening to increase levels of exercise. Both models including leisure-time exercise and lifestyle exercise clarify the mechanisms of factors that affect exercise behavior and give an equation of models to predict exercise behavior.

Furthermore, this study can be considered as testing and extending Pender's HPM (1996). According to theory testing, this research study developed the hypothetical statements of both exercise models under the deductive system by testing the proposition of how many factors influenced the exercise behavior. The results illustrated that commitment to a plan of action acted as the mediator of the exercise behavior. To extend the theory, this research study yields the basis for a further prescriptive study because it is a proven model giving added theoretical statement such as the following:

Model of Leisure-time Exercise Behavior

Corresponding to the findings of the leisure-time exercise model, the factors of social support for leisure-time exercise, perceived barriers to leisure-time exercise, and perceived self-efficacy for leisure-time exercise had direct effects on exercise behavior. However, only social support for leisure-time exercise and perceived barriers to leisure-time exercise had indirect effects on exercise behavior via commitment to a plan of leisure-time exercise. That is, commitment to a plan of leisure-time exercise played as the mediator of exercise behavior. Nevertheless, perceived self-efficacy for leisure-time exercise had failed to indirectly affect exercise behavior through commitment to a plan of leisure-time exercise. As for additional findings, self-efficacy for leisure-time exercise had a direct effect on perceived barriers to leisure-time exercise as well as had an indirect effect on exercise behavior via perceived barriers to leisure-time exercise. Consequently, perceived barriers to leisure-time exercise acted as a mediator of exercise behavior.

These findings are important in determining the utility of the model in successfully intervening to increase level of exercise behavior among the elderly. The theoretical statements include:

1. Social support for leisure-time exercise and perceived barriers to leisure-time exercise influence exercise behavior among the elderly by promoting commitment to a plan of leisure-time exercise.
2. Enhancing or modifying exercise behavior among the elderly can be done by promoting social support for leisure-time exercise, relieving perceived barriers to leisure-time exercise, and reducing perceived self-efficacy for leisure-time exercise.

3. Perceived self-efficacy for leisure-time exercise influences exercise behavior among the elderly by reducing perceived barriers to leisure-time exercise.

Model of Lifestyle Exercise Behavior

The findings concerning the lifestyle exercise behavior model include the following: 1) commitment to a plan of lifestyle exercise and perceived social support to lifestyle exercise which have significance and positive direct effects on exercise behavior; 2) Social support for lifestyle exercise and perceived self-efficacy for lifestyle exercise which have significance indirect effects on exercise behavior through commitment to a plan of lifestyle exercise. The findings from this study has determined theoretical statements for further prescriptive studies as follows:

1. Social support for lifestyle exercise and perceived self-efficacy for lifestyle exercise have effect on exercise behavior among the elderly by enhancing commitment to a plan of lifestyle exercise.

2. Promoting social support and commitment to a plan of lifestyle exercise are important in promoting exercise behavior the among elderly.

2. Extension of the Existing Knowledge of Health Promotion Model

The results of this study help clarify existing body of knowledge in the HPM, especially the difference in explanation between the leisure-time exercise model and the lifestyle exercise model, and commitment to a plan of exercise. Moreover, the additional finding from the data analysis --the relationship between perceived self-efficacy for exercise and perceived barriers to exercise-- was confirmed.



Exercise Behavior

Pender (1996: 185) has proposed a definition of exercise as leisure-time physical activity and lifestyle physical activity. In this study, the researcher developed the causal model to explain and predict the exercise behavior of the elderly including leisure-time exercise behavior model and lifestyle exercise behavior model. In addition, the research test causal relationships among variables of social support for exercise, perceived barriers to exercise, perceived self-efficacy for exercise, commitment to a plan of exercise, and exercise behavior. The finding showed that leisure-time exercise behavior model has a higher strength structural relationship than lifestyle exercise model, indicating that HPM has a higher power prediction in leisure-time exercise than in the other one. It is deemed necessary to understanding leisure-time exercise and lifestyle exercise of the elderly and motivate factors that affect both exercise behaviors.

However, in this study, testing both models used the same exercise behavior variables that reflected both leisure-time exercise and lifestyle exercise. To confirm the results in this study, the researcher combined models of leisure-time exercise behavior and lifestyle exercise behavior together and used the LISREL to test the model. The findings revealed that estimate parameters in combined model of exercise behavior was similar to both models (See Appendix J).

Commitment to a plan of action as cognitive guidance

According to Pender's HPM (1996:72), commitment to a plan of action implies the underlying cognitive process. Moreover, commitment is associated with

intention, which is a major determinant of volitional behavior. According to the volitional process, transforming intention into concrete action will occur, including action plans and action control (regulate the actions of their own consciousness) (Binswanger, 1991:158). Once the intention for exercise participation has been shaped, it is necessary to transform that motivation into a detail set of instruction on how to perform this action. Similar to commitment to a plan of exercise, motivation from behavior-specific cognition (social support for exercise, perceived barriers to exercise, and perceived self-efficacy for exercise) transforms into a plan and control of exercise. The set of plans are micro-behaviors that support consistency to perform exercise behavior overtime (Pender,1999).

The results clearly demonstrated that commitment to continue a regular exercise remains a function of cognitive process, particularly in social support for exercise, perceived barriers to exercise, and perceived self-efficacy for exercise. Together, all variables explained about 81% ($R^2 = 81$) of commitment to a plan of leisure time exercise and 80% ($R^2 = 80$) of commitment to a plan of lifestyle exercise.

The findings from this study suggested that commitment to a plan of exercise was the best predictor of exercise behavior as the parameter estimates the path from commitment to a plan of exercise to exercise behavior in the model of leisure-time and lifestyle exercise behavior as significant (1.22, $p < .05$; 1.95, $p < .05$, respectively). It can be concluded that regular exercise behavior requires major motivation that is changed to a set of plan on guidance to engage in exercise. The regular exercise behavior among the elderly always remains a behavior that requires a rather high level of cognitive guidance.

The Direct Relationship between Perceived Self-efficacy for Exercise and Perceived Barriers to Exercise

There was additional research finding which included substantial causal relationship between perceived self-efficacy for leisure-time exercise and perceived barriers to leisure-time exercise derived from LISREL modification indices as stated in Pender's HPM (1996). The results showed that perceived self-efficacy for leisure-time exercise had a significant and negative direct effects on perceived barriers to leisure-time exercise, indicating support for the causal relationship as stated in Pender's HPM.

In conclusion, this chapter presents the discussion of the data. It focuses on interpreting characteristics of the participants, exercise behavior, causal models of exercise behavior and contribution to nursing science. Pender' HPM can be useful for predicting exercise behavior of the Thai elderly. However, there is a difference in causal relationships among variables between the leisure-time exercise behavior model and the lifestyle exercise behavior models. The nursing intervention should be developed to manipulate factors influencing both leisure-time exercise behavior and lifestyle exercise behavior of the elderly.

CHAPTER VI

CONCLUSION

The purposes of this study were to test a causal model to predict exercise behavior among the elderly and to investigate causal relationships among predictor variables. The two causal models consist of leisure-time exercise and lifestyle exercise. The model of leisure-time exercise behavior includes four variables that were hypothesized to have an effect on exercise behavior: social support to leisure-time exercise, perceived barriers to leisure-time exercise, perceived self-efficacy for leisure-time exercise and commitment to a plan of leisure-time exercise. Using variables from the first model, the model of lifestyle exercise behavior was developed, but all predictor variables reflected lifestyle exercise behavior. The hypotheses of both models were based on Pender's HPM (1996).

Summary of the Study

The Sample and Data Collection

The sample consisted of three hundred elderly people who were selected by the following criteria: aged 60 years or over with no cognitive impairment. Data collection was performed at the elderly's house in a selected community from the health center at different districts in Bangkok Metropolis from June to October 2000. The multi-stage random sampling was conducted to identify the samples.

Instruments

Six instruments were used to collect data including: 1) the Personal Data Form, 2) the Social Support for Exercise Questionnaire 3) the Perceived Barriers to Exercise Questionnaire, 4) the Perceived Self-Efficacy for Exercise Questionnaire, 5) the Commitment to a Plan of Exercise Questionnaire (Pender,1996), and 6) the Yale Physical Activity Survey (YPAS) (DiPietro, et al.,1993).

Three instruments were modified from Pender's measurements, including the Social Support for Exercise Questionnaire, the Perceived Barriers to Exercise Questionnaire, and the Perceived Self-Efficacy for Exercise Questionnaire. The instruments used in this study were translated into the Thai version. The Back-translation technique was used to assure the accuracy of the translation. The validity and reliability of the measurement were also tested.

Research Findings

1. Sample Characteristics

The sample was composed of 180 women (60%) and 120 men (40%). The age of the participants ranged from 60 to 87 years with the mean of 68.01 years. The majorities (68%) of the participants were in the 60-to-70-year age group, and 28% were in the 71-to-80-year age group. Forty percent of the participants had low income with a mean of 4,478 baht per month (SD = 7,236.99). Forty eight percent of the participants were married, 38.70% were widowed, 10 % were separated/divorced, and 3.30% were single. Most of the participants lived with their family members, while only 5.40% lived alone. A majority of the participants (75%) reported having at least

one chronic illness. Hypertension (20.33%), low back pain (14.18%), diabetes mellitus (14.18%), cardiovascular problem (7.09%), and hyperlipidemia (5.91%) were the most common health problems among the participants.

2. Causal Model of Exercise Behavior

The hypothesized models consisted of leisure-time exercise behavior model and lifestyle exercise behavior model derived from Pender's HPM (1996).

Model of Leisure-time Exercise Behavior

The leisure-time exercise behavior model was fit to the empirical data, regarding the overall goodness of fit index. The predictor variables of the leisure-time exercise behavior model explained variance on exercise behavior for 52% ($R^2 = .52$). The findings of causal relationships testing of the leisure-time exercise behavior model were as follows:

1. Commitment to a plan of leisure-time exercise had a significantly positive direct effects on exercise behavior ($\beta = 1.22, p < .05$).
2. Social support for leisure-time exercise had a significantly positive direct effects on commitment to a plan of leisure-time exercise ($\beta = .53, p < .001$) and on exercise behavior ($\beta = .45, p < .05$). In addition, it had a significant positive indirect effects on exercise behavior via commitment to a plan of leisure-time exercise ($\beta = .52, p < .05$).
3. Perceived barriers to leisure-time exercise had a significantly negative direct effects on commitment to a plan of leisure-time exercise ($\beta = -.27, p < .01$) and on exercise behavior ($\beta = -.26, p < .05$). In addition, it had a significant negative indirect

effects on exercise behavior via commitment to a plan of leisure-time exercise ($\beta = -.60, p < .05$).

4. Perceived self-efficacy for leisure-time exercise had a significantly positive direct effects on commitment to a plan of leisure-time exercise ($\beta = .32, p < .001$) and on exercise behavior ($\beta = .36, p < .05$).

5. The path was derived from the analyzed process including perceived self-efficacy for leisure-time exercise which had a significantly negative direct effect on perceived barriers to leisure-time exercise ($\beta = -.61, p < .001$).

Model of lifestyle Exercise Behavior

The lifestyle exercise behavior model was fit to the empirical data, regarding the overall goodness of fit index. The predictor variables of the lifestyle exercise behavior model explained variance on exercise behavior for 32% ($R^2 = .32$). The findings of causal relationships testing of the lifestyle exercise behavior model were as follows:

1. Commitment to a plan of lifestyle exercise had a significantly positive direct effects on exercise behavior ($\beta = 1.95, p < .05$).

2. Social support for lifestyle exercise had a significantly positive direct effects on commitment to a plan of lifestyle exercise ($\beta = .30, p < .001$) and on exercise behavior ($\beta = .21, p < .05$). In addition, it had a significantly positive indirect effects on exercise behavior via commitment to a plan of lifestyle exercise ($\beta = .37, p < .05$).

3. Perceived self-efficacy for lifestyle exercise had a significantly positive direct effects on commitment to a plan of lifestyle exercise ($\beta = .14, p < .05$) and had a

significantly positive indirect effects on exercise behavior via commitment to a plan of lifestyle exercise ($\beta = .26, p < .05$).

Implications and Recommendations

Implications and Application of Research Findings

1. Implication to Nursing Practice

1.1 Exercise Behavior

Regarding exercise recommendation for the elderly, either leisure-time exercise or lifestyle exercise can be beneficial for the elderly, so interest or opportunities should be used to determine which is the most appreciate. However, it is recommended that the elderly should engage in stretching exercise, flexibility exercise and should accumulate intermittent short bouts of physical activity for at least 30 minutes. Furthermore, at least low to moderate intensity should be emphasized.

1.2 Commitment to a Plan of Exercise

For both leisure-time and lifestyle exercise behavior models, the findings pointed out that commitment to a plan of exercise was the best predictor among the studied variables. Commitment to a plan of exercise acts as the effective mediator of exercise behavior. General commitment to a plan of exercise consists of micro-behaviors that support consistency of exercise behavior. Therefore, the elderly should always adopt and maintain regular exercise behavior that requires high level of cognitive guidance. To further clarify, understanding of the process of motivating factors affect exercise behavior. The finding suggested that nurses must focus on developing strategies to promote commitment to a plan of exercise, such as

contracting. (Redland & Stuiberger, 1993: 436). Contracts can be made with others or self-contract. An elaborate contract would include abroad long-term goal, perceived benefits and obstacles to its achievement, and specific short-term goals with target dates for their achievement.

1.3 Social Support for Exercise

The results of this study indicated that social support for both leisure-time exercise and lifestyle exercise had direct effects on exercise behavior and indirect effects on exercise behavior via commitment to a plan of exercise. Interventions with a focus on developing and encouraging social support for elderly are needed to increase commitment to a plan of exercise. Nurses in primary care settings should be central figures in the development of an exercise program, which encourages emotional support, informational support, and facility tangible support.

1.4 Perceived Self-efficacy for Exercise

The results concerning the leisure-time exercise model showed that self-efficacy for leisure-time exercise had a positive direct effects on exercise behavior as well as a negative direct effects on perceived barriers to leisure-time exercise. For the lifestyle exercise model, there was evidence that perceived self-efficacy for lifestyle exercise had a positive indirect effects on exercise behavior through commitment to a plan of lifestyle exercise. This indicated that promoting self-efficacy for leisure-time exercise is relevant not only to encourage the elderly to engage in exercise, but also to reduce perception of barriers to leisure-time exercise. Moreover

encouraging self-efficacy for lifestyle exercise should promote exercise behavior through enhancement of commitment to a plan of lifestyle exercise.

Developing nursing interventions, which assist the elderly to increase their perception of self-efficacy for both leisure-time and lifestyle exercise should be promoted. Such interventions are as follows: 1) Designing exercise program with information campaign and role model; 2) Designing persuasive messages to encourage trial of exercise behavior and convince the elderly that they have capacity to engage in both leisure-time and lifestyle exercise; 3) Reducing the effect of anxiety or boredom during engagement in exercise behavior which is less threatening and allows energy to be focused on performance (Readland & Stuiberger, 1993:433-434); 4) Developing self-management capabilities such as part of instruction in cognitive pain control strategies in arthritis persons. When perceived self-efficacy for exercise has been increased, this motivation is transformed into a set of guidance to exercise, engage in exercise and reduce the exercise obstacles.

1.5 Perceived Barriers to Exercise

In this study, the findings concerning the leisure-time exercise model revealed that perceived barriers to leisure-time exercise had a negative direct effect on exercise behavior as well as an indirect effect on commitment to a plan of leisure time exercise. Nursing interventions that aimed at reducing barriers to leisure-time exercise must be developed to promote exercise behavior and to increase commitment to a plan of leisure-time exercise.

To accomplish perceived barriers, health care providers need to dispel misconceptions about exercise as dangerous, uncomfortable, exhausting, or

embarrassing for the elderly group. It is very important that nurses and health care professionals must acknowledge that those occupation or vocational activities (for example, delivering information as a health center volunteer or helping with community needs by walking or bicycling) can provide exercise opportunities. Structural household activities (such as walking in daily living and walking up and down the stairs) are also a source of exercise behavior and can be integrated into routine exercise (Allison & Keller, 1997: 67). Community activities such as religious activities and volunteer activities may also be encouraged.

Integration of numerous short bouts of lifestyle exercise into daily living may be easier than prescription of leisure-time exercise for the elderly, who reported lack of time as barriers to leisure-time exercise. In addition, integrating the leisure-time exercise into the elderly's usual daily activities should be enhanced.

In addition, nurses can design a home-based exercise program specifically for sedentary older persons. The home-based exercise program is a very important new strategy because it allows the elderly to exercise privately, as they feel convenient, in the comfort of familiar surroundings, and without having to travel, since it reduces some barriers and maintains exercise lifestyles (Jette, et al., 1999:66).

2. Implications to Nursing Administration

Introduction of the new recommendation of exercise affects the geriatric nursing management and plans in the physical activity arena. The accumulation of any array of clinical and physiological evidence over the past decade has increasingly argued for a shift away from a uniform exercise prescription based on intensity, frequency, and duration to one that encourages increased level of general energy

expenditure throughout a person's day. Lifestyle exercise is a new alternative model that demonstrates an extension of a broader physical activity-health paradigm.

The major geriatric nursing goal and management in the physical activity area should focus on increases in low to moderate-intensity activities (e.g. walking, bicycling, stair-climbing) accumulating to at least 30 minutes or more of additional activity on most days and weeks. The recommendation explicitly acknowledges both the importance of low to moderate-intensity activities for health and functioning, as well as the fact that such activities are more readily available and likely to be more easily undertaken by a large segment of the elderly population throughout the week. It further acknowledges the utility of increasing energy expenditure through modes of activity occurring in addition to the recreational activities typically programmed during leisure-time. Mode of activity was routine activities such as walking that occur throughout the day, and transportation activities.

3. Implications to Nursing Education

Nurse educators should incorporate a new alternative model of lifestyle exercise into theoretical and practical learning of student nurses in order to extend their knowledge and skills in geriatric nursing care.

Implications for Further Studies

The findings of this study can be used as a guideline for further studies as follows:

1. An experimental study for leisure-time exercise should be performed to promote exercise behavior among community-dwelling elders by developing

interventions to attempt at increasing social support, increasing perceived self-efficacy, and decreasing perceived barriers. In addition, commitment to a plan should be built into the interventions because it is a mediating factor of exercise behavior process. These interventions are essential for the understanding of the process of exercise behavior among the elderly.

2. For lifestyle exercise behavior, an experimental study to encourage exercise behavior among community-dwelling elders can be implemented in which the intervention to promote social support, perceived self-efficacy, and commitment to a plan of exercise should be used.

3. The revised HPM has just begun to be used as a framework to study physical activity of youth (Pender, 1998: 144), and elderly groups. Replication should be carried out in the elderly in other geographic areas to examine cross validation of the modified models of leisure-time and lifestyle exercise behavior, and to confirm validation or explanation of Pender's HPM in different elderly groups. Furthermore, the results of those studied may be more generalizable to the Thai elderly.

4. The constellation of constructs predicting exercise behavior probably differ at different stages of exercise behavior change. Further research should examine the predictability of social support, perceived barriers, self-efficacy, and commitment to a plan of exercise as predictor variables of exercise behavior among the elderly at different stages of health behavior change.

5. This study used measures of exercise behavior, perceived self-efficacy, social support, and perceived barriers consisting of various forms of exercise. Further study could examine more specific forms of exercise such as walking.

6. In testing the models of leisure-time exercise and lifestyle exercise, further research needs the tool to measure exercise behaviors, both leisure-time and lifestyle exercise, since the exercise behavior should be measured separately. Thus, the researcher can specify the exercise behavior to have a clear-cut distinction between leisure-time exercise and lifestyle exercise behavior.

Limitation of the study

There are two major limitations to present study that need to be considered in future research.

1. Measurement

1.1 Measurement of exercise behavior

In this study, the testing two models (leisure-time exercise behavior and lifestyle exercise behavior) involved the use of the same exercise variables deriving from YALE Physical Activity Survey (YPAS) Part II. The YPAS reflected on leisure-time and lifestyle exercise including duration, frequency, and intensity in each aspect of the activity. This measurement, although appropriated in measuring exercise behavior, was not a rather good measurement to assess two dimensions of exercise behavior. The measurement by means of intensity of some activities, such as vigorous, moving, standing, sitting, was not applicable to separately measure of leisure-time exercise and lifestyle exercise. If the researcher can specify the exercise behavior to develop a clear-cut distinction between leisure-time exercise and lifestyle exercise behaviors, this measurement might be modified to measure those two exercise behaviors separately. However, this modification was not performed in this study because the main focus for this research was to employ the original

measurement in order to compare the results with the findings derived from the framework of Pender's HPM.

1.2. Measurement of Commitment to a plan of exercise

There was a problem when using the Commitment to a Plan of Lifestyle Exercise Questionnaire. Several subjects reported that they had difficulty answering such items as *"You keep written records of your exercise activity"*. This indicated that this item could not be applied to the lifestyle exercise. Further research should modify and validate this measurement in the Thai version.

2. Data Collection

In this study, model testings were based on cross-sectional data, and the causal relationships may be different when time and associated contemporaneous events are considered (Readland & Stuibergen, 1993: 430).

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LIST OF EXPERTS

There are eight experts who validate the content of research instruments. They are:

1. Professor Dr. Somchit Hanuchareonkul
Department of Nursing, Faculty of Medicine,
Ramathibodi Hospital, Mahidol University.
2. Professor Sutthichai Jitapunkul (M.D.)
Departement of Medicine, Faculty of Medicine,
Chulalongkorn University
3. Associate Professor Dr. Wason Silpasuwan
Head of Department of Health Educational and Behavioral Science
Faculty of Public Health, Mahidol University.
4. Associate Professor Dr. Somchit padumanonda
Department of Public Health Nursing
Faculty of Public Health, Mahidol University
5. Associate Professor Dr. Jariyawat Kompayak
Dean of Faculty of Nursing, Huachiew Chalermprakiat University
6. Assistant Professor Wilai Kuptaniratsaikul
Department of Orthopaedic Surgery
Faculty of Medicine Siriraj Hospital, Mahidol University
7. Dr. Sirirat Hirunrat
College of Sport Science and Technology,
Salaya Campus, Mahidol University
8. Dr Punchalee Wasanasomsithi
Chulalongkorn University language Institute

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APPENDIX B
CHULA MENTAL TEST (CMT)

CHULA MENTAL TEST

คำชี้แจง ก. ผู้สัมภาษณ์อ่านข้อความ

ข. ให้คะแนน 1 เมื่อผู้สูงอายุตอบถูกต้อง

ให้คะแนน 0 เมื่อผู้สูงอายุตอบไม่ถูกต้อง

ค. สรุปตีความระดับความรู้คิดและสติปัญญาของผู้สูงอายุ ตามเกณฑ์ที่กำหนดให้

คำถาม	คำตอบ	คะแนน
1. ปีนี้คุณอายุเท่าไร		1 / 0
2. ขณะนี้กี่โมง (อาจตอบคลาดเคลื่อนได้ 1 โมง)		1 / 0
3. พูดคำว่า “ร่วม , กระทะ, ประตุ ให้ฟังซ้ำ ๆ ชัด ๆ 2 ครั้ง	“ร่วม”	1 / 0
แล้วบอกให้ผู้ถูกทดสอบทวนชื่อทั้งสามดังกล่าวนั้นที่	“กระทะ”	1 / 0
(ชื่อที่ถูก 1 ชื่อ = 1 คะแนน)	“ประตุ”	1 / 0
.		
.		
.		
13. บอกให้ผู้ถูกทดสอบลบเลขที่ละ 3 จาก 20 ทั้งหมด 3 ครั้ง		
20 - 3 = ก	ก = 17	1 / 0
ก - 3 = ข	ข = 14	1 / 0
ข - 3 = ค	ค = 11	1 / 0
ให้คะแนนตามจำนวนเลขที่ลบได้ถูกต้องครั้ง 1 คะแนน)		
ได้รับคะแนนรวม =		
ความรู้ความคิดและสติปัญญาของผู้สูงอายุนี้อยู่ในระดับ		

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APPENDIX C
PERSONAL DATA FORM

แบบบันทึกข้อมูลส่วนบุคคล

รหัสผู้ให้สัมภาษณ์.....

รหัสชุมชน.....

วันที่.....

คำชี้แจง ให้ผู้สัมภาษณ์ทำเครื่องหมาย ✓ ลงใน () หน้าข้อความที่เป็นคำตอบและเติมข้อความลงในช่องว่างที่ได้จากการสัมภาษณ์ในคำตอบแต่ละข้อ

1. เพศ

() หญิง

() ชาย

2. อายุ _____ ปี

3. สถานภาพสมรส

() โสด

() คู่

() หม้าย

() หย่า/แยก

4. จบการศึกษาสูงสุดชั้น

() ประถม

() มัธยมศึกษา

() อาชีว

() ปริญญาตรี

() สูงกว่าปริญญาตรี

() ไม่ได้เรียน

() อื่น ๆ ระบุ _____

.
.
.
.

10. ปัจจุบันท่านมีภาวะสุขภาพผิดปกติหรือโรคประจำตัวต่อไปนี้หรือไม่

() ไม่มี

() มี ระบุ () โรคหัวใจ

() โรคความดันโลหิตสูง

() โรคปวดข้อ/ข้ออักเสบ

() โรคเบาหวาน

() ปัญหาเกี่ยวกับการมองเห็น

อื่น ๆ.....

Personal Data Form

Participant code.....

Community code.....

Date.....

General information

The researcher will record the concerned information accordingly in the blank area or check ✓ in the parenthesis in front of the statement.

1. Gender

☐ Female☐ Male

2. Age.....year

3. Marital status

☐ Single☐ Married☐ Widowed☐ Divorced

4. What is the highest level of education that you completed?

☐ Primary school☐ Secondary school☐ Vocational☐ University☐ No education☐ Other, please specify.....

10. Do you have any health problems or chronic illness?

☐ No☐ Yes, please specify ☐ Cardiovascular problem☐ Hypertension☐ Arthritis/joint soreness☐ Diabetes mellitus☐ Visual problem

Other.....

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APPENDIX D
SOCIAL SUPPORT FOR EXERCISE
QUESTIONNAIRE

ข้อความ	สมาชิกในครอบครัว										เพื่อน									
	ชื่อ	การออกกำลังกาย				ชื่อ	การออกกำลังกาย				ชื่อ	การออกกำลังกาย				ชื่อ	การออกกำลังกาย			
		ไม่เคย	บ้าง ครั้ง	บ่อย	ไม่ ทราบ		ไม่เคย	บ้าง ครั้ง	บ่อย	ไม่ ทราบ		ไม่เคย	บ้าง ครั้ง	บ่อย	ไม่ ทราบ		ไม่เคย	บ้าง ครั้ง	บ่อย	ไม่ ทราบ
Emotion กระตุ้นให้ท่านออกกำลังกายหรือออกแรงทำ กิจกรรม (P3)	1					14					27					40				
ให้คำชมเชยเมื่อท่านออกกำลังกายหรือออก แรงทำกิจกรรม (P6)	2					15					28					41				
.																				
.																				
Tangible ช่วยเหลือด้านค่าใช้จ่ายซึ่งเป็นในการออก กำลังกายหรือออกแรงทำกิจกรรม	6					19					32					45				
.																				
.																				
Information ให้ข้อมูลเกี่ยวกับประโยชน์และชนิดออก กำลังกายหรือออกแรงทำกิจกรรม	13					26					39					52				

Item	Members in Family										Friends												
	No.	Exercise				No.	Daily living activity				No.	Exercise				No.	Daily living activity						
		Never	Sometimes	Often	Don't know		Never	Sometimes	Often	Don't know		Never	Sometimes	Often	Don't know								
<u>Emotion</u> Encourage you to exercise or play hard/performing daily living activity. (P3)	1					14					27					40				Never	Sometimes	Often	Don't know
Praise you for exercising/ performing daily living activity. (P6)	2					15					28					41				Never	Sometimes	Often	Don't know
.																				Never	Sometimes	Often	Don't know
.																				Never	Sometimes	Often	Don't know
<u>Tangible</u> Give you necessary financial support to exercise/performing daily living activity.	6					19					32					45				Never	Sometimes	Often	Don't know
.																				Never	Sometimes	Often	Don't know
.																				Never	Sometimes	Often	Don't know
<u>Information</u> Give information about types of exercise/performing daily living activity.	13					26					39					52				Never	Sometimes	Often	Don't know

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APPENDIX E
PERCEIVED BARRIERS TO EXERCISE
QUESTIONNAIRE

ข้อความ	ข้อ	การออกกำลังกาย					ข้อ	การออกแรงทำกิจวัตรประจำวัน			
		ไม่เป็น จริงเลย	ส่วนใหญ่ ไม่ เป็นจริง	จริงบ้าง	ส่วนใหญ่ เป็น จริง	เป็น จริง มาก		ไม่เป็น จริงเลย	ส่วนใหญ่ ไม่ เป็นจริง	จริงบ้าง	ส่วนใหญ่ เป็น จริง
Internal Barriers ท่านอาจจะไม่ออกกำลังกายหรือออกแรงทำกิจกรรมต่าง ๆ หากท่านไม่มีเวลา (P)	1						19				
ท่านอาจจะไม่ออกกำลังกายหรือออกแรงทำกิจกรรมต่าง ๆ หากท่านไม่มีวิธีการทำ (P)	2						20				
.											
.											
.											
External Barriers ท่านอาจจะไม่ออกกำลังกายหรือออกแรงทำกิจกรรมต่าง ๆ ถ้าท่านไม่มีเสื้อผ้าหรือรองเท้าใส่ออกกำลังกายหรือออกแรงทำกิจกรรม(P)	17						35				
ท่านอาจจะไม่ออกกำลังกายหรือออกแรงทำกิจกรรมต่าง ๆ ถ้าการเดินทางออกนอกบ้านอาจมีอันตรายหรือลำบาก	18						36				

Item	No.	Exercise					No.	Daily living activity					
		Not at all true	Not very true	In between	Sort of true	Very true		Not at all true	Not very true	In between	Sort of true	Very true	
<u>Internal Barriers</u>													
You might not exercise/performing daily living activity if you didn't have enough time. (P)	1						19						
You might not exercise/performing daily living activity if you didn't know how to do a certain types of exercises. (P)	2						20						
.													
.													
.													
<u>External Barriers</u>													
You might not exercise/performing daily living activity if you didn't have the right clothes/shoes to exercise. (P)	17						35						
You might not exercise/performing daily living activity if commuting can be harmful or difficult.	18						36						

The background of the page features a large, faint, circular seal of Mahidol University. The seal contains a central emblem with a tiered umbrella and a crown, surrounded by Thai script. The text of the seal is partially obscured by the main title.

APPENDIX F

PERCIEVED SELF-EFFICACY FOR

EXERCISE QUESTIONNAIRE

ข้อความ	ข้อ	การออกกำลังกาย					การออกแรงทำกิจกรรมประจำวัน				
		ไม่เป็น จริงเลย	ส่วนใหญ่ ไม่เป็น จริง	จริงบ้าง ไม่จริง บ้าง	ส่วนใหญ่ เป็น จริง	เป็น จริง มาก	ไม่เป็น จริงเลย	ส่วนใหญ่ ไม่เป็น จริง	จริงบ้าง ไม่จริง บ้าง	ส่วนใหญ่ เป็น จริง	เป็น จริง มาก
Internal Conditions ท่านสามารถออกกำลังกายหรือออกแรงทำกิจกรรมต่าง ๆ ได้ ถึงแม้จะรู้สึกเหนื่อย (P)	1										
ท่านสามารถออกกำลังกายหรือออกแรงทำกิจกรรมต่าง ๆ ได้ ถึงแม้ว่าท่านต้องปฏิบัติตามกิจกรรมเหล่านี้โดยลำพัง (P)	2										
.											
.											
.											
External conditions ท่านสามารถออกกำลังกายหรือออกแรงทำกิจกรรมต่าง ๆ ได้ แม้ว่ากิจกรรมนั้นจะยากลำบาก	13										
ท่านสามารถออกกำลังกายหรือออกแรงทำกิจกรรมต่าง ๆ ได้ แม้ว่าท่านมีกิจกรรมอื่น ๆ ที่ท่านต้องการจะทำ (P)	14										

Item	No.	Exercise					No.	Daily living activity				
		Not at all true	Not very true	In between	Sort of true	Very true		Not at all true	Not very true	In between	Sort of true	Very true
<u>Internal Conditions</u> You could exercise/performing daily living activity even if you were tired. (P)	1						15					
You could exercise/performing daily living activity even if you had to exercise alone. (P)	2						16					
.												
.												
.												
<u>External Conditions</u> You could exercise/performing daily living activity even if the activity is difficult.	13						27					
You could exercise/performing daily living activity even if you had other thinks you wanted to do.(P)	14						28					

APPENDIX G

COMMITMENT TO A PLAN OF EXERCISE

QUESTIONNAIRE

ข้อความ	ข้อ	การออกกำลังกาย			การออกกำลังกายประจำวัน		
		ไม่เคย	บางครั้ง	บ่อย	ไม่เคย	บางครั้ง	บ่อย
ท่านจัดทำตารางเวลาการออกกำลังกายหรือออกกำลังกายเป็นประจำ	1						
ท่านให้รางวัลกับตัวเองเมื่อได้ออกกำลังกายหรือออกกำลังกายเป็นประจำ	2						
ท่านวางแผนเสื้อผ้าและรองเท้าสำหรับออกกำลังกายหรือออกกำลังกายเพื่อเตือนตัวเองไม่ให้ลืมไป	3						
ออกกำลังกาย	4						
ท่านออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายโดยเฉพาะ	5						
ท่านเขียนข้อความสั้น ๆ ติดไว้ในที่ที่เห็นได้ง่ายเพื่อเตือนตัวเองให้ออกกำลังกายหรือออกกำลังกายหรือออกกำลังกาย	6						
ท่านเปลี่ยนรูปแบบการออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกาย	7						
ท่านพยายามที่จะออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกาย	8						
ท่านคิดว่าออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกาย	9						
ท่านบันทึกกิจกรรมเหล่านี้	10						
ท่านบันทึกกิจกรรมออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกายหรือออกกำลังกาย	11						

Item	No.	Exercise			No.			Daily living activity		
		Never	Sometimes	Often				Never	Sometimes	Often
You plan specific time for exercise /performing daily living activity in your weekly schedule.	1						12			
You reward yourself when exercising/performing daily living activity	2						13			
You lay out your exercise shoes and clothes to remind yourself to exercise/performing daily living activity	3						14			
You exercise/performing daily living activity in a specific location or facility.	4						14			
You post notes where you can see them to remind yourself to exercise/performing daily living activity.	5						16			
You vary your exercise/performing daily living activity routine to avoid boredom.	6						17			
You work toward exercise/performing daily living activity goals that are progressively more challenging.	7						18			
You consider exercise/performing daily living activity so important in your life that you allocate time for it.	8						19			
You keep written records of your exercise activity/performing daily living activity	9						20			
You let people know about commitment to exercise/performing daily living activity	10						21			
You encourage your friends to exercise/performing daily living activity	11						22			

The background of the title page features a large, faint, circular seal of Mahidol University. The seal contains a central emblem with a tiered umbrella and a crown, surrounded by Thai script. The text of the title is centered over this seal.

APPENDIX H

EXERCISE BEHAVIOR QUESTIONNAIRE

(YPAS)

**THE YALE PHYSICAL ACTIVITY SURVEY FOR OLDER
ADULTS**

Interviewer: I would now like to ask you about certain types of activities that you have done during **the past month**. I will ask you about how much vigorous activity, leisurely walking, sitting, standing, and some other things that you usually do.

1. About how many times during the month did you participate in **vigorous** activities that lasted at least **10 minutes** and caused large increases in breathing, heart rate, or leg fatigue or caused you to perspire?

- Score:**
- 0 = Not at all (go to Q3)
 - 1 = 1-3 times per month
 - 2 = 1-2 times per week
 - 3 = 3-4 times per week
 - 4 = 5+ times per week
 - 7 = Refused
 - 8 = Don't know
- Frequency score =.....**

2. About how long do you do this vigorous activity (ies) each time?

- Score:**
- 0 = Not applicable
 - 1 = 10-30 minutes
 - 2 = 31-60 minutes
 - 3 = 60+ minutes
 - 7 = Refused
 - 8 = Don't know
- Duration score = ...**

Weight = 5

Vigorous Activity Index Score:

Freq score.....x Dur Score.....x Weight..... = ...

.
.
.
.
.

7. About how many hours did you spend sitting on an average day during the past month.

Score: 0 = Not at all

1 = less than 3 hours

2 = 3 hours to less than 6 hours

3 = 6 hours to less than 8 hours

4 = 8+ hours

7 = Refused

8 = Don't know

Sitting score = ...

Weight = 1

Sitting Index Score:

Sitting score..... x Weight..... =.....

การปฏิบัติกิจกรรมของผู้สูงอายุ

คำชี้แจง แบบสัมภาษณ์ชุดนี้มีวัตถุประสงค์เพื่อ ต้องการทราบกิจกรรมที่ท่านได้ปฏิบัติในช่วง 1 เดือนที่ผ่านมา ได้แก่ กิจกรรมที่ใช้แรงมาก การเดินขามว้าง การนั่ง การยืนและการเคลื่อนไหวอื่น ๆ ที่ท่านได้ปฏิบัติเป็นประจำ

โปรดทำเครื่องหมาย ✓ ลงในช่อง [] ที่ตรงกับคำตอบของผู้สูงอายุมากที่สุด

1. ในรอบ 1 เดือนที่ผ่านมา บ่อยครั้งแค่ไหนที่ท่านได้ออกกำลังกายหรือทำกิจกรรมที่ต้องใช้แรงอย่างมากและทำอย่างต่อเนื่องเป็นเวลาอย่างน้อย 10 นาที จนทำให้ท่านรู้สึกเหนื่อย หรือมีเหงื่อออก หรือรู้สึกปวดเมื่อยตามแขน ขา หรือมีอาการหายใจและการเต้นของหัวใจเพิ่มขึ้น

[0] ไม่เคยปฏิบัติ (ข้ามไปถามข้อ 3)

[1] 1-3 ครั้งต่อเดือน

[2] 1-2 ครั้งต่อสัปดาห์

[3] 3-4 ครั้งต่อสัปดาห์

[4] 5 ครั้งหรือมากกว่า 5 ครั้งต่อสัปดาห์

[7] ไม่ตอบ

[8] ไม่ทราบ

Frequency score = ...

2. ท่านออกกำลังกายที่ต้องใช้แรงมากและทำอย่างต่อเนื่องในแต่ละครั้ง เป็นระยะเวลาานเท่าไร

[0] น้อยกว่า 10 นาที

[1] 10-30 นาที

[2] 31-60 นาที

[3] 60 นาทีหรือมากกว่า 60 นาที

[7] ไม่ตอบ

[8] ไม่ทราบ

Duration score = ...

Weight = 5

Vigorous activity index score: _____

Freq score x Dur score x Weight =.....

•
•
•
•
•

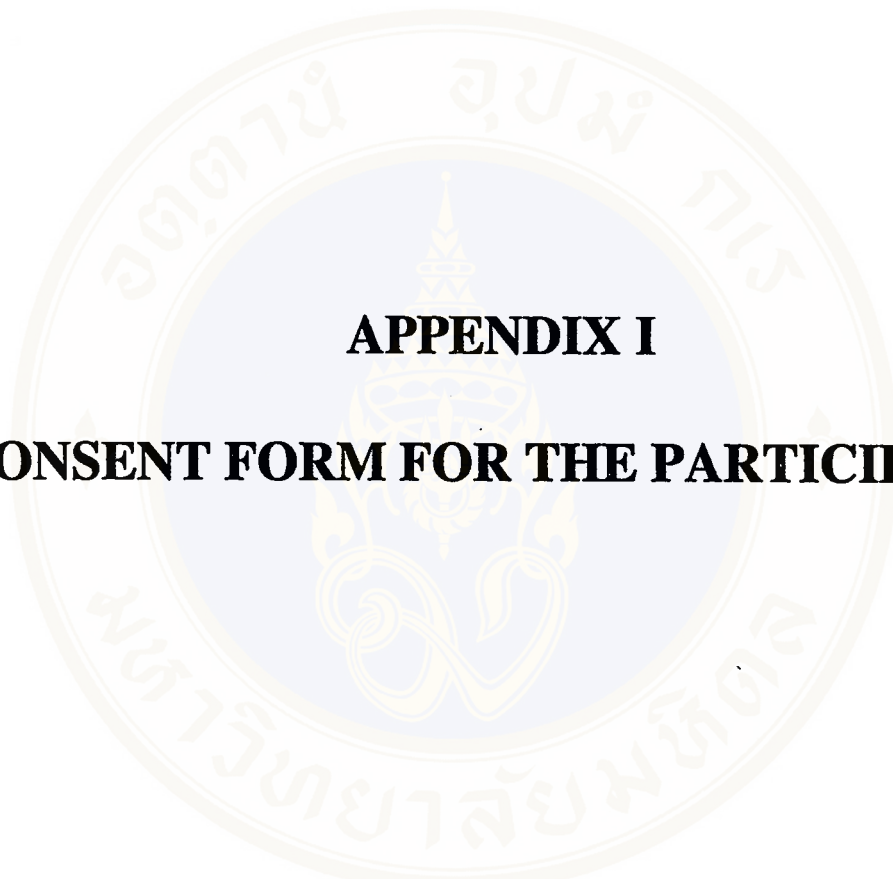
7. ในรอบ 1 เดือนที่ผ่านมา ท่านใช้เวลานั่งทำกิจกรรมต่าง ๆ โดยเฉลี่ยวันละกี่ชั่วโมง

- [0] ไม่ตรงกับข้อ 1-4
- [1] น้อยกว่า 3 ชั่วโมง
- [2] ตั้งแต่ 3 ชั่วโมงขึ้นไปแต่ไม่เกิน 6 ชั่วโมง
- [3] ตั้งแต่ 6 ชั่วโมงขึ้นไปแต่ไม่เกิน 8 ชั่วโมง
- [4] ตั้งแต่ 8 ชั่วโมงขึ้นไป
- [7] ไม่ตอบ
- [8] ไม่ทราบ

Weight= 1

Sitting index score: _____

Sitting score x Weight =.....

The background of the page features a large, faint, circular seal of Mahidol University. The seal is light blue and yellow, with Thai script around the perimeter and a central emblem depicting a crown and a lotus.

APPENDIX I

CONSENT FORM FOR THE PARTICIPANTS

CONSENT FORM FOR THE PARTICIPANTS

You are invited to participate in a study about factors affecting exercise behavior of the elderly in Bangkok Metropolis. The study is conducted by Prapaporn Chinuntuya, a doctoral candidate at the Faculty of Nursing, Mahidol University. This study will involve the elderly in Bangkok. If you agree to take part in this research study, I will interview you about your exercise behavior, what you think about social support for exercise, perceived barriers to exercise, perceived self-efficacy for exercise, and commitment to a plan of exercise. The interview will last about 90 minutes. Your participation will provide valuable information to nurses and other health care providers on promoting exercise behavior among the elderly.

Your information will be kept confidential. The results of this study will be published as group data, and no one will be able to identify you personally in the report. You can stop taking part or withdraw from this study at any time. If you have any question about the study, you can directly contact me by phone number 01-6268310 and 2564096 Ext. 134. You will receive a copy of this informed consent. You are not abandoned any of your legal rights by signing this consent form. Your signature below indicates that you agree to participate in this study.

Thank you for your cooperation.

.....(Researcher)

For Participants

I was informed about the detail of the study and I agree to participate in this study.

.....

(Signature of the participant)

Date.....

แบบฟอร์มการยินยอมเข้าร่วมโครงการวิจัย

ท่านได้รับเชิญให้เข้าร่วมโครงการวิจัยเพื่อหา ปัจจัยที่มีอิทธิพลต่อการออกกำลังกายของผู้สูงอายุเขต กรุงเทพมหานคร ผู้รับผิดชอบโครงการนี้คือ นางสาว ประภาพร จินันทุยา นักศึกษาปริญญาเอก คณะพยาบาล ศาสตร์ มหาวิทยาลัยมหิดล ผู้เข้าร่วมการวิจัยนี้คือผู้สูงอายุในกรุงเทพมหานคร ถ้าท่านยินยอมเข้าร่วมโครงการนี้ ท่านจะถูกสัมภาษณ์โดย นางสาว ประภาพร จินันทุยา เกี่ยวกับกิจกรรมการออกกำลังกาย การสนับสนุนในการ ออกกำลังกายที่ท่านได้รับจากครอบครัวและเพื่อน ความคิดเห็นเกี่ยวกับอุปสรรคในการออกกำลังกาย ความ สามารถในการออกกำลังกายและเจตจำนงต่อแผนการออกกำลังกาย การสัมภาษณ์ใช้ระยะเวลาประมาณ 90 นาที ข้อมูลที่ได้รับจากท่านจะเป็นประโยชน์ต่อพยาบาลและเจ้าหน้าที่ที่มึสุขภาพในการนำไปใช้วางแผนส่งเสริมการ ออกกำลังกายสำหรับผู้สูงอายุ

ข้อมูลที่ได้จากการวิจัยครั้งนี้จะถูกเก็บเป็นความลับ ข้อมูลดังกล่าวจะถูกนำเสนอเป็นรายกลุ่มและไม่มี การเปิดเผยชื่อของท่านให้ผู้อื่นทราบ ท่านสามารถปฏิเสธหรือถอนตัวจากการเข้าร่วมการวิจัยได้ตลอดเวลา ขณะที่อยู่ในระยะเวลาของการวิจัยโดยไม่มีผลเสียใดๆ ใดๆต่อตัวท่าน หากท่านมีข้อสงสัยหรือคำถามเกี่ยวกับการ วิจัย ผู้วิจัยยินดีตอบคำถามของท่านได้ตลอดเวลา ท่านสามารถติดต่อผู้วิจัยได้ทางโทรศัพท์หมายเลข 01-6268310 หรือ 2564092-6 ต่อ 134 ท่านจะได้รับสำเนาการเข้าร่วมโครงการวิจัย 1 ฉบับ ท่านจะไม่สูญเสียสิทธิทาง กฎหมายใด ๆ ทั้งสิ้นจากการเซ็นชื่อยินยอมเข้าร่วมการวิจัย การเซ็นชื่อของท่านข้างล่างนี้แสดงว่าท่านยินดีเข้าร่วม โครงการวิจัย และท้ายที่สุด ผู้วิจัยขอขอบคุณที่ท่านได้สละเวลาและให้ความร่วมมือในครั้งนี้

.....(ผู้วิจัย)

(นางสาวประภาพร จินันทุยา)

สำหรับผู้เข้าร่วมวิจัย

ข้าพเจ้าได้รับคำอธิบายเกี่ยวกับการวิจัยดังรายละเอียดข้างบนอย่างครบถ้วนและข้าพเจ้ายินดีเข้าร่วมใน การวิจัยครั้งนี้

..... (ผู้ยินยอม)

(.....)

วันที่.....เดือน.....พ.ศ.....

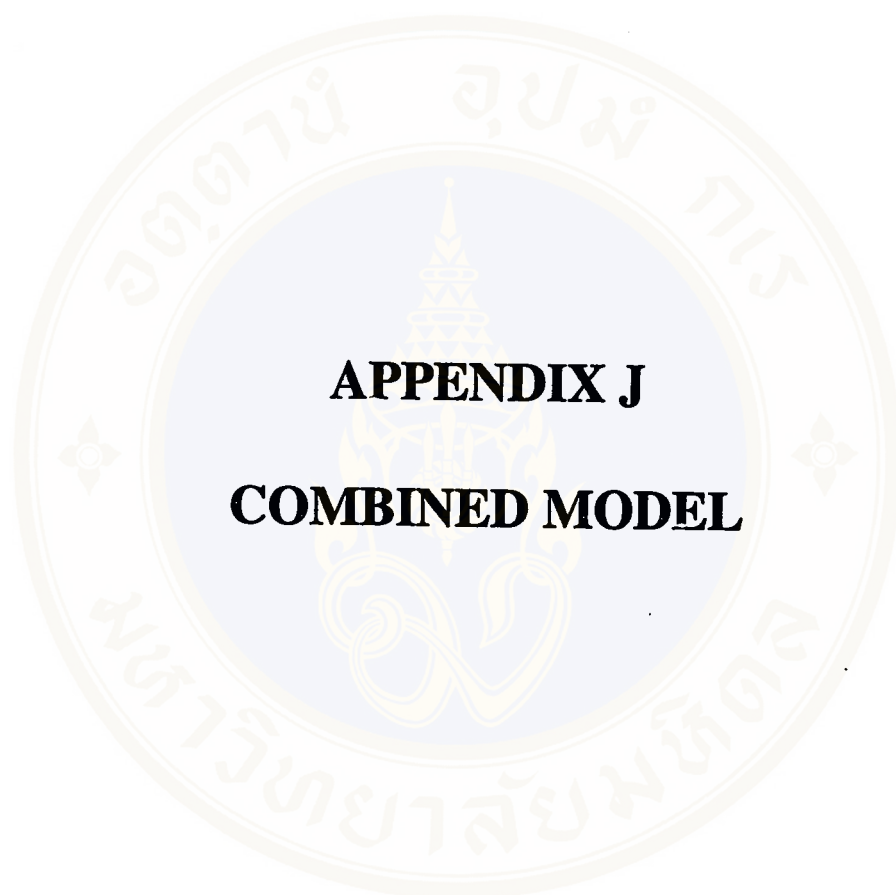


Table 20 Total, Indirect, and Direct Effects of Causal Variables on Affected Variables of Combined Model (N=300)

Affect Variable Causal Variable	CIF			CF			TPA		
	TE	IE	DE	TE	IE	DE	TE	IE	DE
Modified Model: Chi-Square (χ^2)=852.79, df=408, p=0.000, RMSEA=0.06, GFI=0.89, AGFI=0.84									
SSIF	0.31***	-	0.31***				0.90*	0.41*	0.49*
BIF	-0.04	-	-0.04				-0.26	-0.03	-0.23
SEIF	0.48***	-	0.48***				0.39*	0.31*	0.08
SSF				0.33***	-	0.33***	0.86*	0.25*	0.61*
BF				-0.35***	-	-0.35**	-0.58*	-0.34*	-0.24*
SEF				0.24**	-	0.24**	0.70*	0.11	0.59*
CIF							0.39*	-	0.39*
CF							0.24*	-	0.24*
Structural equation fit		0.80			0.78			0.46	

Affect Variable Causal Variable	CIF			CF			TPA		
	TE	IE	DE	TE	IE	DE	TE	IE	DE
Hyperthesized Model: Chi-Square (χ^2)=1204.75, df=423, p=0.00, RMSEA=0.081, GFI=0.81, AGFI=0.78									
SSIF	0.21***	-	0.21***				1.11**	0.19	0.92*
BIF	-0.01	-	-0.01				-0.32	-0.01	-0.31
SEIF	0.21***	-	0.21***				0.51	0.20	0.31
SSF				0.27***	-	0.27***	0.92*	0.04	0.88*
BF				-0.32***	-	-0.32***	-0.62*	-0.19*	-0.43
SEF				0.13**	-	0.13**	0.64*	0.08	0.56*
CIF							0.91		0.91
CF							0.59		0.59
Structural equation fit		0.58			0.82			0.44	



BIOGRAPHY

NAME	Ms. Prapaporn Chinuntuya
DATE OF BIRTH	March 5, 1964
PLACE OF BIRTH	Bangkok, Thailand
INSTITUTIONS ATTEND	College of Nursing, the Thai Red Cross Society, 1982-1986: Bachelor of Nursing Mahidol University, 1990-1993: Master of Science (Nursing) Mahidol University, 1996-2001: Doctor of Nursing Science
RESEARCH GRANT	Doctoral Collaborative Program, Ministry of University Affair, Thailand
POSITION & OFFICE	1986-Present instructor, Department of Surgical Nursing College of Nursing, the Thai Red Cross Society